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HYYTINEN (Kirsi), « Collaboration multi-acteurs pour le développement des innovations de service »

RÉSUMÉ – Cet article s'appuie sur le concept de Partenariat-Public Privé dans les Services (ServPPINs) pour étudier les collaborations multi-acteurs dans l'innovation de service. Il analyse des collaborations dans lesquelles les solutions innovantes aux problèmes sociétaux sont fondées sur l'intégration de technologies et de services, les partenariats, la négociation et la confiance entre acteurs multiples. Le terrain empirique retenu est celui du secteur de l'environnement et de l'énergie.

MOTS-CLÉS – Innovation de service, réseaux d'innovation public-privé dans les services (ServPPINs), collaboration, secteur de l'environnement et de l'énergie

HYYTINEN (Kirsi), « Multi-actor collaboration for the development of service innovations »

ABSTRACT – This article studies the multi-actor collaboration in the service innovation using the concept of ServPPINs (Public-Private Innovation Network in Services). It addresses new collaborative mechanisms in which the solutions to societal problems are based on the integration of novelties in technology and services, and which appreciate partnerships, negotiation and trust between actors. The study examines service innovations tackling sustainability issues in the environmental and energy sector.

KEYWORDS – Service innovation, Public-Private Innovation Networks in Services (ServPPINs), collaboration, environmental and energy sector

MULTI-ACTOR COLLABORATION FOR THE DEVELOPMENT OF SERVICE INNOVATIONS

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INTRODUCTION

The objective in this article is to study the collaborative forms of service innovations, and to illustrate the networked and participatory processes by giving the floor to the multiple actors taking part in the collaboration. The focus is on *service and social innovations in the environmental and energy sector.*

Environmental sustainability is one of the so called "grand societal challenges", referring to complex and global societal problems. They are systemic by nature and cannot be solved via individual product or service innovations created in individual organisations. Conversely, the challenges require the combination of various innovations and their effective dissemination on the basis of continuous interaction and dynamics between different organisations and parts of society (Gadrey, 2010, Geels, 2002, Rubalcaba *et al.*, 2013, Toivonen, 2014). Thus, besides the combination of technological and service innovations, system and social innovations are required. *System innovation* refers to a renewal of a whole set of networked supply chains, patterns of use and consumption, infrastructure, regulations etc. that constitute the socio-technical system

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providing basic services such as energy provision (Smith *et al.*, 2010). To develop system innovations, new operational models based on the simultaneous development of organisations, technologies, services and multiple network relationships are required (Gallouj, 1994, 2002, Harrisson *et al.*, 2010, Rubalcaba *et al.*, 2012, Windrum and García-Goñi, 2008).

A prerequisite for the realisation of these system level changes is the active engagement of various actors in the creation, implementation and diffusion of innovations. Thus, system innovations are interlinked with *social innovations*, characterised in the recent literature by the two different aspects of "social": social by the ends and social by the means. The first aspect refers to the societal challenges (e.g. environmental sustainability) that innovations are aiming to solve, and the second aspect refers to participatory and networked processes without which it is not possible to create innovation in a multi-actor environment (Harrisson *et al.*, 2010, Toivonen, 2014).

However, the networked structure of innovation has been understood only partially. Large amount of literature is focused on the analysis of innovations from the organisational perspective (Moore and Hartley, 2008), and typically private and public innovations have been studied in isolation (Rubalcaba *et al.*, 2013). In addition, examining the different logics and drivers of innovations in private and public sectors is insufficient. That may produce a partial and incomplete understanding of the dynamics and impacts of innovations and services (Hartley, 2005, Levesque, 2013, Moore and Hartley, 2008, Rubalcaba *et al.*, 2013). What is needed is a more comprehensive analysis of the collaborative and interactive development processes between multiple actors providing societally important innovations (e.g. Moore and Hartley, 2008, Windrum, 2013).

In the literature, the multi-actor perspective has been proposed as an analytical framework to better understand the collaborative structure and complex interaction between decision makers, public and private service providers and users (e.g. Windrum and Garcia-Goñi, 2008, Windrum, 2013). Specifically, the recently introduced network concept "ServPPIN" (public-private innovation networks in services; Gallouj *et al.*, 2013) aims to narrow this gap by emphasising the complementarities and synergies between public and private service providers in a complex service innovation process (Di Meglio, 2013, Rubalcaba *et al.*, 2013). ServPPINs can be seen as a practical way of organising a cooperative and interactive arena for diverse actors, competences and knowledge and thus for driving the systemic

change in a flexible, cooperative and interconnected way (Di Meglio, 2013). Currently, the studies on ServPPINs have mainly specified the concept and defined its role and nature–compared, for example, to the traditional innovation networks (Djellal and Gallouj, 2013, Gallouj *et al.*, 2013). In the analysis, the focus has been on the roles of different actors, on the type of innovation processes, and on the outcomes of innovations produced by these networks. The importance of public sector organisations both in the formation of ServPPINs and in the promotion of service innovations has been highlighted in particular. In addition, the role of policy as an enabler of ServPPINs and service innovations has been highlighted (Gallouj *et al.*, 2013). On the other hand, the bottom-up perspective in the collaboration has not been emphasised so far. Especially, the actors' experiences of ServPPINs and actual collaborative processes in the development of societally important innovations have not been examined in depth.

This article studies the multi-actor collaboration in environmental services using the concept of ServPPINs (Gallouj *et al.*, 2013). It concretises the new collaborative mechanisms in which the solutions to societal problems are based on the integration of novelties in technology and services, and which appreciate partnerships, negotiation and trust between multiple kinds of actors (Hartley, 2005, Levesque, 2013, Moore and Hartley, 2008, Voß *et al.*, 2006). A specific aim is to increase the understanding of the interactive and participatory processes and the experiences of multiple actors taking part in the collaboration. To understand the social process, the concept of social innovation is applied.

Empirical data of the study was collected in Finland and describes a new policy instrument "Strategic Centers for Science, Technology and Innovation" (abbreviated in Finnish "SHOK"). The aim of this instrument is to accelerate service, system and social innovations. The specific SHOK examined in this study operates in the area of environmental sustainability. Data has been gathered from face-to-face interviews (35 in total), observations of six collaborative workshops, program documents and other documentary material on the SHOK strategy.

The article is structured in five sections. The second section after this introduction presents the central theoretical approaches: social innovation to create understanding of the participatory and networked processes when tackling the system level challenges, and ServPPIN to illustrate a practical mode of organising the multi-actor collaboration

to solve societal challenges. The third section presents the case context in the energy and environmental sector, and the research methodology applied in the data gathering and analysis. The fourth section describes the results. The final section sums up the study and provides some practical implications.

I. THEORETICAL BACKGROUND

SYSTEM CHANGE THROUGH SOCIAL INNOVATION

Today the challenge of sustainable development is increasingly understood as a transition towards more sustainable socio-technical systems (Elzen *et al.*, 2004, Geels, 2010). The perspective of socio-technical systems acknowledges difficulty in studying the sustainability of isolated technologies and services, if not analysed as embedded in a broader context. It points out strong interdependencies between various elements of the systems which impede new ways of organising the provision of renewable energy, for instance. The analytical challenge is to understand these interdependencies in a dynamic system, and then to identify how innovation can induce a transition to other, potentially more sustainable, systems. (Geels, 2005, Smith *et al.*, 2010) Sustainable systems imply that major changes are required along the entire production-consumption chain from resource extraction to the final consumption of goods and services. These changes concern material and knowledge flows, the multi-level architecture, institutions and structures including policy and governance processes, and–not least–the behaviour of the actors involved (Smith *et al.*, 2010, Weber and Hemmelskamp, 2005).

The current literature on systemic change concentrates on the introduction of new technologies and solutions and obscures the discussion and questions of how to intervene in ordinary practices and dynamics to accelerate the systemic change (Showe and Walker, 2010). However, a fundamental problem lies in understanding the interaction between top-down and bottom-up approaches. Co-creation with different actors and actor groups is essential and includes the public, private, and third sector organisations–not forgetting the central role of citizens as an

engine for the change. The perspective of social innovation is needed to create understanding of the participatory and networked processes, without which it is not possible to create and implement innovations in a multi-actor environment (Harrisson *et al.*, 2010, Toivonen, 2014).

As stated in the introduction, the literature on social innovation recognises two different aspects of "social": social by the ends and by the means (Harrison *et al.*, 2010, Toivonen, 2014). In addition, research into social innovation approaches society as a "horizon of action" (Jessop *et al.*, 2013, p. 124): society is not pre-given but it is co-constructed and defined by the multiple actors and multiple competing visions and preferences. This aspect of social innovation highlights the fundamental role of collective social practice and processes when developing new innovative solutions for societal transformations. Within this approach, particular attention is given to the relations and participatory and collaborative practices that promote the societal development, empowerment of the variety of actors, and governance of social structure (Jessop *et al.*, 2013). In this process, the integration of bottom-up and top-down perspectives is essential (Rubalcaba *et al.*, 2013). Social innovations may emerge at the grassroots level among users and employees; they may be produced in the collaboration of private, public and third sector organisations; or they may be initiated by policy makers and regulatory bodies.

Bottom-up grassroots activities are seen as an "engine of social innovations". The process of creation and implementation of social innovations highlights empowerment: citizens and their organisations are active co-developers of innovation (Sundbo, 1996). The importance of bottom-up processes is clearly observable in the sustainability context. The behaviour of consumers has a crucial impact on the achievement of the goals set. For instance, a change in user preferences is necessary in order to avoid undermining the improvements in the production and delivery of energy by consumption patterns (Weber and Hemmelskamp, 2005).

Equally important are the top-down processes which translate the general objectives into concrete policies and practices in the circumstances characterised by societal and political dispute (Meadowcroft, 2009). They are needed for the materialisation and dissemination of social innovations. Community decision makers and company managers have to support, recognise and organise bottom-up processes in order to make ideas implementable and scalable (Høyrup, 2010). Policy actors

have to enhance society's innovation capacity by revitalising innovation institutions and by fostering the innovation activities of public, private and third sector organisations (Rubalcaba *et al.*, 2013).

PUBLIC-PRIVATE INNOVATION NETWORKS (SERVPPINS) CONDUCTING THE CHANGE

ServPPINs (Gallouj *et al.*, 2013) can be seen as a practical way to create cooperative and interactive arenas to tackle the challenges posed by increasing societal fragmentation, complexity and dynamism (Sørensen and Torfing, 2007). In the heart of ServPPIN is the collaborative relationship between public and private partners. Deviating from the traditional view on innovation networks, the ServPPIN concept highlights that the public service providers have an equal role in innovation with the manufacturing firms. Instead of being limited to the provision of infrastructure, financing and the institutional framework, public organisations may be genuine co-producers of service innovation by initiating, organising and propagating new ideas (Di Meglio, 2013). Moreover, to facilitate better matches between technology and demand, ServPPINs involve consumers, intermediate users and third sector organisations as active collaborators (Rubalcaba *et al.*, 2013). Non-technological innovation–which is often overlooked in the literature–is a central target of development (Gallouj *et al.*, 2013).

ServPPINs embody flat and flexible types of organisations which aim to develop synergies between different knowledge, competences, interests, objectives and services that different partners bring in to the network (Di Meglio, 2013, Gallouj *et al.*, 2013, Rubalcaba *et al.*, 2013). Based on the empirical studies (e.g. Rubalcaba *et al.*, 2013), the potential of ServPPINs is in credibility, dissemination, speeding up the process of agenda setting and decision making, provision of a more comprehensive view of the problems, legitimacy, resources and efficiency, learning capacity and knowledge transfer.

These new mixed organisational arrangements have emerged as a result of the modernisation trends in the public sector (Di Meglio, 2013). They reflect a further change of the focus in the public service provision: the earlier modernisation from bureaucracy to cost-efficiency, market imitation and consumer choice has proved to be incompatible with the current development stage characterised by complexity, co-production and public value (Levesque, 2013, Rubalcaba *et al.*, 2013). The new trends reflect a broader paradigmatic transfer gaining ground in the governance system (Newman

and Clarke, 2009). Instead of hierarchical top-down coordination (e.g. new public management), there is a tendency towards non-hierarchical and self-regulated practices (Hartley, 2005, Lévesque, 2013, Sørensen and Torfing, 2007). They include the rise of networks and partnerships, innovations as a democratic practice, the increasing choice of consumers, and co-production of services (Langergaard, 2011, Newman and Clarke, 2009).

There are some key features which help to understand how ServPPINs operate. *Firstly*, they are grounded on a *broad concept of innovation* brought about by evolutionary economics (Dosi *et al.*, 1988, Dosi, 1999, Kline and Rosenberg, 1986, Nelson and Winter, 1982). This concept highlights the dynamic nature of innovations and the need for an integrative perspective which takes into account both technological and non-technological aspects. *Secondly*, ServPPINs are formed as multi-agent frameworks (Windrum and Garcia-Goñi, 2008, Windrum, 2013): a variety of actors from the public, private and third sectors is involved both in the innovation process and in the delivery of final service. Each of the actors incorporates their specific competencies and interests into the innovation process. The engagement of various actors in different phases of innovation promotes a systemic change in the sectors concerned (Weber and Heller-Schuh, 2013, Windrum, 2013). *Thirdly*, ServPPINs evolve through various phases that may affect their dynamics and composition; this kind of evolution makes a life-cycle perspective suitable in their analysis. The phases can be characterised as design (1), pilot and implementation (2), and consolidation (3) (Green *et al.*, 2013, Weber and Heller-Schuh, 2013). *Fourthly*, the development of ServPPINs follows an open, complex, uncertain and interactive trust-based process (Fuglsang, 2013), in which the several driving forces influence the final outcome. The level of "formality" and structure of relationships may vary, but typically a certain degree of formalisation is required (e.g. exploitation of intellectual property rights).

Djellal and Gallouj (2013) have proposed a typology of ServPPINs according to their complexity. The criteria used for this typology pay attention to the nature of innovation (tangible vs. intangible) on the one hand, and to the characteristics of the development process (planned vs. unplanned) on the other. These ServPPIN types are also related to the main perspectives on service innovation: assimilative (or technologistic), demarcative (or service-oriented), and integrative (or synthesis) (Coombs

and Miles, 2000, Gallouj, 1994, 2002, Gallouj and Weinstein, 1997). The assimilation perspective analyses services innovation as an imitation of technological and manufacturing innovations, whereas the demarcative perspective focuses on the specific characteristics of service innovation. The integrative perspective has become increasingly relevant due to the blurring lines between goods and services: it highlights the production and consumption that focus on integrated solutions. Simple technologically focused ServPPINs have been considered as a manifestation of assimilation, simple non-technologically focused ServPPINs as a manifestation of demarcation, and complex ServPPINs as a manifestation of synthesis.

For the purposes of this article, the original typology has been slightly modified. The phenomenon of multi-actor collaboration has been pointed out explicitly in the characterisation of complex ServPPINs. In addition, the analytical dimensions have been ordered differently. The type of ServPPIN has been set as the first dimension, to emphasise it as a core analytical perspective of this article. The modified typology is presented in figure 1.

Analytical dimensions	ServPPINs according to their complexity			
Type of ServPPIN	Simple ServPPIN to adopt technological innovation	Simple ServPPIN to co-produce technological innovation	Simple ServPPIn to co-produce non-technical innovation	Complex ServPPINs to adopt, produce and enhance implementation of complex architectural innovation Multi-actor collaboration
Type of innovation	Technological innovation		Non-technological innovation	Broad, complex innovation including various individual technological and non-technological innovations

Dominant type of innovation process	Planned innovation	Unplanned innovation	Planned/ unplanned innovation including both bottom-up and top-down innovations
Theoretical perspective	Assimilation	Demarcation	Integration

FIG. 1 – ServPPINs according to their complexity
(modified by the author from Djellal and Gallouj, 2013).

As shown in figure 1, four types of ServPPINs can be identified. The table represents them in the increasing order of complexity. Simple ServPPINs–the first category–adopt a technology that has been produced elsewhere. They include minimal collaboration between public and private actors; the aim is, for example, to make joint investments and to organise the common use of technology. Simple ServPPINs may, however, also co-produce technological innovation (the second category); various actors from public and private sectors are involved. The "simplicity" here indicates that the objective of the development is limited and does not cover the integration of technological and non-technological novelties (the innovations developed may be relatively complex). In both the first and the second categories, the process is predominately based on planned innovation. The third category includes simple ServPPINs set up to produce non-technological–organisational, social and methodological–innovations. They typically adopt an unplanned innovation process, such as bricolage (Fuglsang, 2010), ad hoc innovation (Gallouj, 2002) or a rapid application model (Toivonen, 2010). Their complexity derives from the large number and diversity of partners as well as tacit knowledge and technologies they bring in to the network. The fourth category involves complex or architectural ServPPINs. Their objective is to solve complex organisational or societal problems by combining various forms of technological and non-technological innovations. Co-production is the central principle integrating both the bottom-up and top-down processes (Djellal and Gallouj, 2013).

This study applies the different analytical dimensions of ServPPINs to create understanding and concretise new innovation instruments based on co-production. These dimensions are used as the basic structure in the description of the empirical case and they are also utilised in the analysis of the results. The type of a ServPPIN demonstrates the structure and the objective of the collaborative network. The type of innovation highlights the integrative nature of the solutions developed to tackle the complex system level problems. The dominant type of innovation process, for its part, refers to the integration of top-down and bottom-up processes required for the adoption, production and implementation of complex architectural innovation.

II. RESEARCH CONTEXT AND METHODOLOGY

CASE CONTEXT

In recent years, different types of networks have become one of the primary policy mechanisms to create and speed up innovations. Especially the strategic importance of public private partnerships has been highlighted. The approach to partnerships has varied in different countries. However, a typical aim has been to accelerate industrial renewal by enhancing the collaboration between the state and business actors. The case selected for this study provides information about how the Finnish policy instrument "Strategic Center for Science, Technology and Innovation" (abbreviated in Finnish "SHOK") promotes a systemic change and industrial renewal. SHOKs operate as not-for-profit limited companies built on a public-private partnership and aim to enhance collaboration and interaction between business life and academia in a cross-sectoral way. Their main goal is to renew industry clusters and to create system innovations to meet the needs of Finnish industry and society within a five-to-ten-year period.

In this study, the specific SHOK studied is "Cleen" which operates in the area of energy and the environment and aims to promote the competiveness of the companies clustered around the sustainability issues. Cleen has currently 44 shareholders, including companies (28 in total) and universities and public research organisations (16 in total). The focus areas and operational

activities are based on a strategic research agenda (SRA) jointly defined by the partners. The targets of the research agenda are operationalised through long-term research programs carried out in collaboration with shareholders and partners. Funding for the programs comes from multiple sources. On average, fourty per cent is co-funded by partner firms, ten per cent by public research organisations and the rest by the public funding providers such as Finnish Funding Agency for Innovation (Tekes) and the Academy of Finland. The SHOKs also apply to EU research programs for funding.

This study focused on three ongoing research programmes and the preparation of two "second generation" programmes. The first ongoing programme is *"Distributed Energy Systems"* (DESY), aiming to increase the production of renewable energy and to promote the use of hybrid energy technologies. The second programme is *"Smart Grids and Energy Markets"* (SGEM), aiming to develop smart grid architectures and intelligent management and solutions for smart consumption and customer interface. Interaction between ICT systems and energy systems is a central innovation behind the advancements in this area. The third programme is *"Measurement, Monitoring and Environmental Assessment"* (MMEA) that aims to develop an environmental information system to monitor and evaluate the environmental efficiency of various industrial processes, products and infrastructures.

Two programmes in preparation relate to the development of *"architecture of sustainable energy systems"* and *"healthy urban living"*. The former aims to provide a holistic view needed for the energy system revolution towards a sustainable and flexible system. The focus of the programme is the optimal integration of centralised and decentralised energy resources and production on the system level, and the flexible use of various energy carriers (electrical networks, gas, heat, cool). The latter programme aims to increase urban resilience and the well-being of citizens. It focuses on the interaction and interlinkages in urban systems, taking into account the energy chain, human behaviour, environmental and meteorological data, and air quality and its effect on human well-being. It engages the citizens and enhances the co-production of urban systems between different societal actors.

Figure 2 describes the case context using the analytical dimensions of ServPPINs (Djellal and Gallouj, 2013). Cleen can be characterized as a complex ServPPIN, as it is focused on architectural innovations and a multi-actor network has been formed to produce these innovations.

Further, the innovations created are both technological and non-technological in nature and the innovation processes reflect both bottom-up and top-down approaches. All these aspects emphasise the integrative nature of service innovation.

Analytical dimensions	Description	Cleen as a ServPPIN
Type of ServPPIN	Complex ServPPINs to adopt, produce and enhance implementation of complex architectural innovation Multi-actor network	Co-production of various forms of technological and non-technological innovations 44 shareholders representing private and public organisations and different parts of the system Multi-actor collaboration essential to co-develop new competences, to promote the creation of new business and industrial competitiveness and to enhance the implementation of complex innovations in the area of energy and environment
Type of innovation	Broad perspective to innovation; complex, architectural innovation including various forms of technological and non-technological innovations	Complex innovation to promote the systemic change and industrial renewal in energy and environment sector and to define e.g. "the new architecture of the future energy system". System renewal requires variety of technological and non-technological innovations; e.g. new patterns in production and consumption of energy.
Dominant type of innovation process	Planned/unplanned innovation requires both bottom-up and top-down innovations developed both within formalized models and various informal models (e.g. bricolage and rapid application models)	Systemic change in energy end environment sector requires innovations in every level of society and is based on top-down strategies and activities as well as bottom-up activities and experiments. The systemic change is promoted by both by formalized and informal models of innovation.

Theoretical perspective	Integrative	Renewal of energy and environment sector is based on the collaboration of multiple actors representing the different sectors of society and on the integrative solutions combining multiple types of technological and non-technological innovations.

FIG. 2 – Cleen SHOK as a ServPPIn.

The characteristics of Cleen as a complex ServPPIN will be revealed in more detail in the results section. The case description can be summarised by stating that Cleen aims to tackle prominent societal challenges, among which environmental sustainability is primary. It accelerates new system level innovations and industrial renewal through a new type of interaction and co-creation.

DATA COLLECTION AND ANALYSIS

In order to gain an in-depth understanding of the activities under study, we gathered data from four types of sources. The author of this article had the main responsibility for designing the data collection and for analysing the data. The actual data was collected by the group of three researchers. *The primary instrument for data collection* was face-to-face interviews (35 in total). The interviews were gathered between February and June 2013. Some complementary interviews were conducted in spring 2015. We applied snowball sampling in the identification of interviewees: the first respondents were the Managing Director of Cleen Ltd and the Programme Managers. Based on their suggestions, we thereafter selected the other interviewees among the members of the programme consortiums. The final sample represented actors in the area of sustainable energy and environmental measurement in a diverse way. It consisted of representatives of small and medium size companies (SME's) and large companies in the field of environmental measurement and sustainable energy. In addition, a number of experts representing universities and other public research organisations in the same fields were interviewed. All interviewees were managers or senior experts in

their background organisations and they had a significant role in the preparation and implementation of research programmes. Typically they were acting as programme managers, work package leaders or they were leading the service demonstration development as a part of the programme implementation. Interviews were complemented during the spring 2015 by the interviews of technological and development managers of Cleen.

We applied a semi-structured interview method: the topics were decided beforehand but within them the respondents were given a great deal of freedom (Bryman and Bell, 2011). The topics were structured on the basis of our theoretical analyses of the systemic change and innovation in the area of energy and the environment, governance and management of the innovation process in ServPPINs, and roles and responsibilities of network actors in innovation processes. The duration of the interviews ranged from one and a half to three hours. All interviews were recorded and transcribed.

The second source of material gathered were observations of the preparation process for new programmes. We took part in six collaborative workshops which collected participants from companies, universities and research organisations. Workshops took place during the spring 2014 (February-June). During the meetings, the author and her colleagues wrote up field notes based on the discussions. The official minutes of meetings were utilised to complement the field notes.

The third source of information was the material provided during the preparation phase of the new programmes. The digital working space of Cleen, to which we had access, enabled us to follow the proceeding of the programme: documents and other material provided in the course of programme preparation were continuously updated. *The fourth information source* was the strategic documentary material provided by the case organisation. This included, for example, the strategic research agendas, guidelines and criteria for the programme preparation, annual reports and programme results material.

In the analysis and interpretation of the data was made in a dialog between theory and empirical findings. In the analysis of empirical data any computer-assisted coding tool was not used, but several rounds of analysis were carried out to derive meanings from data and to reduce the amount of data (Huberman and Miles, 1994). While reading the

interviews, observation notes and the other documentary material we uncovered the most common and typical themes, and classified and structured them. Aim was to create holistic understanding of the research topic via systematic and thorough analysis rounds of interviewees' responses. The quotations in the results sections illustrate the level at which extracts were picked from the material. The empirical observations were linked to the theoretical views on ServPPINs and social innovations. The analysis was started by describing the study context using the analytical dimensions of ServPPINs (Djellal and Gallouj, 2013). Thereafter, the participatory and networked processes were examined thoroughly. Particular attention was in the relations and empowerment of variety of actors as well as the integration of bottom-up and top-down perspectives.

III. RESEARCH RESULTS

This section represents the main results of the study. The structure follows the central analytical dimensions of the study. The first section characterises in details the type of multi-actor network required for the development and implementation of complex innovations. Thereafter the focus is in collaborative and social processes: second section focuses to the central characteristics in bottom-up process and third in the top-down interaction.

TACKLING THE SOCIETAL CHALLENGES IN THE COLLABORATION OF MULTIPLE PARTNERS

Cleen SHOK is one of the central actors in the Finnish innovation system to tackle environmental challenges and enhance a systemic change in the energy and environmental sector. The data of this study indicates that the role of research programmes is especially important in the creation of a comprehensive picture of the transition required. They are also crucial for the definition of strategic research questions and for the identification of the central actors who are needed to solve the problems and thus to enhance system level change.

According to our interviews, the empowerment of multiple actors representing a variety of sectors, competences and world views is essential both in creating a holistic understanding of the requirements of the system level change and in developing solutions that correspond to the comprehensive needs. It turned out that the novel programmes have accelerated network generation over the traditional organisational boarders. Consequently, they have enabled the generation of strategic understanding and the development of completely new competences required for the systemic change. For example in the SGEM programme, the interaction between energy and ICT systems is a central innovation behind the advancement of a novel smart energy infrastructure. The following interview quotes illustrate that in the face of complex and systemic problems, actors are running out of competence and are not capable of handling systemic problems without the support of a broad network:

> Understanding the ongoing change is anything but a linear process. To create general understanding, we need multiple organisations, multiple actors, multiple backgrounds. One actor understands this and other actors that, and together we are able to create a holistic view of the ongoing changes. Without the collaboration of many actors, the creation of a strategic view is not possible. For that reason, we did not have strategic understanding of the ongoing changes in the energy sector before the first SHOK programme period. (Representative of university A)
>
> If we are alone, we are running out of competence regarding the systemic transition in the energy and environmental sector. Thus, we need to have a variety of players who have different types of competences required for the creation of holistic understanding of the ongoing change (Representative of large company A)

Besides, the collaboration with different types of companies was emphasized. Most of the actors affirmed that the active participation of companies–and the entire value networks–ensures the development of practical service solutions. Companies carry out pilots and demonstrations in a real-life context, which is a prerequisite for the dissemination of the results. Moreover, particularly the role of large companies was seen to be very powerful in society-level vision building. Like the citation below illustrates, companies' ability to enhance the system level objectives through their strategies was important. Therefore, having them inside the collaborative networks was highly valued.

> To really make systemic change happen it is important to have large companies in these networks. They are also capable of enhancing the transition through their organisational strategies and programs (Representative of large company A)

However, compared to traditional research and development programmes, collaboration between multiple partners and over traditional sectoral boarders also complicates the structure of networks. For example, SGEM encompasses in total 21 industrial partners from the energy sector, including energy technology providers, power production companies, energy distributors, and energy service providers. From the ICT sector, it includes software developers, network providers and network safety consultants. In addition, eight partners representing universities and public research organisations are in the core of the network. Correspondingly, in the first preparatory workshops of the healthy urban living-programme, approximately one hundred participants representing a variety of public, private and third sector organisations took part. Although the structure is complicated, the following interview quotes show that the extensive participation ensures both system level problem solving and real co-creation.

> On the one hand, traditional research programmes are clearer and simpler in their structure, but on the other hand, they have not managed to incorporate all the actors needed for the system level problem solving. In addition, traditional research programmes lack of genuine will and capacity of co-creation. By empowering all central national partners, the SHOK programmes have managed to create a forum for real collaborative innovation (Representative of public research organisation A)

While the multi-actor collaboration between universities and companies was commended as a central notion in all the interviews, the absence of other public sector authorities, municipalities and citizens was also highlighted. The interviewees unanimously stated that the focus of the first generation programmes has primarily been in the development of new technologies and solutions. A broader understanding of citizens' needs and societal aspects has been lacking. They admitted that to create comprehensive understanding of healthy urban living conditions or the requirements of novel comprehensive energy architecture, new actors and competences–including the political and

sociological perspective–need to be incorporated into the programme networks. The following quote points out that understanding the function of political and social systems, including the power relations and consumer needs and behaviour, are in a crucial role in order to support the acceptance of novel solutions and enhance the systemic change.

> To tackle the ongoing transition in energy sector, we need to incorporate the competences and perspectives of multiple actors. Technology is the easiest part of the transition. To be really able to tackle the complex needs of a system change, we need to incorporate new actors and competences into our network. We need to have understanding of the energy as a political issue. In addition, we need to understand what customers really need and how they behave. When we have comprehension of these societal aspects of energy and their dynamic interaction in the system, we may be able to develop viable and comprehensive service solutions and novel business concepts. (Representative of university A)

Based on our observations, the preparation of the "second generation" programmes has evolved into the desired direction: attention has been paid to the centrality of citizen centric approaches and participation of public authorities. For example in the preparation of the healthy urban living programme, the strategic research agenda highlights the centrality of citizens' needs in the urban planning and the role of municipalities as service development "platforms". Further, in the actual collaborative projects the aim is to integrate citizens and municipalities in the bottom-up experiments. According to the interviewees, broadening the collaboration is crucial both for the development and for the implementation of better and more viable solutions: acceptance of citizens and support of public sector actors are prerequisites for the scaling up of the results.

However, the success of SHOK-programmes is manifested only if new knowledge and innovations developed in the programmes can be executed as nationwide decisions. Some of the interviewees regretted that the current dissemination of the research results is too slow. According to them, one potential reason is the inadequate communication with decision-makers and other interest groups. Although single programme actors were active in collaborating with national and local policymakers–they for example met politicians frequently and took part in EU and national level working groups–the most of them did not have any

direct contact to decision-makers. As the interview quotes below reveal, in order to affect on the national and EU-level strategies, and to have an impact on a societal development a more systematically organised and continuous interaction with decision-makers is needed.

> Currently the programme actors have produced lot of paper. But nothing is really changing, if we don't have courage to implement the results. Now the research is going round in circles; we are mainly communicating with companies and other researchers. Instead we should be thinking how and with whom we implement the results as concrete solutions and changes (Representative of a small company A)

> We should be more active in communicating our research results to decision-makers. Single actors have been active in contacting local and national decision-makers and politicians. This is very important if we want to have an influence and impact on society. Hoverer, we should be much more active in national and EU-level strategy and vision work to really influence on the future developments. (Representative of large company B)

CREATING NEW COMPETENCES AND BUSINESS SOLUTIONS IN A TRUST-BASED COLLABORATION

Interviewees emphasised that the programmes have managed to create a model example of the network that integrates a variety of actors from multiple sectors and develops completely novel competences and innovations. As interviewees pointed out, these are the central features when aiming for the industrial renewal. According to our empirical data, the collaborative ability of the network is based on formal agreements. For example partners' role as a formal shareholder and contracts on intellectual property rights (IPR) commit the partners to collaboration. However, these official agreements are only a starting point for partnership. Much more important is the informal trust. According to all the interviews, the role of trust was highlighted in the creation of open and profound collaboration. Like one of the interviewed representative of the university (B) pointed out: "without trust, the collaboration is limited only to the exchange of information".

Informal trustbuilding has been systematically facilitated by Cleen and programme managers from the beginning of the programme planning. According to our observations, Cleen has an active role in promoting new partnerships and in creating a forum for open and trust-based discussion. They have organised an open call, for multiple

stakeholders, to take part in the generation of the research agenda in the series of collaborative workshops. The aim is to give voice and responsibility to multiple partners in strategy formulation and to match up companies and research actors across traditional sectoral borders. According to our informants, setting the common targets and planning the practical implementation in the interactive and collaborative process weld the partners together from the beginning and form a core for open knowledge sharing and a trustful relationship.

The operational principle of Cleen defines that programmes are industry driven. That means that the industry needs are high on the research agenda and the targets are mainly set by the stakeholder companies. As the quote of one large company (B) representative reveals, the company needs are heard in the programme design: "thanks to the novel programmes company targets are high on the agenda, whereas in the traditional research programs funding is directed to research done in ivory towers". The informants emphasised that the companies' will and ability to sit in "a driving seat" commit them to programme targets and the partner network. From the company perspective it is a core issue when aiming for a profound collaboration, especially with the other companies. However, the programmes, which aim to tackle complex societal challenges, cannot be built solely on business needs. The interviewees highlighted the research partners' role in balancing the short term business opportunities to long term societal needs. Like the following quotes show, the interviewed actors believe that the combination of different type of objectives enhances the understanding the complementarities of different actors and thus benefits the collaboration.

> This new policy instrument has created condition for true and open collaboration over company boarders. Partners sit in the same meetings to set targets for the common development and they implement targets collaboratively. Companies are actually affecting the target setting and thus the company and user needs are taken into account in research and development work. Also our research partners have benefitted from the collaboration–they have said that now they understand better what company needs are and what the challenges that need to be solved. In the best case this operational model generates an innovative platform for a variety of organisations willing to tackle collaboratively our common societal problems. (Representative of large company A)

> The programme includes a variety of actors from research and industry and it has managed to combine the long term visionary research work and concrete short term business objectives. The combination of different types of targets is essential for good trust-based collaboration and is relevant in tackling system level problems. (Representative of large company B)

According to the interviews, profound and trust-based collaboration has been a stone foundation–and a prerequisite–for the generation of new combinatory competences and for the creation of integrative service solutions. Programs have, for example, facilitated the emergence of a new type of co-production of services between experts from the energy and ICT sectors. This has been a starting point in the development of comprehensive energy architecture: the new combinatory competences have, for example, made possible the coexistence of centralised and distributed energy systems as well as guaranteed the safe energy flow in the system. In addition, by combining ICT in the energy system, programs create knowledge to design, construct, steer and use the smart and flexible energy system in the networks of multiple actors. As the interviewees revealed, these combinatory competences are required for industrial renewal in the energy sector. The quote of one large company (A) representative illustrates that the novel combination of competences helps tackling the challenges in the energy and environment sector: "we have generated completely new competences with completely new partners. This creates the ground for a completely new industrial sector".

Novel combination of competences generates new strategic partnerships and gives room for practical pilots and demonstrations. It benefits both companies and research partners. For example actors who develop a platform for sharing environmental data witness that the program has given rise to a new knowledge cluster; the development has both ameliorated the scientific base in the area and supported the development of concrete business solutions. The interview quotes below illustrate that close collaboration in developing common business solutions has led to interdependence between partners, which again has opened new doors for the actors. It has changed the way of thinking and doing business and has given rise to novel ecosystems. In addition, it is seen to be of strategic importance in ensuring the long-term business opportunities, in strengthening companies' competitiveness and in facilitating their entrance into the international markets.

> SHOK programs have generated a new type of collaboration between company partners. We have learned to collaborate fluently and openly with other companies. That is not a typical way of action in business. This new way of action is of strategic importance and gives us a competitive advantage in markets in five or ten years. In the future, the firms who do not have the same capacity, will stay alone and focus on their own narrow activities. These company networks are extremely important in the internationalisation of business. We cannot fight the Chinese alone, but we can compete with them in the well-functioning company networks. Collaboration strengthens our competiveness domestically and internationally (Representative of large company A)

> For our company this programme has been extremely important. It has especially supported our internationalisation into China. In Europe it is easy to operate for our type of small company. On the contrary in China operating alone is not possible. Without the support we get from this public-private innovation network if would be impossible to create business in China. (Representative of small company B)

Building a trust-based relationship, and creating a completely new collaborative way of working, is an essential but not a simple issue. On the contrary, it is time consuming work, which is based on systematic and open interaction, and recognition of common interest and the additional value of each party in the development. Learning to speak a common language and having shared working methods cannot be adopted immediately by the partner organisations. On the contrary, it requires changes in mindset and in ways of working. Single organisations need, for example, to adopt the idea of shared value, which affects the current operational model and business logic in entire organisations and business networks. Although the needs for change are ambitious, almost all the participating actors know that the creation a partnership network requires give-and-take. As the interviewees underlined, the baseline for the co-production has been created: the first generation programs have managed to generate shared working methods and to increase understanding of the collaborative nature of value generation, when tackling complex societal challenges.

SUPPORTING THE MULTI-ACTOR COLLABORATION BY THE MECHANISMS OF TOP-DOWN COORDINATION

Programmes are steered by multiple mechanisms and varyingly in different phases of their implementation. The primary organisation carrying out the top-down coordination is the funding organisation Tekes: it both sets the criteria for funding and follows the success of programmes based on continuous reporting and evaluation. In addition, Cleen is monitoring the success of the programmes. According to the interviews, the double steering only increases bureaucracy and does not improve the programme results. However, it was seen as a small and bureaucratic snag. The bigger problem, according to our informants, is the governance criteria and mechanisms of funding the organisation. The problem manifests as contradictory and mechanistic targets of evaluation, a bureaucratic preparation process and restrictive consortium rules.

When the programme consortium is setting programme targets, there is paradox to match them up with funding criteria. Current criteria do not take into account the complex and systemic nature of the programmes. Further, they do not pay attention to the different types of objectives in the programmes. Instead, top-down coordination is based on the linear view of innovation, which emphasises the short term results such as publications, patents, computer softwares and new products. The systemic changes, which require for example new combinatory competences, collaboration between variety of actors and the long time scale have not been considered. As the following interview quotations reveal, the problems in steering reflects the absence of good measures which are suited to the co-production of service solutions, and which are capable of capturing their integrative nature and dynamic development process.

> The traditional steering is based on concrete outputs of programmes, such as publications and software. But what we are actually developing in the programmes is comprehensive and holistic understanding to support the societal transition in the energy sector. Programmes support the new ways of thinking and new societal structure. But how we can measure these types of changes? It is paradoxical that there are no good measures for these systemic innovations. At the same time it is understandable that good measures do not exist yet. The changes would not be innovative and revolutionary if

> there were already measures for these changes. (Representative of University representative B)
>
> The problem in steering of the programmes is the traditional measures and indicators. Funding organisation is still focusing, for example, on the numbers of developed products or reviewed articles. We must report how many new products we have launched during the programme's period and how many articles we have written. But the answer is none. This is because it has not been a target in our development. The targets for the programmes are something completely different, but the current measures are not able to capture the programme targets. Current programme targets are much more holistic than these current measures. (Representative of large company C)

The problems described above, according to programme participants, manifest as contradictory targets. On the one hand programs are supposed to be risk taking and revitalising industrial structures in the long term. On the other hand, the indicators, for example, expect short term readiness to launch new products and services into markets. However, according to the codes of funding, concrete service and technology development in the programmes is denied. As interview quotes below illustrate, the conflicting criteria make the preparation of the programmes schizophrenic and cause uncertainty about the role of different actors in governance of the network.

> The problem is the contradictory funding criteria set by Tekes. On the one hand we are expected to promote export activities, but on the other hand we are not allowed to do any service or project development. Steering is schizophrenic because of contradictory and over-mechanistic targets (Representative of small company C).
>
> Current steering is based on conflicting targets. On the one hand the programs need to be long term and risk taking, and on the other hand programs should provide concrete short term results. I don't know if I should laugh or cry when thinking which targets to follow. The funny thing is that Tekes has forbidden us to develop concrete products. Anyhow, they are using it as a success indicator because they do not have any better indicators. But how can you get something which has not been set as target? Furthermore the steering culture is very much dependent on the personal opinions of the person in charge in the funding organisation. During our programme preparation the person has changed three times and every time that has affected the emphasis of our program. The former one stressed completely different things to the current one. (Representative of university A)

Also the timescale in steering was criticised by the programme's actors. Enhancement of systemic changes, such as the integration of user communities to provide real time environmental data, and the development of business solutions for environmental reporting, is a complex and long term process. The timeline for these changes is much longer, which cannot be captured by the current steering mechanisms. Therefore the reported results do not tell the truth of the attained results. Like the following interview quote reveals, they may even lead to the misevaluation conclusion of the success of the programmes:

> The current indicators in steering may lead to the completely wrong conclusion of the success of the programs. They may even show that companies have not achieved anything in these programs. The reason for the wrong conclusion relates to the different time scales of steering and product development in companies. Launching the new products is a long term process. Companies publish the information of new solutions when launching them. A problematic thing is that steering in the funding organisation is based on targets which do not take into account different timescales. We have, for example, started several the product development processes based on the program results, but we won't tell about these results in public before launching the new products. (Representative of a large company D)

Current criteria are set top-down. Instead of top-down target setting, programme actors are begging for better interaction with funders during the programme preparation and implementation. According to interviewees, it would be essential to have a dialogue between top-down and bottom-up processes to create shared vision and to set targets for the development. In addition, the operational environment is continuously evolving. Therefore the targets and operations of the programmes need to be adapted to the changes in operational environment. That again emphasises a need for a continuous interaction. According to the interviews, the role of the funders should be as a supportive and collaborative partner, not a controlling administrator. Like the following quote reveals, continuous collaboration between top-down and bottom-up processes, would promote the success of the programmes.

> The bureaucracy and control do not enhance good quality research, business impacts or industrial renewal in this country. On the contrary, when we are aiming at radical and long term change the objectives should be defined in the collaboration of multiple actors including the funding organisation. This

> can not be done via a traditional bureaucratic process. Together we should set targets and identify the steps to reach targets. (Representative of large company E)

Interviewees believed that open interaction with funders would also improve the programme preparation. Currently the preparation processes are typically prolonged because of the bureaucracy, lasting in some programmes even for five years. Ineffective preparation has led to fatigue of company partners, and some of them have decided to opt out from the consortium. The loss of the central partners has led to the absence of the required competences.

Not only the poor interaction, but also the consortium rules are limiting the formation of an agile network and collaboration. Current rules are inflexible; they do not correspond with the modern way of development, which is based on continuously evolving networks. Currently, permanent participation in the consortium is a necessity: and network evolvement in the course of the programme is denied. That may, according to the interviewees, slow down programs activities. For example, programme actors perceived the need to empower the citizens and residents' associations into the development of energy solutions in the course of the "first generation" programmes. However, the integration of new actors into the ongoing programme was not possible, which, for example, prevented the collaborative development with citizens. In addition, in some companies–such as in start-up and high growth companies–the operations are fast and cyclic. As one large company (D) representative described: "flexible entry into and exit from programmes is denied by the old-fashioned consortium rules". That may prevent the some potential partners to take part in the collaboration, which again may cause the loss of required competences.

CONCLUSION

In this article, the first aim has been in examining the collaborative forms of service innovations in the environment and energy sector. To describe the central characteristics of multi-actor collaboration, the concept of ServPPIN (Gallouj *et al.*, 2013) has been applied. The concept concretizes forms of co-production, in which the solutions to complex societal problems are based on the architectural innovations that integrate technological and service based novelties, trustful partnership between variety of actors and interaction between bottom-up and top-down processes. The second aim has been to increase understanding of the interactive and participatory processes–including the interplay between top-down and bottom-up approaches–without which it is not possible to develop innovation and scale them up in a complex system. Therefore the approach of social innovation has been applied (Harrisson *et al.*, 2010, Toivonen, 2014).

The study illustrates the new Finnish innovation policy instrument, SHOK, according to the analytical dimensions of ServPPIN. Results show that the SHOK can be characterised as a complex ServPPIN. It develops architectural innovations in a multi-actor collaboration to promote systemic change and industrial renewal in the area of energy and environment. For example, one of the targets is to define "a new architecture for a future energy system", and to achieve that a variety of technological and non-technological innovations, such as new patterns in production and consumption of energy, have been developed.

Innovation dynamics within ServPPINs are the result of complex interactions between various actors having heterogeneous competences and goals (Djellal and Gallouj, 2013). According to our results, the empowerment of multiple actors representing a variety of sectors, competences and world views is essential in creating the comprehensive picture of transition required. Further, integration of the variety of competences is needed to develop the solutions that correspond with these comprehensive needs. The novel innovation policy instrument has managed to create a forum that accelerates the creation of novel partnerships. However, in the current collaboration the representatives

of public and private sectors are dominating. What is lacking is the broader understanding of citizens' needs and societal aspects. That may hinder the acceptance of novel solutions and hamper the sectoral renewal. Broadening the collaboration is crucial not only for the development but also for the implementation of better and viable solutions: the success on SHOK is manifested only if the new knowledge and innovations developed in the programs can be executed as nationwide decisions. Therefore more collaboration with users and better communication with decision-makers, is required.

A network's capacity for the creation of novel competences is mainly based on the informal trust between network partners. As the results show, building trust is based on a will to create an open, collaborative culture and a continuous interaction between partners. That requires changes in typical ways of working: mindset and organisational boundaries need to open up to integrate competences and divergent goals. These capabilities are not required only on the level of bottom-up networks. Besides, new competences, new ways of communication, coordination and steering need to be developed at every level of the system.

From the viewpoint of the current governance system, the study reveals factors that threat the realization of targets in networked programs: ignoring their dynamic and long term performance is such a threat in particular. As a practical implication, the formal mechanisms of governance need to be developed to be adaptive, to strengthen diversity and horizontality in the development and to enhance co-production in networked world.

REFERENCES

Bryman, A. and Bell, E., *Business Research Methods* (3rd ed.), New York, Oxford University Press, 2011.

Coombs, R. and Miles, I., "Innovation, measurement and services: the new problematique", *in* Metcalfe J. S. and Miles I. (Eds.), *Innovation Systems in the Service Economy: Measurement and Case Study Analysis*, London, Kluwer Academic Publishing, 2000, p. 85-104.

Di Meglio, G., "The Place of ServPPINs in the range of pulic-private collaboration arrangements for service provision", *in* Gallouj, F., Rubalcaba, L. and Windrum, P. (Eds.), *Public-private innovation networks in services*, Cheltenham, UK, Edward Elgar, 2013, p. 59-87.

Djellal, F. and Gallouj, F., "How public-private innovation networks in services (ServPPINs) differ from other innovation networks: what lesson for theory?", *in* Gallouj, F., Rubalcaba, L. and Windrum, P. (Eds.), *Public-private innovation networks in services*, Cheltenham, UK, Edward Elgar, 2013, p. 21-58.

Dosi, G., "Some notes on national systems of innovation and production, and their implications for economic analysis", *in* Archibugi, D., Howells, J. and Michie, J. (Eds.), *Innovation Policy in a Global Economy*, Cambridge, Cambridge University Press, 1999, p. 35-48.

Dosi, G., Freeman, C., Nelson, R., Silverberg, G. and Soete, L., *Technical change and economic theory*, Pinter Publishers, 1988.

Elzen, B., Geels, F. W. and Green, K., *System Innovation and the Transition to Sustainability*, Cheltenham and Northampton, Edward Elgar, 2004.

Fuglsang, L., "Bricolage and invisible innovation in public service innovation", *Journal of Innovation Economics*, 1 (5), 2010, p. 67-87.

Fuglsang, L., "Collaboration and trust in a public-private innovation network: a case study of an emerging innovation model", *in* Gallouj, F., Rubalcaba, L. and Windrum, P. (Eds.), *Public-private innovation networks in services*, Cheltenham, UK, Edward Elgar, 2013, p. 247-264.

Gallouj, F., *Économie de l'innovation dans les services*, Paris, Éditions L'Harmattan, coll. "Logiques économiques", 1994.

Gallouj, F., *Innovation in the service economy: The new wealth of nations*, Cheltenham, UK, Edward Elgar, 2002.

Gallouj, F., Rubalcaba, L. and Windrum, P. (Eds.), *Public-private innovation networks in services*, Cheltenham, UK, Edward Elgar, 2013.

Gallouj, F. and Weinstein, O., "Innovation in services", *Research Policy*, 26 (4/5), 1997, p. 537-556.

Gadrey, J., "The environmental crisis and the economics of services: the need for revolution", *in* Gallouj, F. and Djellal, F. (Eds.), *The Handbook of Innovation in Services. A Multi-disciplinary Perspective*, Cheltenham, UK, Edward Elgar, 2010, p. 653-673.

Geels, F. W., "Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study", *Research Policy*, vol. 31, 2002, p. 1257-1274.

Geels, F. W., "From sectoral systems of innovation to socio-technical systems. Insights about dynamics and change from sociology and institutional theory", *Research Policy*, vol. 33, 2004, p. 897-920.

Geels, F. W., "Processes and patterns in transitions and system innovations: Refining the co-evolutionary multi-level perspective", *Technological Forecasting and Social Change*, vol. 72, 2005, p. 681-696.

Geels, F. W., "Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective", *Research Policy*, vol. 39, 2010, p. 495-510.

Green, L., Pyka, A. and Schön, B., "A life cycle-based taxonomy of innovation networks – with a focus on public-private collaboration", *in* Gallouj, F., Rubalcaba, L. and Windrum, P. (Eds.), *Public-private innovation networks in services*, Cheltenham, UK, Edward Elgar, 2013, p. 113-135.

Harrisson, D., Klein, J.-L. and Browne, P. L., "Social innovation, social enterprise and services", *in* Gallouj, F. and Djellal, F. (Eds.), *The Handbook of Innovation and Services*, Cheltenham and Northampton, Edward Elgar, 2010, p. 197-281.

Hartley, J., "Innovation in Governance and public services: past and present", *Public Money and Management*, 25, January, 2005, p. 35-42.

Høyrup, S., "Employee-driven innovation: A new phenomenon, concept and mode of innovation", *in* Høyrup, S., Bonnafous-Boucher, M., Hasse, C., Lotz, M. and Moller, K. (Eds.). *Employee-driven innovation: A new approach.*, New York, Palgrave Macmillan, 2012, p. 3-33.

Huberman, A. M. and Miles, M. B., "Data Management and Analysis Methods", *in* Denzin, N. K. and Lincoln, Y. S. (Eds.), *Handbook of Qualitative Research*, Thousand Oaks CA, Sage, 1994, p. 428-444.

Jessop, B., Moulaert, F., Hulgård, L. and Hamdouch, A., "Social innovation research: a new stage in innovation analysis?", *in* Moulaert, F., MacCallum, D., Mehmood, A. and Hamdouch, A. (Eds.). *The International Handbook of Social Innovation. Collective Action, Social Learning and Transdisciplinary Research*, Cheltenham, UK, Edward Elgar, 2013, p. 110-130.

KLINE, S. J. and ROSENBERG, N., "An Overview of Innovation", *in* LANDAU, R. and ROSENBERG, N. (Eds.), *The Positive Sum Strategy – Harnessing Technology for Economic Growth*, Washington D.C., National Academy Press, 1986.

LANGERGAARD, L., "Understanding of 'users' and 'innovation' in a public sector context", *in* SUNBO, J. and TOIVONEN, M. (Eds.), *User-based Innovation in Service*, Cheltenham, UK, Edwards Elgar Publishing, 2011, p. 203-226.

LÉVESQUE, B., "Social Innovation in governance and public management systems: toward a new paradigm?", *in* MOULAERT, F., MACCALLUM, D., MEHMOOD, A. and HAMDOUCH, A. (Eds.), *The International Handbook of Social Innovation. Collective Action, Social Learning and Transdisciplinary Research*, Cheltenham, UK, Edward Elgar, 2013, p. 25-39.

MEADOWCROFT, J., "What about the politics? Sustainable development, transition management, and long term energy transitions", *Policy Sciences*, vol. 42, 2009, p. 323-340.

MOORE, M. and HARTLEY, J., "Innovations in Governance", *Public Management Review*, 10:1, 2008, p. 3-20.

NELSON, S. and WINTER, R., *An evolutionary theory of economic change*, Cambridge (Mass.), Belknap Press/Harvard University Press, 1982.

NEWMAN, J. and CLARKE, J., *Public, Politics and Power: Remaking the Public in Public Services*, London, Sage Publications, 2009.

RUBALCABA, L., DI MEGLIO, G. and GALLEGO, J., "Public-private innovation networks and social innovation in the service economy", *in* VIÑALS, C. R. and RODRÍGUEZ, C. P. (Eds.), *Social innovation: New forms of organization in Knowledge-based societies*, New York, Routledge, 2013, p. 188-205.

RUBALCABA, L., MICHEL, S., SUNDBO, J., BROWN, S. W. and REYNOSO, J., "Shaping, Organizing and Rethinking Service innovation: A multidimensional Framework", *Journal of Service Management*, vol. 23, Issue 5, 2012, p. 696-715.

SHOVE, E. and WALKER, G., "Governing transitions in the sustainability of everyday life", *Research policy*, 39 (2010), 2010, p. 471-476.

SMITH, A., VOSS, J.-P. and GRIN, J., "Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges", *Research Policy*, vol. 39, 2010, p. 435-448.

SØRENSEN, E. and TORFING, J. (Ed.), *Theories of Democratic Network Governance*, New York, Palgrave Macmillan, US, 2007.

SUNDBO, J. and TOIVONEN, M. (Eds.), *User-based innovation in services*, Cheltenham and Northampton, Edward Elgar, 2011.

SUNDBO, J., "The Balancing of Empowerment: a strategic resource based model of organizing innovation activities in service and low-tech firms", *Technovation*, 16 (8), 1996, p. 397-409.

Toivonen, M., "Different types of innovation processes in services and their organizational implications", *in* Gallouj, F. and Djellal, F. (Eds.), *The Handbook of Innovation in Services. A Multi-disciplinary Perspective*, Cheltenham, UK, Edward Elgar, 2010, p. 653-673.

Toivonen, M., "Social innovations – manifested in new services and in new system level interactions", *in* Kijima, K. (Ed.), *Service Systems Science*, Series of Translational Systems Sciences n° 2, Springer Japan, 2014, p. 83-95.

Voss, J-P., Bauknecht, D. and Kemp, R., *Reflexive Governance for Sustainable Development*, Cheltenham, UK, Edward Elgar, 2006.

Weber, M. and Heller-Schuh, B., "ServPPIN as instrument for realizing system innovations: two case studies in passenger transport in Austria", *in* Gallouj, F., Rubalcaba, L. and Windrum, P. (Eds), *Public-private innovation networks in services*, Cheltenham, UK, Edward Elgar, 2013, p. 384-408.

Weber, M. and Hemmelskamp, J. (Eds.), *Towards Environmental Innovation Systems*, Heidelberg, Springer, 2005.

Windrum, P., "Multi-agent framework for understanding the success and failure of ServPPINs", *in* Gallouj, F., Rubalcaba, L. and Windrum, P. (Eds), *Public-private innovation networks in services*, Cheltenham, UK, Edward Elgar, 2013, p. 88-112.

Windrum, P. and García-Goñi, M., "A neo-Schumpeterian model of health services innovation", *Research Policy*, 37 (4), 2008, p. 649-672.