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Services, innovation, capabilities and policy: Towards a synthesis and beyond

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With innovation scholars being increasingly interested in services, the debate on why and how to formulate innovation policy for services is more urgent than ever. An appropriate response to ongoing servitization requires a thorough understanding of the interwoven nature of goods and services. This paper provides an up-to-date overview of policy strategies fitting an all-encompassing ‘synthesis’ perspective on innovation.

We distinguish two emerging views on the role of services in novelty creation. Each view conveys distinct policy approaches for solving insufficient supply or demand of service capabilities (required for creating and delivering services). The subject-oriented perspective suggests improving interactions involving the use of available capabilities. The object-oriented perspective aims to enhance the development of lacking capabilities. Following this novel distinction in synthesis perspectives, we propose a framework of associated policy instruments and illustrate it with the case of the Dutch province of Limburg.

We conclude by discussing further research possibilities.

Keywords: Innovation policy, service innovation, capabilities, mission oriented policy, business models

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1. Introduction

Post-industrial economies are characterized by a rise in the relative importance of service activities (Bell, 1973). There are several reasons why innovation scholars keep stressing the need to study services more extensively (Martin, 2015). One of the initial points of interest on this account was the observation that rather than just being technology adopters, service providers do innovate (Gallouj, 1994; Gallouj and Weinstein, 1997; Djellal and Gallouj, 2001). A closer look revealed that service providers, and especially knowledge intensive business services (KIBS), are also important drivers of innovation by other economic actors (Den Hertog, 2000; Miozzo and Soete, 2001; Muller and Zenker, 2001). Finally, it has been noted how manufacturing firms have in fact started to switch to service provision themselves (Teece, 2010). For manufacturing industries facing the commodity trap, service-dominant logic is a key to innovative and high value-added solutions (Vargo and Lusch, 2004; Chesbrough, 2011). Apart from ‘servitization’ among incumbent technology firms, also many of today’s most remarkable startups are characterized by business models in which services are indispensable (Suarez et al., 2013). Much of the current research on services therefore concerns the way firms strengthen their competitive position by developing capabilities for designing and offering service-based business models (Den Hertog et al., 2010; Cusumano et al., 2015; Visnjic and Van Looy, 2013; Janssen et al., 2016a). A separate line of ongoing research examines how services tend to be a fundamental part of answers to societal challenges (Gallouj et al., 2015).

As this brief overview shows, it is becoming clear that services relate to innovation dynamics in many different ways. A major question is how advances in our understanding of the manifold and pervasive interdependencies between goods and services affect the need for service innovation policy. Acknowledging that a strong service-orientation can improve the competitiveness of firms, and economies as a whole, policy makers indeed wonder how to respond best to these developments (see, for instance, OECD, 2005; Abreu et al., 2010; European Commission, 2006; 2012; EPISIS, 2011; ESIC, 2015). Actual policy interventions targeting services, however, are commonly reported to be of still a highly experimental nature (Miles, 2007; Rubalcaba et al., 2010; ESIC, 2015). Moreover, the recently booming policy interest in re-industrialization or ‘industrial renaissance’ (European Commission,

2014a; De Backer et al., 2015; Mazzucato et al., 2015) also casts doubts on policy approaches targeted towards services.

Clearly, the sheer finding that services account for a larger share of the economy does not automatically imply a need for more policy support. Economists might even entirely object against public resources being devoted to strengthening low-productivity sectors like services (Gallouj and Savona, 2009). As argued by Rubalcaba (2006, 2007), and later Rubalcaba et al. (2010), examining whether there is a rationale for innovation policy to target services requires a thorough understanding of the place of services in innovation theory.

One decade after Rubalcaba (2006) published his first study on policy rationales, it is time to assess current views on the essence of service innovation. In recent years much progress has been made in exploring the close relation between innovation in services and in goods (Carlborg et al., 2014; De Backer et al., 2015). Research with such a scope is in line with the long sought-after ‘synthesis’ perspective to service innovation, which strives at an all-encompassing rather than dualistic view (Gallouj and Weinstein, 1997; Drejer, 2004; Miles, 2016). The goal of this study is to analyze how conceptualizations of the nature of service innovation are advancing in this direction, and how they translate into policy problems and corresponding policy strategies. Of particular interest in this respect is the notion of service capabilities, as capability development is increasingly regarded as a key objective of innovation policy (Hausmann and Klinger, 2006; Bleda and Del Río, 2013).

The remainder of this paper is as follows. We first introduce our reasons to state that service innovation thinking is evolving into two different synthesis perspectives. On this basis, we argue how our distinction between object-oriented and subject-oriented synthesis translates into possibilities for supporting either the development or the use of service capabilities. Subsequently, we illustrate our framework with a case study of the policies adopted by the Dutch region of Limburg to develop its service-orientation. This case is salient since Limburg is representative of many other regions aiming to revitalize their post-industrial economies (ESIC, 2014; Los et al., 2016). We conclude by discussing how the proposed distinction in synthesis perspectives is relevant in the process of policy formulation, as well as for the wider literature on service innovation.

2. Evolution in service innovation thinking

2.1 *The traditional perspectives*

Whether or not service innovation is believed to be a phenomenon that differs from (and perhaps complements) other forms of innovation has far-reaching implications for considerations on whether and how to support it (Rubalcaba, 2006). To reinvigorate debates on the need for service innovation policy, we start by discussing how service innovation thinking has evolved through various phases.

Scientific inquiries into service innovation have traditionally been grouped into three main lines of thinking: assimilation, demarcation and synthesis (Gallouj, 1994; Coombs and Miles, 2000; Carlborg et al., 2014; Miles, 2016).¹

The *assimilation* perspective is built on the assumption that ‘most economic attributes of services are fundamentally similar to those of manufacturing sectors’ (Miles, 2007, p. 262). All dissimilarities between the two domains can be thought of as matters of degree, rather than fundamental differences. Typical for this perspective are the attempts to adapt existing frameworks to the specific features of services, like for instance the taxonomy Miozzo and Soete proposed in 2001 (see also Castellacci, 2008; Castaldi, 2009). However, by starting from the same concepts and methods used for analyzing manufacturing, e.g. for measuring R&D, this ‘technologists’ perspective is generally found to be unsatisfactory in its ability to shed light on what is special about services (Miles, 2005).

The *demarcation* or *differentiation* perspective is a response to much of the critique concerning the assimilation perspective. Rather than treating all forms of economic and especially innovative activity as similar, this perspective focuses on identifying peculiarities of services. Particularly popular are domains like consultancy, financial services, tourism, or retail. By studying innovation in such different service industries, scholars concentrate on finding specificities that do not apply to the domain of manufacturing and goods. Due to its focus on idiosyncrasies, the demarcation perspective is accused of resulting in ‘local theories’ rather than contributing to a better understanding of innovation in general (Gallouj and Savona, 2009).

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¹ Some authors also distinguish an ‘inversion’ perspective, which regards service industries as sources of innovation across the entire economy (Gallouj, 2010).

The *synthesis* perspective, finally, is commonly regarded as the most promising research avenue (Miles, 2007; Consoli, 2007). Rather than seeing service innovation as fundamentally equal or different from goods-oriented innovation, it integrates the characteristics of both into overarching theories and frameworks. An important reason to take this perspective is that the borders between manufacturing and service activities are becoming hazy (Bryson and Monnoyer, 2004; Bryson and Taylor, 2010). Regarding the domain of goods- and service-based innovation as strongly intermingled, the synthesis perspective urges not to view service innovation in isolation. Instead, services should be considered an inherent part of change processes in individual products as well as in the transformation of entire sectors, value chains or clusters (Gallouj and Windrum, 2009; Ciarli et al., 2012).

Despite the fact that the synthesis is widely advocated, the risk that lures when adopting all-encompassing views is that the acclaimed peculiarities of service innovation dynamics are not adequately taken into account after all (Gallouj and Savona, 2009; Rubalcaba et al., 2010). The rise of tightly interconnected product-service combinations, be it at the level of ‘hybrid’ business offerings or the value chains they are part of, can only be explained - and managed – when properly understanding how developments in manufacturing and services are driving each other (Schaarschmidt et al., 2017). Without acknowledging the underlying complex interactions, presumed comprehensive accounts of innovation keep being relapses to assimilation rather than contributions to the synthesis perspective.

2.2 *Subject-oriented synthesis and object-oriented synthesis*

The synthesis perspective does not emphasize the contrasts between goods and services (like demarcation), but the complementarities. While there is a wide consensus that goods and services are increasingly linked with each other, there is less of a shared understanding of how this happens. The linkages can take many forms, which is often obscured by referring to some complex yet unspecified interplay. Besides preventing the synthesis perspective from advancing, a poor overview of the possible connections between goods and services also hampers possibilities for formulating policy (Rubalcaba et al., 2010).

A suitable starting point for providing clarity on this account is to untwine debates about *who* is involved in providing services and *what* constitutes a service offering. So far, the synthesis perspective

captured contributions on both the role of service industries and service employees (in innovation and economic production) as well the service elements in product-service systems or business models. These two approaches entail different propositions about the complementarities between goods and services. We therefore propose a distinction between subject-oriented synthesis and object-oriented synthesis.² Below we describe how the synthesis perspective has been evolving along these two lines.

We define as subject-oriented synthesis a perspective focused on the agents that are responsible for the linkages between goods and services.

Agents can refer to different levels of aggregation, from whole sectors to firm employees. The literature on service innovation emerged with the observation that ‘tertiarization’ was taking place around the world (Bell, 1973). While most of the research fitted the assimilation and demarcation perspectives, studies looking at the dynamics between the secondary and tertiary sector classify as early examples of subject-oriented synthesis. This broad sectoral view was followed up by investigations of the interrelations between particular manufacturing and service industries. A typical example in this category is the research on the ability of knowledge intensive business services (KIBS) to transfer knowledge from one domain to another, thereby also acting as a driver of innovation in manufacturing (Den Hertog, 2000; Muller and Zenker, 2001).

A lower and thus more detailed level of aggregation is the value chain. One point of interest is the variety of interactions between goods-producers and service firms along the value chain (Matthyssens and Vandenbempt, 2008). Service providers are known to take over an increasingly wide range of activities from their (manufacturing) clients (Brax and Visintin, 2017). This also includes the development in which producers are extending their offerings with services that serve to run even the core business of their customers (Urmetzer et al., 2016). Business and marketing scholars study the ‘value networks’ and ‘value systems’ in which agents assemble goods and services (Agarwal & Selen, 2009). Slightly related is the line of research on manufacturing and service firm collaboration at the cluster level, which often has a geographical dimension to it (Mas-Verdú et al., 2008).

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² We are grateful to one reviewer for the suggestion to use this distinction.

The subject-oriented synthesis also invites to investigate and steer how individual manufacturing and service firms benefit from each other's capabilities. Plenty of literature exists on the conditions for manufacturing and service firms to innovate collaboratively, and the factors that determine the success of their joint efforts (e.g. Mina et al., 2014). At an even more fine-grained level of aggregation, we find service departments and service employees performing service tasks. Labor mobility and job composition statistics show that manufacturing firms increasingly rely on service skills (OECD, 2005; OECD, 2014).

Object-oriented synthesis focuses on the manufacturing and service elements of solutions. The subjects involved are less relevant, it is the actual service-based output that is the focus of the analysis.

Service innovation studies preceding the synthesis perspective have paid extensive attention to the differences between goods and services.³ Gallouj and Weinstein (1997) laid the foundations for the (object-oriented) synthesis perspective when introducing their characteristics-based approach to conceptualizing products. Their integrative representation of a product consists of vectors of characteristics and competences. In this representation, distinct sets of technical and service characteristics are recognizable but interlinked. Going one step further, Vargo and Lusch (2004) claimed that any offering can be expressed as a bundle of services only. According to their marketing-based service-dominant logic, customers value the services a firm renders via its activities and goods. This 'functional' view is also the basis of concepts like the experience economy, and – more recently – the collaborative or sharing economy (Djellal et al., 2010; Frenken & Schor, 2017). These concepts reflect the rapidly spreading notion that customers do not want to purchase individual goods or services; their ultimate needs are experiences and total solutions.

The object-oriented synthesis perspective sheds light on this service-dominant logic via a variety of research lines. Studies on the competitive advantages of 'servitization' (Vandermerwe and Rada; 1988) show how product offerings can be adapted, extended or even substituted by service activities (Cusumano et al., 2015). Adding to such strategic perspectives, the literature on product-service systems

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³ According to Parasuraman et al. (1985), key characteristics for services are that they are intangible or perishable (non-stockable), heterogeneous (e.g. personally delivered services), inseparable (i.e. there is simultaneous production and consumption), and co-produced (fulfilling a need requires interaction with customers).

(PSS) and product-service combinations describes how these hybrid new offerings look like, for instance in the context of the circular economy (Tukker and Tischner, 2006). The integration of distinct tangible and intangible features into viable service innovations is also studied with the help of multidimensional frameworks (Den Hertog, 2000; Rubalcaba et al., 2012; Janssen and Den Hertog, 2016). The six-dimensional conceptualization by Den Hertog et al. (2010) regards new solutions and experiences as being composed of changes in the service concept, customer interaction, business partners, revenue model, organizational delivery system, or technological delivery system.

Particularly prominent in the last decade is the scholarly and business attention for business model innovation (Chesbrough, 2007). Business models describe how value is created, delivered and captured (Teece, 2010). Looking at great disruptions, it turns out that an innovative business model is often at least as important as the technologies being used. To analyze and develop new business models a plethora of frameworks is available (see Saebi and Foss, 2015), the most well-known probably being the business model canvas by Osterwalder and Peigneur (2010). The frameworks typically capture a range of dimensions that help to articulate the architecture of a business model. For instance, the *revenue model* dimension covers the application of ‘pay what you use’ pricing that replaces the traditional ownership-based sales of a product (e.g. Roll’s Royce’s ‘Power by the Hour’). Features of a business model typically associated with service provision are found on dimensions like the *key activities* and *customer relationships*. Because the frameworks are integrative without making a stark distinction between goods- and service-dimensions, business model thinking allows analyzing ongoing hybridization of the ‘objects’ being traded in modern economies (Suarez et al., 2013; Janssen and Den Hertog, 2016; Adrodegari and Saccani, 2017).

2.3 *Linking subjects and objects: Service capabilities*

Both synthesis perspectives show how service innovation thinking evolves by looking at increasingly specific units of analysis. The emerging object-oriented perspective aims to go beyond notions like goods and services, as in many business models the two are strongly interwoven with each other (as well as with other features and activities that define a given proposition). With services being ubiquitous also in product-based solutions, an implication for the subject-oriented perspective is that a

high variety of agents can be considered service provider. This intertwining clearly hampers possibilities to make statements – or policies – specifically on ‘pure’ service products or service firms. Much of our regular vocabulary is becoming too crude if we really wish to disentangle the role of services in innovation dynamics. The synthesis perspectives beg the question of what concepts are still useful when considering the place of services in the creation of novel varieties of economic output. In other words: with the object- and subject-perspective converging to a fine-grained theoretical and empirical scope, what basis is there for having a meaningful discussion about services in the light of innovation (policy)?

A typical way to reflect on the ability of a firm, industry or economy to adapt its activities is to look at the capabilities that organizations possess. According to the resource-based view, firms create economic output by combining production factors like resources and capabilities into value propositions (Barney, 1991). Capabilities can be organizational structures, competences and routines. Different types of economic output require different kind of capabilities (Nelson and Winter, 1982).

A clear merit of the demarcation perspective on service innovation is our enhanced understanding nowadays of how creating and delivering intangible and coproduced (elements of) propositions requires capabilities different from the ones needed for producing and selling an artefact or commodity (Olivia and Kallenberg, 2003). For instance, firms providing services need to be able to deliver value through client interactions dissimilar to regular sales processes of tangible goods. Manufacturing firms aiming to servitise often experience difficulties in reorganizing themselves effectively (Gebauer et al., 2010; Baines and Lightfoot, 2013). Apparently, the creation and production of services requires a range of activities and competences we can refer to as ‘service capabilities’ (Visnjic Kastalli and Van Looy, 2013; Baines et al., 2009; Chen et al., 2016). Despite capabilities being an abstract construct, there is plenty of research showing which kind of activities are typically enacted when delivering services (Davies, 2004; Neely, 2008) or when creating new ones (Kindström et al., 2013). Some capability conceptualizations are designed to cover activities relevant for the development of both tangible and intangible elements of hybrid offerings, regardless of the sector an innovator belongs to (Den Hertog et al., 2010; Janssen et al., 2016a).

The notion of service capabilities fits the detailed yet comprehensive scope of the emerging synthesis perspectives. It goes beyond technological R&D, which is only of limited relevance for

innovation involving service features (Miles, 2007). Taking an object-oriented synthesis perspective, a relevant question to ask is which elements of a product-service system or business model rely on the use of (which type of) service capabilities. The subject-oriented synthesis then serves to highlight the type of agents applying these capabilities, either for their own use or for advising others.⁴ The two synthesis perspectives can thus be linked to each other by regarding service innovation as a matter of organizations (of any kind) using service capabilities to develop the service-based features of new solutions.

The next section describes how the views presented here correspond with different sets of policy problems and approaches.

3. Services, innovation and policy

3.1 Policy problems related to the development and use of service capabilities

The success of an economy is closely linked to its ability to combine distinct kinds of productive capabilities (Hausmann and Klinger, 2006). Countries possessing varied and hard to master capabilities tend to develop complex economies associated with high levels of competitiveness, welfare and resilience (Hausman and Rodrik, 2006). The outputs they create by deploying the capabilities can also be sophisticated solutions for grand societal challenges, like green technologies or circular economy approaches (Rodrik, 2014). Accordingly, policy makers legitimate support for capability development by pointing at the possible economic and societal benefits of the industrial change it drives (Bleda and Del Rio, 2013).

Earlier research on services and service innovation policy has largely been focused on identifying service-specific market and system failures (Rubalcaba, 2006, 2007; Rubalcaba et al., 2010). At the same time, the authors of these studies recognize the limitations of stressing the differences between services and goods, and have repeatedly called for a more all-encompassing view. Although capability issues have been discussed briefly before (Rubalcaba et al., 2010), there are no studies available in which the policy imperative of capability development is linked with the central role of service capabilities in synthesis perspectives.

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⁴ Note that this does not necessarily coincide with clear-cut distinctions between manufacturing firms and service firms: also manufacturers engaged in service delivery might advise other manufacturers how to embed services in their integrated offerings.

Looking at the topic of services and servitization, a key question is whether firms have sufficient service capabilities at their disposal. Policy intervention is needed when there are only few opportunities for firms in an economy to deploy the capabilities needed for bringing about the (innovative) service features of their business models. Broadly speaking, this happens either because there is only weak supply of capabilities, or because there is not enough demand for capability-building (Mazzucato et al., 2015). Supply can be low when there are few organizations possessing and sharing knowledge or skills needed for service-based industrial change. A demand-side issue occurs when economic activities that could benefit from using service capabilities are scarce, or when firms lack awareness of how services could be relevant for them. As we will explain below, applying the two synthesis perspectives to these supply and demand side issues points at policy problems related to either insufficient interactions involving the use of capabilities, or the insufficient development of suitable capabilities (see Figure 1).

Figure 1: Four categories of problems limiting the use of service capabilities.

Given its focus on agents and their interplay, the subject-oriented perspective covers problems causing the *absence of interactions* related to the use of service capabilities present in an economy. This concerns barriers preventing an industry, firm or employee to interact with other subjects on the development and implementation of service features (including initial exploration of product-related services as well as experimentation with advanced service propositions). Interaction problems imply that service capabilities are locally available, but the market in which they could be used is not functioning well. From a policy perspective, the most relevant type of agent here is the organization.

A supply-side explanation for a shortage of interactions taking place is that organizations possessing service capabilities, like service-supporting consulting, design, marketing, digitalization and engineering firms, are unable to express their relevance for possible clients. It might be hard to identify the appropriate propositions and channels to reach clients, or to determine which customer segments are most relevant to target in the first place (Matthyssens and Vandenbempt, 2008; Brax and Jonsson, 2009). After all, the intangible and heterogeneous nature of services make that it is relatively difficult to describe what value is being created by supporting clients in the use of services (Gallouj and Djellal, 2010).

The demand-side type of interaction problem pertains to clients' latent needs for support in applying service capabilities. Although there are strong indications that adopting service-based business models can be a promising way to strengthen competitiveness, it is widely acknowledged that many organizations are reluctant to do so (Visnjic and Van Looy, 2013). Willingness to explore this is usually weak when firms are not aware about the business potential of providing services, or doubt the profitable effects this might have (Gebauer et al., 2005). Even when firms do realize they can benefit from a stronger orientation towards services, it can be challenging to formulate the specific needs they have regarding the use of service capabilities (Baines et al., 2009). When hardly familiar to the domain of services yet, it is also difficult to identify parties suitable for creating a service-oriented environment (Mathieu, 2001).

The object-oriented synthesis perspective focuses instead on the hybrid nature of modern days' economic output, and in particular on the type of capabilities essential for bringing this about. Associated

policy problems concern the very *absence of service capabilities* required for producing the service features of new solutions and experiences. While subject-oriented issues cover possible interactions not taking place (due to awareness and communication problems), object-oriented issues arise when suitable service capabilities and opportunities for using them are not even present. Thus, rather than considering allocation problems, this perspective points at difficulties in the creation and application of valuable service capabilities.

Problems concerning the supply of suitable service capabilities occur when firms lack the expertise and competences required for creating the service features of a solution requested by private or public agents. The inability to develop service capabilities can result from insufficient absorptive capacity or financial means to experiment with hybrid business models. Learning how to embed service features in product-service systems is a transformation often requiring substantial investments and organizational changes (Baines et al., 2009). Because servitization follows different patterns in different sectors, there is not much general knowledge firms can access effectively. Moreover, most firms do not automatically possess a ‘learning and adapting’ ability allowing it to master the service capabilities that are so distinct from ordinary production capabilities (Rubalcaba et al., 2010; Den Hertog et al., 2010).

A demand-side problem marks a situation in which there is lack of willingness (or ability) to pay for and absorb innovation (Boon and Edler, forthcoming). This happens when, in an economy, there are hardly any activities that can easily benefit from relying more intensively on service capabilities. While technology-oriented firms typically have a high potential to strengthen themselves by also looking at (advanced) services, this is less the case for firms dealing mostly with commodities. Dominance of such products in an economy implies the lack of a market on which profitable product-service systems could be commercialized. Also private and public sectors restricting their procurement criteria mainly to technological artefacts limit possibilities for suppliers to develop and exploit service capabilities (Rubalcaba et al., 2010).

Which of the problems occurs in a particular economy, and why exactly, is up for policy makers and researchers to analyze; the remainder of this paper aims to provide insights on how to solve it.

3.2 *Policy strategies*

Following the categorization of problems, we introduce the main policy strategies for improving the development (in case their presence is low) and use of suitable service capabilities (in case it is merely the application that is lacking). In our clarification of these strategies we occasionally draw on policy examples from various countries, as discussed in Janssen et al. (2012).⁵

Starting again with the subject-oriented perspective, there are two possible routes to follow. When there are issues with the organizations supposed to supply service capabilities, it is key to make their offerings more attractive for possible clients. The supply side of the market for service capabilities consists of consultancies, design studios, engineering firms and (other kind of) KIBS. A policy strategy fitting the demarcation perspective would argue for supporting such firms on the basis that they might have a handicap when it comes to innovation opportunities (Rubalcaba, 2006). However, the crux of (subject-oriented) synthesis is to strengthen the interlinkages between goods and services. For this problem this involves any type of policy intervention that allow firms possessing service capabilities to increase their relevance, visibility and accessibility. As noted before, such firms can also be servitised manufacturers supporting other (manufacturers) firms in becoming more service intensive. Similarly, technology firms can help any type of private and public organization to adopt new ways of organizing service provision. Policies geared towards fixing this side of the market should also ensure there are few barriers for such firms to conduct their business.

On the demand-side of subject-oriented synthesis we find the policy strategy dedicated to helping clients to become more interested in using service capabilities. One way to spur interest is to inform firms about service-related developments, like the opportunities and challenges posed by digital platforms solutions, the internet-of-things, circular economy, e-health, etcetera. The demand side can also be familiarized with ‘service tools’ suitable for e.g. concept modelling and service design (Vasanthan et al., 2012). Informing and activating activities can happen via newsletters or seminars from the chamber of commerce or the national agency implementing innovation policies. The objective is to help

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⁵ See table 5 on p. 27 of the report for references to the examples mentioned here (www.dialogic.nl/file/2016/12/2012.049-1228.pdf).

firms to extend the spectrum of opportunities they take into account when experimenting with new propositions. For this kind of fairly traditional approaches, what matters is that the target group realizes there are valuable capabilities available that can be accessed via markets rather than by making all the efforts of developing them internally.

The object-oriented synthesis perspective is pertinent when it is insufficient to only mobilize service capabilities already present in an economy. The essence of the associated policy strategies is to drive the very development of new service capabilities.

A supply-side strategy consists of supporting research and experimentation with business propositions relying on so far unexploited service features. When supply of suitable service capabilities is largely absent, one option is to establish centers in which specialized government officials or other experts provide trainings. An example is the Swedish SU innovation, an incubator providing coaching on innovation types also including services. Besides such dedicated coaching programs, it is possible to increase incentives for firms to start developing new capabilities themselves. This strategy revolves around R&D and innovation funding schemes in which services are again not the core focus – like in demarcation-style policies – but rather an embedded element of the instrument's scope. Schemes like these might include the development of novel business models as part of their subsidy conditions. Exemplary here is the Austrian 'Service initiative' funding program, for the development of innovative technology-based services. Given that knowledge institutes and (applied) universities might possess relevant expertise, policy can also aim to involve them in collaborative research on service capabilities. Note that, contrary to subject-oriented policies, the idea behind targeting a specific agent group here is to create new capabilities rather than supporting exchanges involving existing capabilities.

Finally, at the demand-side of object-oriented synthesis, a different range of policies opens up. The core strategy here is to create demand for solutions relying on missing service capabilities. It is not synthesis-like, and probably very inefficient, to simply fund the rise of industries known to rely heavily on product-service bundles. The demand-side opportunities for capability development are best strengthened by recognizing services as intrinsic elements of not just commercial, but also societally relevant solutions. Providing such solutions might typically require other capabilities than the ones firms

develop for commercial purposes only, and therefore also another type of policy support (Mazzucato et al., 2015). Inspiring in this respect is the rising attention for ‘mission oriented policy’; the view that governments should use innovation support for steering techno-economic developments in particular societally desired directions (Foray et al., 2012; Boon and Edler, forthcoming). It is increasingly believed that answers to grand societal challenges are hardly ever a matter of clever technology, but rather clever combinations of technology and service enabled solutions (Gallouj et al., 2015). Policy for actually solving such challenges is thus urged to be open for multidisciplinary combinatory innovation propositions, and not to focus just on the propositions and capabilities of individual industries (Alkemade et al., 2011). One concrete way to drive demand for integrated solutions is through public procurement of innovation (Edquist & Zabala-Iturriagoitia, 2012). Changing the technical specifications in public tenders to functional specification corresponds very much with the service-dominant logic and gives room to the development of hybrid solutions. By framing the scope of calls around actual problems instead of how to solve them, also instruments supporting facility studies (like the Small Business Innovative Research; SBIR) appear to be a suitable way for inviting firms to develop propositions drawing on combinations of technical and service capabilities (Edler and Georghiou, 2007).

Figure 2: Policy strategies for intensifying the use of service capabilities.

The framework in Figure 2 summarizes the policy strategies in a graph consisting of two independent axes. As both axes relate to merely gradual distinctions, policy instruments can be plotted anywhere on this conceptual ‘map’. This also implies it is possible that there are policy interventions to be located at the center of any axis, or even of both axes.

Policy interventions covering both the supply and demand for service capabilities include, for instance, the organization of network events devoted to coupling manufacturing firms with servitization ambitions to design thinking firms. Consider also the British ‘Creative Credits’, a voucher scheme for encouraging SMEs to innovate by purchasing services from creative businesses.

Policies in the middle of the vertical axis drive service capability use by targeting both their production as well as exchange. An example is support for public-private research partnerships on service-relevant topics (like in French Nekoé for collaborative service research), or any other type of research funding combined with knowledge sharing mechanisms.

Right at the center of the map are interventions addressing all of the problems causing limited use of service capabilities. As shown in Figure 2, this combinatory strategy aims to enable cross-sectoral learning and experimentation. One suitable example is a campus or cluster management approach in which a high variety of firms is intentionally being exposed to each other in creative environments. Such a set-up might help firms with service capabilities to discover how they can be of use for e.g. high-tech firms or start-ups in need of business models. The Services Cluster Denmark is a national innovation network that creates relations between enterprises, research and knowledge institutions in order to help firms to develop new service-based business models. Facilitating interactions in an innovation-oriented setting like a campus or shared research facility is a promising basis for the service firms not just to apply their existing service capabilities, but also to start experimenting themselves with new approaches.

4. An empirical illustration

In the previous section, we outlined different policy strategies regarding services and innovation. The purpose of this empirical section is to illustrate in more depth the variety of actual policy instruments one can consider when enhancing the development and use of service capabilities. Specifically, we demonstrate how a manufacturing-based regional economy is combining multiple types of interventions into a comprehensive policy mix. To obtain a complete picture of how such a policy mix is composed, we explicitly take into account the full range of policy interventions implemented at the regional level and at the national level. This broad scope allows us to discuss examples of all the policy strategies captured by our framework.

We purposely sample a manufacturing-intensive region aiming at strengthening its orientation towards services. This region is Limburg, a province located in the south of the Netherlands. Especially after the closing of mines in the 1970s, industry has gained importance in the local economic structure. As seen throughout many Western countries, however, the competitive position of this industrial base is increasingly contested (Los et al., 2016). With respect to its policy goals, Limburg is similar to many other European regions. The main objective is to sustain the success of the region by shaping a knowledge-based economy in which manufacturing is combined with provision of advanced services.

Its background makes Limburg representative of a wider set of post-industrial regions struggling to secure the future competitiveness of their economies (ESIC, 2014).

4.1 Method and data

This section builds on a case study conducted by the European Service Innovation Centre (ESIC), an initiative of the European Commission's DG Enterprise. ESIC's objective was to shed light on the transformative power of service innovation. One part of the research project consisted of case studies in regions coping with the challenge of revitalizing their economy. The case on Limburg serves as the basis for this empirical section; additional insights on policies at the national level are retrieved from policy projects conducted over the past six years (primarily for the Ministry of Economic Affairs).

The practices for information sourcing follow most of the suggestions by Borrás and Edquist (2013). First, information on the region's economic performance and policies was retrieved through extensive desk research. Part of this phase was a benchmark exercise using indicators from the European Service Innovation Scoreboard to compare the region to similar and best-performing regions. During site visits, one-hour interviews were conducted with about 10 key stakeholders. Interview summaries were returned for verification purposes. Some of the stakeholders agreed to fill out a self-assessment about the current state and service-inclusiveness of their policies. After an assessment report was shared with the regional stakeholders, a policy workshop was organized to verify the findings and to explore opportunities for further policy development. Apart from local stakeholders and peers from other regions, also independent experts participated in these sessions. The final assessment of Limburg's innovation strategies, including detailed descriptions of the present policy measures, can be found in the publicly available reports (ESIC, 2014).⁶ Rather than providing the detailed description, the focus here lies on giving an overview of actual policy examples. Investigation of to what extent the identified instruments were successful in solving underlying policy problems lies beyond the scope of this study.

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⁶ Subsequent activities in the ESIC project, involving interaction aimed at fine-tuning policy advice, are outside the scope of this paper. Also, they came after the preliminary assessment of existing policy mixes on which the cases studies are based.

4.2 Regional policies: the case of Limburg

As Figure 3 shows, Limburg is trying to advance its economic structure via a varied set of policies dedicated to service innovation.

The Document Services Valley supports innovative entrepreneurship with respect to high tech services in the domains of printing, imaging and document management. The initiative fits the (subject-oriented) synthesis perspective since it serves as an incubator for startups developing apps and information-services that might improve business practices throughout the entire economy. Although the focus on promoting service capability-intensive startups implies a supply-side orientation, the fact that the Services Valley is located near a large printing multinational probably also has an effect on the local willingness to adopt novel service-based ways of working. Another initiative to support the position and therefore supply of service capabilities is the Smart Services Campus, established by universities and public and private organizations engaged in financial, administrative and information-based services. The campus functions as a hub where all sorts of service capability-intensive firms can co-locate, which helps to emphasize their importance for the rests of the economy.

In the subject-oriented quarter on the lower right, there are two powerful examples of how to target the demand for service capabilities. The LimburgMakers strategy consists of several initiatives helping specifically manufacturing firms to adopt a service-oriented mindset. This includes possibilities for manufacturers to obtain advice from other organizations on how to develop services. The Service Business Acceleration Program, also focused on manufacturing, resulted in a roadmap explaining producing-firms why and how to start producing services.

The object-oriented policies in Limburg only follow a supply-side approach. The Service Science Factory and the Business Services School, both having an academic link, aim to develop service capabilities rather than just to spread them. The initiatives bring service thinking and experiments to non-service industries as well as to service firms not knowing what innovation might mean to them. The power of these service infusers lies in the experience of introducing service innovation in a wide variety of firms and having strong links with universities. While the Business Services School focuses primarily on offering courses related to service innovation, the Service Science Factory positions itself as an

institute where researchers, students and firms jointly work on actual business problems related to customer-centric thinking and service design.

Finally, Limburg's service innovation policy mix contains policy initiatives that combine all of the perspectives. Contrary to the mostly goods-focused chemicals/materials campus in the region, the AgroFood campus and Health campus are explicitly oriented towards the creation of innovative solutions in which technology and services reinforce each other. By facilitating collaborative research, the campuses at the same time support interactions (between service capability requiring or providing subjects) and experiments (with 'objects' like service-based business models). The success of the Agro-food cluster depends for instance on its openness to the combination of machine building and automation on the one side, and trade, transport and logistics on the other side. Rather than being distinct lines of agro-food business, these activities contribute to each other's competitiveness. While symbiosis in the Agro-food domain merely concerns activities distributed over suppliers and their clients upwards the value chain, the level of goods-service integration is even higher at the Health Campus. Here, it is typical that close links between production and servicing form the key of new solutions (i.e. the objects themselves) coming out of the campus.

4.3 National policies in the Netherlands

Besides regional policies, the region of Limburg is also subjected to national policy initiatives.

A recently opened demand-side policy scheme offers Service design vouchers to manufacturing firms.⁷ Manufacturing SMEs can use the vouchers to get service-related advice from a design firm they can select themselves. This way of supporting transactions is similar to the Creative Credits in the UK, although the latter is targeted at the supply-side of the market for service capabilities. In the Netherlands there is not an exact equivalent of such a supply-side policy, but of course creative firms could use the Service design vouchers to promote their own offerings.

A policy initiative corresponding with the (supply-side) object perspective is the launching of Smart Industry Fieldlabs, by the Ministry of Economic Affairs, the main employers organizations and

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⁷ See: <https://www.rvo.nl/subsidies-regelingen/service-design-vouchers> (in Dutch). The scheme is a pilot set up as a randomized controlled trial (RCT).

the independent research organisation TNO. The Fieldlabs are environments where firms and research organizations develop, test and apply smart industry (i.e. internet-enabled) solutions. Many of the currently 29 labs are dedicated to a topic implicitly or explicitly emphasizing the importance of services. For instance, there is a Fieldlab for ‘Ultra personalized products and services’, for ‘Smart Dairy Farming’ (using real-time data sharing) and two for remote maintenance. Generic masterclasses on smart services and business model innovation serve to help firms with broadening their innovation horizons.

A very prominent element of the national science and innovation strategy is the Topsector approach. At its core are nine Triple Helix platforms for developing and executing knowledge and innovation agenda’s. One of them is the Topsector Creative Industry. Prominently featuring in its agenda is the objective to use the potential of the creative industry to transform business practices throughout the entire economy. As actual activities in the Topsector consists of matchmaking and conducting public-private research on innovation-enabling topics, this policy fits the ‘cross-over learning’ approach at the center of our policy map (see also Figure 3).

Finally, just like in the regional policy mix, demand-based solution support is not very visible at the national level. An exception is the Dutch version of SBIR. According to a recent evaluation, the innovative public procurement instrument is well-suited to evoke original solutions for societal problems (Dialogic, 2017a). While not addressing services explicitly, the resulting problem-oriented experimenting with new technologies does invite firms also to focus on service elements of their project.

The figure does not show policy options currently considered in the light of moving more towards mission-oriented policy, since these are not being fully developed yet. Now that innovation policy is increasingly being regarded as a means to solve societal challenges, also in the Netherlands, there is a fierce debate on how to formulate appropriate instruments (Janssen et al., 2016b; Dialogic, 2017b). One particularly relevant development is the large public consultation resulting in the National Science Agenda. As so often, the major issues in the (Dutch) society do not ask for mere technologies, but for integrated solutions in which a wide range of capabilities must be applied. Although it is still uncertain how this will be supported, it is clear that a solution-oriented approach is feasible here.

Figure 3: Examples of policies found in the Dutch region of Limburg (L) and the Netherlands (NL) as a whole.

4.4 Lessons from Dutch service innovation policies

Reflecting on the set of policies shown in Figure 3 allows us to make a couple of observations on how service innovation is being dealt with in a European region trying to boost its competitiveness beyond a manufacturing focus.

First, there is ample experimentation with the relatively traditional approach of subject-oriented supply policy. The Document Services Valley and the Smart Services Campus resemble the demarcation way of supporting services, except for that the link with other parts of the economy is very clear here. This link is clear as well for the subject-oriented policies targeting the demand side: central is the objective to help manufacturing firms with transforming their business models.

Second, attention for object-oriented policies has been growing over the past years, especially when it comes to driving the supply of new service capabilities. This also includes the establishing of platforms for applied collaborative research, both at the regional and national level. While market-

oriented initiatives are devoted to services quite explicitly, policies like the SBIR, the Smart Industry activities and the Agrofood and Health Campus deal with service features in a mostly implicit way. All in all this makes for a quite comprehensive set of parallel policies.

Finally, there are only a few examples of demand-side solution-oriented policies, while both at the regional as well as at the national level it is increasingly recognized that a technological policy focus is myopic when aiming to solve emergent commercial or societal challenges. Awaiting actual policy instruments targeted at solving those societal challenges in an innovative way, the development and use of service capabilities in Limburg benefits only poorly from the potential of demand side innovation policy.

5. Discussion

The heart of this study concerns the observation that service innovation thinking is evolving into two distinct forms of synthesis perspectives. Each of them points at different policy problems and policy strategies related to the use of service capabilities.

One form of synthesis is the subject-oriented perspective. It captures views on how different types of agents (e.g. industries, firms, employees) interact. This translates into innovation policy aimed at exploiting the way service providers complement other organizations, including manufacturing, service providers, hybrids, and public bodies. Challenging earlier beliefs (e.g. Rubalcaba, 2006), we argue that such measures can be of a vertical (i.e. sector-specific) policy orientation. Examples include measures to strengthen the extent service sectors like KIBS or creative industries contribute to the development of hybrid offerings throughout the innovation system.

The second synthesis perspective, which we coined as object-oriented, concerns the nature of the actual solutions that are being provided. It is marked by the fact that it no longer recognizes services as such. Reflecting the ongoing emancipation of services in innovation literature, it refers to theories and frameworks where the specificities of service and goods-based innovation are taken into account without emphasizing either of them. Suitable policy instruments for enhancing the use of service capabilities in devising competitive (service-based) business models comprise programs for innovative procurement, solving societal challenges, or the promotion of solutions based on for instance general

purpose technologies like the internet-of-things or 3D-printing. All of these exemplify currently popular forms of innovation policy that can be service-inclusive (i.e. in which knowledge of the relevance of service features is embedded), without being plainly service-ignorant.

Our distinction between two synthesis perspectives thus reveals that it is possible to respect the peculiarities of services both by addressing the symbiotic relationship with other economic activities, and by treating them as an inherent part of value and novelty creation.

An important result of recognizing different ways to look at services and innovation, and how they interrelate, is that it helps policy makers to respect services as a universal element of economic activities rather than as a particular type of sector or product only. The synthesis perspectives underline that it is very well possible to develop policies that are - implicitly rather than explicitly - sensitive to the particular role that services have in innovation processes. For studies on service innovation to have policy impact, we reckon it constructive if research results are picked up in the design of all-encompassing policy strategies.

Looking at the identified variety of policy strategies that can spur the use of service capabilities, a comprehensive policy approach already appears to be characteristic for many of the innovation instruments currently enjoying popularity. In the prevailing European policy strategies for research and innovation, there is a prominent place for cluster policy, research facilities (not just offering access to research infrastructures, but also promoting the use of those infrastructures to result in novel business models), societal challenges and public private procurement (European Commission, 2014b). On this basis we argue that it is hard to maintain that services are largely being overlooked by policy makers, and that service-exclusive re-industrialization is on its way. As a matter of fact, the synthesis policy approaches offer promising opportunities for reinvigorating manufacturing industries. Policy makers can help to rejuvenate those industries by facilitating their interaction with knowledge-intensive and creative services, by supporting them to develop service engineering capabilities themselves, or by ensuring their participation in techno-economic developments stretching over traditional industry barriers (like Industry 4.0). Which type of approach fits best depends on the type of service capability problem in a region, as well as on the exact policy goals ultimately pursued (Borrás and Edquist, 2013).

Further research could be devoted to identifying additional service-relevant policy instruments and categorizing them according to the service innovation perspective they belong to. Conducting more case studies can provide opportunities for structured debates aimed at exchanging policy experiences. Given the increasing scholarly attention for an all-encompassing account of innovation, synthesis-based policy instruments are of special interest in this respect.

A particularly relevant way to extend research on the all-encompassing approach to innovation policy is to explore another theme that is gaining popularity among (European) policy makers: smart specialization (Foray et al., 2009). This term is applied to policy agendas that take a knowledge-based perspective on transforming economic structures. Some key features of research and innovation strategies for smart specialization (RIS3), accordingly, are: the focus of national or regional priorities and challenges, the exploitation and further development of local strengths, and the support for diverse forms of innovation (Camagni and Capello, 2013; Heimeriks and Balland, 2016). How to use service innovation policy for reinforcing existing domains of (regional) specialization seems to be a promising avenue for advancing the current study. In particular, we consider it worthwhile to explore not only the role of services within those specializations, but also between them.

Recent studies of regional development and technological relatedness (e.g. Frenken et al., 2007) show that knowledge flows between unrelated specializations are rare, but at the same time have the potential to cause disruptive breakthrough innovations (Castaldi et al., 2015). Since service capabilities are relevant throughout different specializations, policy makers could consider using this theme for linking previously unrelated industries (Janssen, 2015). In fact, some of the synthesis instruments in our case (like the Topsector Creative Industry and the Smart Services Campus) already aim to position service innovation as the glue between regional strongholds. Probably this is just one of many possible ways to make services a means rather than an end when devising innovation policies and innovation strategies. Additional research could serve to identify alternative ways.

6. Conclusion

The observation that services are emerging as ubiquitous and that they might drive competitiveness and welfare posits an important policy question. Not every organization has the

capabilities to develop solutions containing services. How can policy makers provide support to the development and use of these capabilities, given that that services are so deeply interwoven with other economic activities?

To answer this question, this paper has taken seriously the complex ways in which services play a role in the development of innovative solutions. As Rubalcaba (2006) stated, having a comprehensive account of the place of services in innovation theory is a prerequisite for determining which type of policy approach is appropriate within a certain context. The decade after Rubalcaba's initial study has witnessed vast progress in the quest for a synthesis approach to service innovation. In this paper we extended the traditional classification of service innovation perspectives by distinguishing subject-oriented synthesis and object-oriented synthesis. Applying the extended range of perspectives to policy formulation illustrates how the newly identified lines of thought provide distinct possibilities for improving the use of service capabilities.

Our overview of suitable policy strategies include four main categories; combining all of them is a possibility as well (i.e. in policies facilitating cross-sectoral experimentation). The resulting policy framework provides a basis for characterizing the communalities and differences between service-related policies. An advantage of the categorization of policy strategies is that it allows for objective comparisons of both the extent services are captured by policy measures (how many policies with how much financial commitment), as well as according to what perspectives. It thereby facilitates the kind of policy learning that is required for drawing lessons from ongoing experiments with different forms of service innovation policy (Miles, 2007; Rubalcaba et al., 2010). Opportunities for mutual policy learning are enabled by the possibility to compare the policies of various regions in a systematic way.

Drawing on our case study of a post-industrial economy, this paper contains a first illustration of how policy makers can typify the service-specificity of their policy mix. Including relevant national policies as well, the Dutch example region of Limburg can benefit from about a dozen of policies supporting the use of service capabilities. Although the performance of the policies remains unknown, we were able to characterize the developments currently taking place by using the policy strategies as a guidance. Interactions involving the use of service capabilities are supported from both the supply side (enhancing visibility of capability-owners) and the demand side (creating awareness around

servitization). The very development of service capabilities is almost exclusively covered from a supply-side strategy. While the importance of applying a certain policy strategy depends primarily on what is locally missing, it is remarkable that examples of demand-side support for service capability development are hardly present in a region so committed to service innovation. Acknowledging that it only concerns anecdotal evidence, this suggests that the neglected potential of demand-side innovation policy also stretches to driving service-based novelty.

It is important to note that our contribution to the literature aims to reach beyond policy debates only. Ever since the seminal studies by Gallouj (1994), Gallouj and Weinstein (1997), and Coombs and Miles (2000), reflections on how the field of service innovation evolved are a common part of research addressing the relation between services and innovation. Amongst them we find several recent studies describing explicitly how this development might continue (Djellal et al., 2013; Carlborg et al., 2014). While the urge for more synthesis is unanimously recognized, it is not always clear how exactly synthesis is envisaged. We aim to move the field forward by distinguishing between subject-oriented and object-oriented synthesis, and presenting service capabilities as a link between them. Our introduction and application of these concepts offers an alternative to coarse vocabulary like goods, services and service industries. As such, it can help to clarify future discussions on the nature (as well as policy and managerial relevance) of services and service innovation.

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