



ServPPIN: a review of scientific findings

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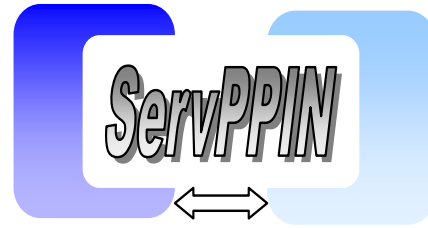
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ServPPIN: The Contribution of Public and Private Services to European Growth and Welfare, and the Role of Public-Private Innovation Networks

Deliverable 7.1 (WP7): Integrative synthesis of theoretical and empirical findings

ServPPIN: a review of scientific findings

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Executive summary

ServPPIN is a research project which focuses on the role of public and private services on growth and welfare and the particular role of public-private innovation networks (PPIN). Public-private innovation networks are considered to be an organisational platform in which public and private services can perform complementarities and synergies in many ways.

The project analyses public and private services, and their impact on growth and welfare. In particular it focuses on service innovation and on public-private services, and their impact on growth and welfare. Specifically, the main objectives of ServPPIN are:

- To identify the linkages between services, economic and social growth, understanding the contribution of service innovations in the current economy and society and any differences that may exist between the public and private sectors.
- To understand how public-private sector interactions function, and how they can be better managed by private and public sector policy-makers to increase performance and welfare.
- To understand the characteristics of public-private service networks that induces innovation, growth, employment and welfare.

ServPPIN has undertaken new theoretical and empirical fieldwork involving cross-country and cross-sector empirical analysis. New techniques are applied for impact analysis: both public and private services, comparing impacts on performance (productivity, competitiveness) with impacts on welfare (e.g., employment, service quality, 'universal' access to services). The project has been organised around nine working packages (WP). In order to define the service innovation and service public-private innovation networks (ServPPINs) concept, and to guide the interface between theory and empirical research, the project has developed an analytical framework for studying multi-institutional networks. The empirical research has followed a three-pronged approach:

- A large-scale statistical analysis of public and private services in growth and welfare at the macroeconomic level.
- A statistical analysis of the contributions ServPPINs to performance, growth and welfare at the meso and sectoral level.
- Case studies covering major services types: health, transport and tourism and knowledge intensive services.

The project has produced new knowledge and European added value through:

- Knowledge creation on the service economy: growth factors, facilitators and impacts on productivity, employment, socioeconomic changes, and welfare.
- New approach to service innovation from a multi-agent framework perspective.
- Understanding of public-private interactions through the case of networks and related dynamics including the use of life cycle theory.
- Drawing of functional and effective policy lines.

ServPPIN tackles the key developments and impacts of public-private services provision and of public-private innovation networks (PPINs) at three levels of analysis: macro, meso and micro. At *macro level* the main outcomes of the project are related to new service developments, service innovation and the contribution to growth and welfare. The project studies the stylized facts on public, private and mixed services; their similarities and dissimilarities across the enlarged EU; the challenges of the EU service economy; the explanatory factors of services growth and assesses the performance and efficiency of services.

At present, the ever-increasing and dynamic role of services in modern societies has led to increasing levels of interaction between public and private services and to the development of mixed forms. Moreover, across the enlarged EU, the dominant trend is towards the increasing participation of private services in total employment, although a diverse macro and meso mapping of service economies in close correlation with social and institutional models can also be found. Furthermore, the variety of service economies in the EU can be explained on the basis of the different roles played by factors such as the state, social changes, labour market institutions and previous developments in the evolution of public, private and mixed services. ServPPIN has also proven that although private and public services have made significant contributions to aggregated growth in the EU in recent years, their impacts should also be assessed on the basis of a multidimensional approach which takes into account outcomes and quality aspects.

In addition, the project addresses the different dimensions of public and private service innovation and examines the impacts of innovation on productivity, growth and employment. Services, particularly the knowledge-based ones, are very active in terms of innovation in all developed countries. Besides technological innovations, non-technological or intangible forms of innovations play an important role in services despite not being comprehensively captured by statistics yet. Along with the problems related to the measurement of innovation, lies another one concerning performance. Thus, an innovation and a performance 'gap' are identified in contemporary advanced service economies. ServPPIN aligns with the integrative perspective of innovation in services, also studying service innovation specificities in the field of public services. Public and private innovation networks can be partly related to the 'open innovation' models and social innovation models which have the particularities of being cooperative and interactive.

At *meso level* the main outcomes relate to theory developments under multi-institutional frameworks, the concept of innovation network life cycle and the study of the role played by evolutionary inefficiencies in the networks. The application of social network analysis allows acknowledging for the heterogeneity of actors in the network and their different roles. From this focus on networks, we derive a new rationale of innovation policy that can be summarized under 'avoiding evolutionary inefficiencies'. This approach seeks to avoid situations which hamper the economic development. Such network inefficiencies concern the amount of existing links among the relevant actors, the size of the network, its structure, and the different roles that the individual actors play within the network. In this perspective, the structures and dynamics of innovation networks become the focus of attention as well as the starting point of action in innovation policy.

At *micro level*, ServPPIN followed a case study approach. In 2008/2009, the project teams carried out 40 case studies in seven different countries in the following sectors: transport; health services and in knowledge-intensive services and tourism. Case studies provide a micro-perspective on the emergence of innovation networks over their life cycle and give insight as regards drivers, actor configurations, impacts and critical events of their evolution over time. The key role played by the third sector and entrepreneurship in many PPINs is stressed which is also closely connected with rising social innovation.

Results have shown the importance of cooperation and interaction in innovative service networking between public and private agents -and civil third sector, allowing exploiting potential complementarities and synergies in areas such as credibility, dissemination, speeding up the process of agenda setting and decision making, more comprehensive view of the problems, legitimacy, resources, efficiency, flexibility, public research more efficient, learning capacity and knowledge transfer. ServPPINs are mainly organizational networks, often small, professional and goal oriented that can be partly considered social innovation in some cases, but they cannot be considered as social networks in full.

The success of service innovation networks can be derived from four main interrelated sources:

- a. *The role of promoters and drivers*-both internal and external- of ServPPINs is essential. Success factors require the definition and implementation of a joint business case, trust -fundamental in many of the case studies analyzed-, a good entrepreneurial fit, flexible structures, use of inputs from benchmarking exercises, and pro-innovation entrepreneurship and culture. Finance also plays a role as well as the establishment of the right strategy between bottom-up or top-bottom set up that may vary depending on the particular service innovation to be developed and the institutional context.
- b. *The integration of a particular individual innovation network within systemic and social network*, what can be reflected in the role of the third sector, the integration in local community, and the different facilitators from institutions such as universities or public and policy administrations and, in general, society through social innovation networks. The multi-agent framework for service innovation has been tested and can be considered as an appropriate platform where different agents interact to make a network innovative and successful. To some extent, successful ServPPINs can be considered the outcome of successful social innovation crystallized in the small, professional and goal-oriented nature of most of them.
- c. *The overcoming of barriers to ServPPINs* in areas such as the rigidity of public administrations, the mistrust and expectations mismatch, the existence of different interests and incentive systems, the problem of free riders and asymmetric information, networking competences and, in some cases, mainly knowledge-oriented services, appropriability problems.
- d. *The reduction of evolutionary inefficiencies in the life cycles* of ServPPINs where networks are not efficient enough to adapt to the changing phases of their life and the different external and internal elements that can drastically affect their development, their expected functioning and impact and even their own nature and composition.

At *policy level* three broad objectives of possible policy intervention are identified to overcome market and systemic failures, reduce evolutionary inefficiencies and increase the contribution of ServPPINs to growth and welfare:

- Strengthening service-specific innovation and innovation capabilities of firms, users and other agents involved in innovation
- Facilitating co-operation and networks involving service and social innovation

- Empowering the public sector and the third sector for co-operation: role of civil society

Moreover, the promotion of ServPPINs may be based on the enhancement and application of a full range of policies such as: R&D policies, innovation policies, public procurement, standards, regional policies, employment & skills, internal market, competition, health, transport, tourism, etc. In this sense, service-oriented innovation policy is not necessarily aimed at specific individual's service sector: in contrast, it can be seen as a predominantly horizontal policy, going across sectors, based on service innovation being considered as a systemic dimension useful for any kind of economic activity, thus, encouraging the development of public-private innovative networks.

Introduction

Services are the dominant economic sector in modern economies and are a crucial component of competitiveness strategy and welfare in Europe. In the past public and private services have been studied in isolation of one another. At best this is misleading. At worst it produces a false understanding of the drivers, dynamics, and impact of services. The ServPPINproject aims to overcome this gap and to go beyond these dichotomies, studying the contribution of services to growth and welfare from the perspective of the complementarities between public and private services. In particular, it focuses on service innovation and on public-private innovation networks (PPINs) because these are an important organizational mode for developing, producing, and delivering new and improved services. PPINsallow the merging and sharing of dispersed knowledge among participants as well as sharing the risk of financial engagement in uncertain innovation processeswork; establishing and enhancing complementarities and synergies between public and private organizations.

This synthesis aims at integrating the main theoretical and empirical findings of the project. The emphasis is put on the theoretical review work and the insights gained in the context of the different levels of empirical work.

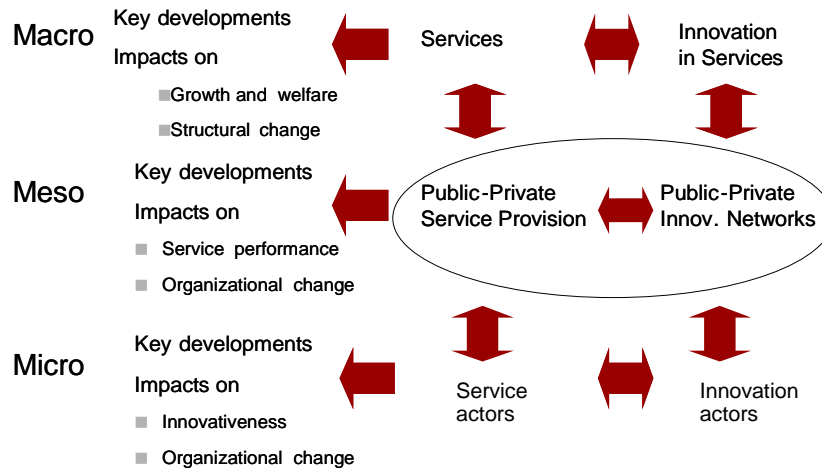
Research focus of ServPPIN project

Understanding the role and impact of public-private services is a major research undertaking. On the one hand, it requires a broad approach to capture the full scope of public-private service interactions and their impact. On the other hand, it must drill down into the specifics of public-private innovation networks in order to understand the micro dynamics, drivers and success factors of individual networks.In order to achieve this requirement for breadth in scope and detailed in focus, the ServPPIN project conducts research on three interrelated areas:

1. An assessment of the impact of public and private services on economic growth and social welfare with a special emphasis on the role of services innovation.
2. An investigation into how public-private sector interactions work and the particular role played by ServPPINs in the creation of new knowledge and services.
3. An investigation into the key characteristics of ServPPINs that successfully innovate and have a high impact on growth, employment and welfare.

Understanding all three areas is of utmost importance if they are to be better managed by private and public sector policy-makers in order to increase performance and welfare. As Figure 1 show, this involves an integrative analysis at the macro, meso and micro levels.

Figure 1. Macro, meso, micro levels of analysis in ServPPIN project



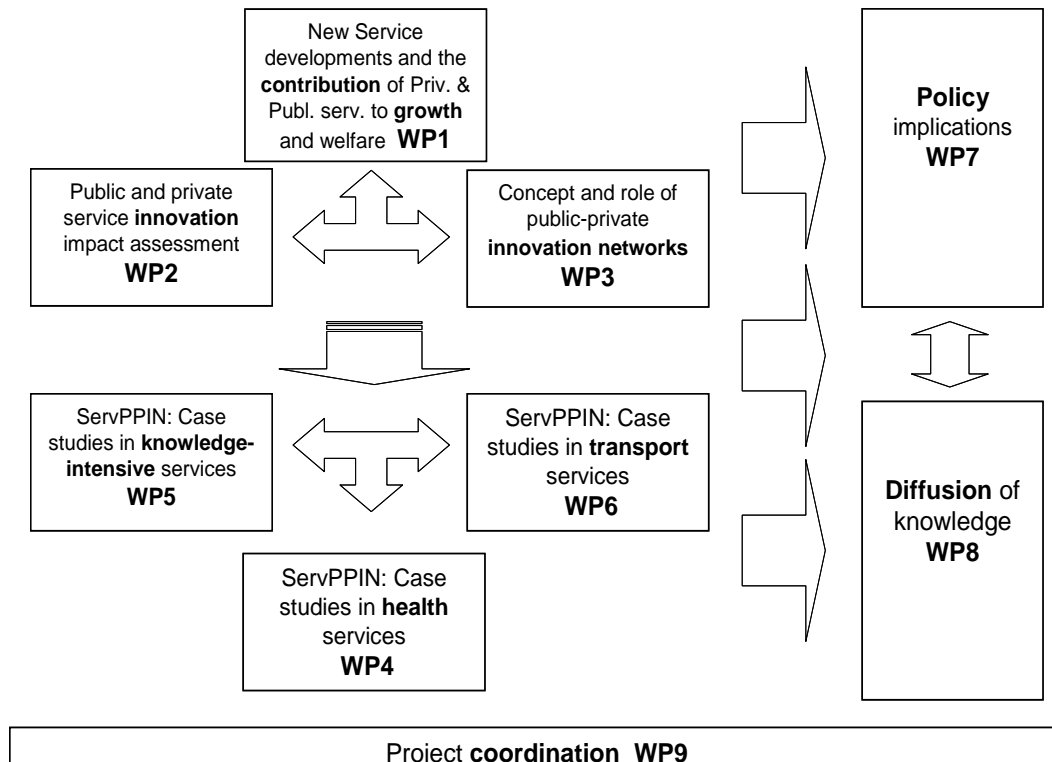
Research approach

To address the different levels of analysis, the project undertakes new theoretical, empirical and field work that is cross-country and cross-sector. In order to define the ServPPIN concept, and to guide the interface between theory and empirical research, the project has created an analytical framework for studying multi-institutional networks. The empirical research has followed a three-pronged approach:

- Large scale statistical analysis of public and private services in growth and welfare at the macroeconomic level;
- Statistical analysis of the contributions of service innovation and service public-private innovation networks (ServPPINs) to performance, growth and welfare at the meso and sectoral level; and,
- Development of case studies covering major service types (health, knowledge intensive services and tourism, and transport).

The project is organised around 9 working packages (WP), as shown by Figure 2, applying their research at macro, meso and micro levels. In particular, the WP 1, 2 and 3 focus on the present and the future most relevant aspects of the service economy, service innovation and networks analysis. WP 4, 5 and 6 brings the analysis at a more specific level, undertaking case studies on public-private innovation networks in the field of health, knowledge-intensive and tourism, and transport services. WP 7, 8 and 9 are the tools by which the work of elaboration of policy implication, diffusion of knowledge and management of the project is planned and realized respectively.

Figure 2. The ServPPIN project



ServPPIN uses a number of different methodological approaches, from theory to applied research, from single disciplinary perspectives to multidisciplinary ones (that integrate economics with regional and political sciences as well as socioeconomics and management sciences), from analyses based on statistical and econometric approaches to case studies and social network analysis. Each work package uses those methodological approaches that are best suited to different tasks at hand.

Structure of this synthesis

This integrative synthesis follows the structure of the project and thus is organised as follows. The next three chapters deal with the main theoretical and empirical findings of WP 1, 2 and 3. Chapter 1 analyses new service developments and the contribution of service activities to growth and welfare. It focus on understanding the nature of the service economy and, particularly of public and private services; their similarities and dissimilarities across countries; the explanatory factors of their growth and the diverse impacts they may have on economic growth and welfare. Chapter 2 addresses the key facets of public and private service innovation, examining the impacts on productivity, growth and employment. Next, the concept and role of PPINs is studied by Chapter 3. On the basis of network theories and dynamic multi-actor framework, a taxonomy of innovation networks and a new policy rationale for ServPPINs is proposed. Then, Chapter 4 presents the common research framework followed for the selection and implementation of case studies that are presented in Chapter 5 (health), Chapter 6 (knowledge intensive services and tourism) and Chapter 7 (transport). Policy issues around ServPPINs and service innovation are addressed in Chapter 8 which brings together the results of the theoretical and empirical work packages of the project with recent concepts of science, technology and innovation policy. To conclude, Chapter 9 summarises the main lessons learned and outlines some future research avenues.

Chapter 1: New service developments and the contribution to growth and welfare

Introduction

The ultimate goal of the first WP of ServPPIN is to analyse the macro and meso picture of services and, in particular, of public and private services in the enlarged European Union (EU). The focus is set on understanding their interactions, synergies and complementarities; the challenges they face; their similarities and dissimilarities across countries; the explanatory factors of their growth and the diverse impacts they may have on economic growth and welfare. The relevance of the argument is shown by the undeniable dominance of service activities in modern economies along with a recently renewed interest in the public and private discussion and by the need to adopt a comparative approach that goes beyond existing dichotomies in the study of these services. Several research questions are addressed:

1. What are the new developments in the services economy? Which are the old and the new challenges? What are the differences between geographical regions in Europe?
2. What is the contribution of services to growth and welfare? What are the main differences by country and economic sector? Is there international convergence in the services knowledge economy? Do we see distinctly different models of the service economies in different societies?
3. Which are the key differences between public and private services in performance and impact on welfare and employment?

In order to address the former research questions, WP1 adopts an applied economic perspective in which the revision of existing literature on the topics under study is complemented by different empirical methods of analysis. It is worth mentioning that the service sector has traditionally been deficient in systematic, homogeneous and accurate statistical recording. However, manifold improvements have been made in this respect during recent years and, even though there is still room for further progress, several consistent statistics on services activities such as those that serve as the basis of this empirical research have been produced. This WP uses an extensive set of statistical sources, such as: EUKLEMS Database¹, Eurostat, OECD, World Bank, UNCTAD, ILO, World Economic Forum and World Trade Organization.

An important outcome of this WP is the generation of new empirical findings on public and private services, and their interaction on growth, employment and welfare. The empirical methods applied differ across the research questions formulated and range from statistical techniques and beta and sigma convergence analysis to econometric modelling through panel data regressions including also multivariate clustering techniques, sectoral growth accounting estimations and the construction of composite indicators. As mentioned, particular focus is given to differences between public and private services as well as to differences across European countries, between Europe and other economic areas such as the United States. In addition, the situation in the CEEC countries is closely looked in order to evaluate progress towards convergence and the challenges of service development

¹ www.euklems.net. This project was funded by the European Commission, Research Directorate General as part of the 6th Framework Programme, Priority 8, 'Policy Support and Anticipating Scientific and Technological Needs'.

in transition economies. This WP also copes with services heterogeneity. Even though the analysis aims at drawing a complete picture on the service sector, the diversity of service activities is particularly stressed in WP1.

The next section attempts to summarise the main theoretical and empirical findings of this WP and to conclude some final remarks are made.

The EU service economy: new developments, challenges and convergence patterns

Even though the progress in the comprehension of services has been considerable, it should not be assumed as ultimate or definitive as discussed in Maroto (2009). In fact, services concept has continually evolved from the initial notions of classical economists: from being considered as unproductive activities to productive ones; from being defined in negative terms to the consideration of positive features; from a unilateral research approach to a multidisciplinary perspective; from the sectoral classification of their heterogeneous activities to the blurring of sectoral boundaries owing to the increased reciprocal relationships between services and manufacturing. In this sense, it is possible to talk about a 'new' service economy (Rubalcaba and Di Meglio, 2009).

Within this framework, the nature of the tertiarization process is revealed as dynamic, heterogeneous and diverse across economies and sectors. Moreover, the increasing participation of services in wealth creation and employment is not an exclusive fact of developed nations. Developing and transition economies have also undergone a tertiarization process although at different paces and intensities. In every geographic area, services growth may be explained on the basis of multiple determinants such as income increase, productivity differentials relative to manufacturing activities, flexibilization of productive systems, new technologies, human capital, goods-services integration, outsourcing, globalization, governmental regulations and social changes. Moreover, the new service economy is, to some extent, a reaction to the dynamics of the new challenges that it faces: the continuous advance of global sourcing, service liberalization processes, ICT boost, increased service standards requirements, formalization of service science, sustainable development issues and new KIBS needs.

The main challenges related to the service economy such as the sources of structural change, the patterns of transition economies, environmental issues, social considerations, gender and job quality topics and the internationalization of service activities have also been theoretically and empirically tested along WP1. Based on an I-O Structural Decomposition Analysis (SDA) carried out on 13 manufacturing and service sectors, from the end of 1960s to the end of 1990s, Savona and Lorentz (2009) found that the largest contribution to the structural changes leading to the growth of services stems from (domestic) final demand, whereas the role of foreign trade remains marginal even in the last decade. Changes in the sectoral intermediate linkages have instead been the main responsible for the growth of KIBS, along with a sustained contribution of final consumption. The role of (domestic) demand constraints might affect the degree of exploitation of technological opportunities and the patterns of growth, even in the case of the most technologically advanced service sectors.

The analysis of transition economies patterns developed by Burger and Stare (2010) showed that New Member States (NMS) still lag behind EU15 and US employment shares in private and public services even in 2005, with Romania and Bulgaria experiencing particularly big gaps. The convergence of employment shares of the NMS to EU15 average was faster in private than in public services in the period 1995-2005. This corresponds to different starting positions of both groups of services and particularly to the relatively well developed public services in the NMS

at the outset of reforms. A main message is that NMS bring additional diversity into the spectrum of service models in Europe. When analysing the catching up of NMS towards the more advanced EU 15, Palócz and Oblath (2010) indicate that the real convergence of the new member states involved a steeper convergence in expenditures on goods, and a milder catching up in those on services. The corollary of this finding is that the convergence in prices of services was more rapid than in those of goods.

As regards environmental and sustainable development issues Djellal and Gallouj (2009) claim that a service-based approach should be adopted. In this way, a loosening of the various biases that characterize the notion of sustainable development (industrialist, technologist, environmentalist and defensive) would be achieved. They stress the essential place that non-technological (particularly social) innovation occupies in a sustainable service society. In a similar line, Gadrey (2009a) calls for a revolution in the economics of services in order to deal with the environmental and social crisis which would ultimately give rise to a powerful wave of innovations in services, manufacturing and agriculture.

Concerning gender issues, Iglesias-Fernández et al. (2010) have studied the extent to which new technologies are improving the labour situation of women in Spain, with special reference to the educational requirements of their jobs. In addition, job quality and job satisfaction have been analysed from a sectoral perspective for the particular case of the Spanish labour market (Dueñas-Fernández et al., 2010). Results show that it cannot be affirmed that services show lower relative levels of quality of employment. Moreover, large differences exist in terms of job quality within the service sector.

The internationalization process remains as another major challenge for service activities. Services are at the heart of world economic integration. Their particular characteristics (such as intangibility and simultaneity) influence their international provision. Several modes of international provision act and interact within this framework. Within them, international trade and provision through commercial presence are keen to present in a complementary way (Visintin, 2009).

Despite services dominating the sectoral composition of advanced economies, a single model of structural change cannot be deduced from an exploratory sigma and beta convergence analysis (Rubalcaba and Di Meglio, 2009). Even though the enlarged EU and the United States seemed to converge towards service activities as a whole during 1995–2005 this is not verified in all services subsectors in particular, in the case of financial services, knowledge-intensive services, other business services and health. The heterogeneous behaviour of services activities suggests that diverse and dynamic European service economy models may prevail over a single and static one. On the basis of quantitative and qualitative structures of employment in services, four 'service worlds' have been identified by Gadrey (2009b): liberal (or Anglo-Saxon), Nordic, European Continental and familialist (or Mediterranean, although the inclusion of Japan excludes the use of this geographical qualifier). National conventions (related to equality and solidarity and to family and gender) play a key role in explaining the plurality of service economies and societies.

The nature of public and private services

Within the process of structural change, public and private services and the role played by public and private sectors in their supply also reveal a complex, heterogeneous and diverse nature across countries and sectors (Di Meglio, 2010). In fact, providing a universal and relentless definition of public services is a difficult task. In economic literature different arguments that confer a public character to certain services may be found: their characteristics concerning rivalry and excludability, the presence of market failures (informational asymmetries, natural

monopoly, externalities) and equity considerations. Nevertheless, the division between public and private services has progressively changed across time, countries and sectors as technology and social institutions evolved.

Since public services may not be adequately supplied by the market some sort of collective action is needed. Traditionally, government intervention has carried out this collective action. However, the profound distinction between the 'provision' and the 'production' of public services puts the role played by the government in perspective. Even when the public sector provides public services it does not have to produce them. Private firms, non-profit organizations, voluntary associations of citizens may also be involved in the process of production. Many arguments have been used to support or oppose the increasing role of the private sector in public services delivery but still further research and rigorous theories are needed in this respect.

The possible organizational arrangements for services supply as well as their suitability in each case is a complicated issue in which several factors are involved: the particular characteristics of the service; the capacity of government to perform certain tasks; the organizational traditions of the different countries; the technology available; the scope of the collective action required and the level of competition in the relevant market. In fact, a large variety of organizational arrangements for delivering public services has emerged in recent years ranging from pure public provision to pure community provision including contracting out, concessions, license for monopolies, selling of state-owned enterprises, PPP, competitive licensing, vouchers and tradable permits.

From this perspective, the public versus private debate has to move beyond polar positions towards a more fruitful view which recognizes that both sectors may contribute positively to the goal of effective public services supply. Cooperation, interaction and networking between both are crucial in order to exploit their potential complementarities and synergies in services delivery. Actually, the borderline between both is shifting and has to some extent been blurred due to the increasing use of market mechanisms by the public sector and the growing role of the private sector as a public services supplier. The achievement of a better division of responsibilities and functions between public and private sectors in order to take more advantages of the strengths of each and overcome the limitations of the other is one of the major challenges that public services provision still faces. Recent financial crisis has uncovered that, as the world goes global, this balance is increasingly difficult to accomplish.

Varieties of service economies in Europe

From this WP we have learnt that the configuration of the service economy is not homogeneous across European countries. If services provision is classified into private, public and mixed categories, the variety across Europe is the rule. Despite recent growth, the enlarged EU lags behind the United States, Australia, Japan or Korea in private services employment; and this is particularly notable in the case of new member states. Sigma and beta convergence analysis suggests that public, private and mixed employment share dispersions across EU25 and the United States have reduced during 1995–2005 and this has occurred together with a process of catching up by the least advanced economies. Nevertheless, when the sectoral breakdown is studied both measures of convergence may bring about different results. This fact highlights the relevance of considering both the aggregated and the sectoral perspective when undertaking an analysis of the configuration of service economies.

From an aggregated perspective, several clusters of countries can be outlined depending on the relative shares these services have in total employment and their annual growth rate during the last decade (Di Meglio et al., 2010a). Within Europe,

five service economy models emerge: Anglo-Saxon, Nordic, Continental, Mediterranean and Central Eastern European. This classification is strongly correlated with classifications based on welfare state systems and systems of capitalism. In this way, the main orientation of the varieties of service economies identified is closely connected to the diversity of social models, as well as to differences in the institutional organization of production. Moreover, the main trend across clusters, during the last decade, is towards an increased participation of private services in total employment. On the other hand, no conclusive evidence is found regarding the catching-up process of mixed and public services.

When analysing a comprehensive set of indicators at disaggregated level, the models discussed in the first empirical exercise are only partially confirmed. These indicators reflect different dimensions of service economies, such as: structural composition; knowledge base and innovative efforts; internationalization; and competitive restrictions. The overall pattern detected is closely linked to socio-economic and geographical proximities. The country size effect, which may apparently play a role from this perspective, no longer prevails in the partial analysis of the building blocks of the service economies under study. The structural composition of countries emerges as the dimension which mainly shapes the varieties of EU service models, while knowledge base and innovative efforts in services show a relatively more dynamic and uneven pattern across the clusters identified.

Explaining public and private services growth

This WP confirms the multiplicity of determinants explaining services employment growth from the perspective of public, private and mixed categories and from the perspective of NMS and of the enlarged EU in the period 1995 to 2007. According to Stare and Jaklič (2010), in the case of NMS, transition reforms exert a statistically significant influence on the growth of services. In addition, past developments in regard to different service categories and the transition process disrupt the explanatory power of the standard variables for explaining the growth of services. In Di Meglio et al. (2010b) the results confirm the significant impact of standard variables for the total services sector and they also indicate large distinctions between public, private and mixed categories which, to some extent, are linked to their properties and patterns of transformation. Therefore, the growth of employment in private services responds to different incentives compared to public and mixed services. This is in line with the reasoning of some scholars who claimed that dealing with services as a uniform category might hide growth patterns of different services. While income per capita turns out to be a key determinant for explaining employment growth in private services this effect is not verified in public or mixed categories. On the contrary, in accordance with the results of some previous studies, income level negatively affects public administration job expansion. Employment in public and mixed services is comparatively more sensitive to short term GDP fluctuations, with public administration being the most sensitive category to the cycle. Whereas a relative lag in services productivity explains employment expansion in the aggregated service sector and in public administration this is not confirmed in private services. It appears that this effect could be attributed to the role played by some capital and ICT intensive service sectors used as intermediate inputs where productivity growth is fairly dynamic (e.g., logistics, financial and transport services).

When analysing the impact of the role of the state, two interesting outcomes are found. First, the influence of government consumption on services employment seems to be somewhat blurred by the changing relationships between public and private sectors arising from privatization, deregulation and liberalization processes, which particularly affected the provision of mixed services. Second, tax revenue has a differentiated impact on service categories: it deters employment growth in

private services and encourages employment in public services, public administration and mixed services which are mainly financed by taxation. Among the variables reflecting social and demographic changes, urbanization emerges as the most significant factor positively influencing services employment in every service category analysed. In addition, female participation in the labour force is important for public and mixed services employment growth.

Institutions in the labour market, such as strict employment protection legislation and union density, are not neutral for the growth of services. Moreover, they act as a barrier for employment growth in total services and in private services. Since the latter account for the largest share of employment in old and new member states alike, this fact is a serious concern. On the other hand, the results indicate that employment in mixed services is not sensitive to labour market institutions. This could be explained, to a certain extent, by the rigidity of jobs in two large groups of mixed services (e.g. health and education), resulting from more favourable employment protection and from the importance and sensitivity of those services for the population. Nevertheless, such properties of mixed services might provide a basis for poor efficiency that need to be addressed by adequate policy governance. Lastly, belonging to the EU15 'club' seems to be a relevant determinant for stimulating total service employment and for job expansion in public and mixed services. It appears that past socio-economic systems and changes undertaken in EU12 since the beginning of the 1990s bear influence on the evolution of public related service activities in those countries. Therefore, the empirical estimations suggest that 'history matters' in explaining the dynamics of service employment growth across the enlarged EU, which conveys an important message for policy shaping.

Public and private services: impacts on growth and welfare

In WP1 the focus has been also set on assessing the impacts of services (Di Meglio et al., 2009, Maroto, 2010a and 2010b). A survey of the literature confirms the multi-dimensional character of service impacts and the need to take account of the perspective of service suppliers, service users and society in general. Capturing dimensions of public and private services performance such as quality, outcome for service users and their impact on welfare presents a big challenge for researchers and necessitates a combination of different theoretical, conceptual and methodological approaches, along with and systematic collection of data. Within this framework, two different approaches for assessing and measuring public and private services impacts on EU economies have been applied. First, the focus has been set on traditional indicators such as the contribution of services to overall employment, gross value added and productivity growth. It has been found that private services, in particular the category 'other business activities', have contributed heavily to employment and value added growth in the enlarged EU between 1995 and 2007. While private services contributed positively to aggregate productivity growth in EU economies the opposite occurred in the case of public services. Among the former category the role played by real estate activities, communications and financial services was particularly important. The situation in new member states is to some extent different to EU15, mainly due to the process of catching up that is taking place in those economies after the implementation of market reforms. Distributive trades and public administration accounted for a larger part of employment and productivity growth in new member states during the period under analysis. This is closely linked to rising living standards and administrative/institutional support needed to implement market reforms and carry out the accession process.

Apart from traditional indicators, services performance is assessed from an 'extended' perspective where other dimensions are considered. Accordingly, the focus is set on the outcomes rendered to end users (individual, enterprises or public institutions) rather than on outputs. The use of composite indicators enables the

adoption of a multi-criteria or multi-dimensional framework for measuring performance and efficiency in public and private services. The empirical analysis shows that public services 'extended performance' differ across countries although not in an extreme way. Countries with the highest scores for public services include Austria (public administration and other social services), Finland (education) and the Czech Republic (health). The variability of performance scores across countries increases when analysing private services. Italy (travel and tourism), Germany (transport) and Luxembourg (KIS) reveal the highest 'extended performance' in private services. Moreover, efficiency scores are much more diverse across the enlarged EU than performance in both categories of services analysed. The composite indicator for total public services reveals to some extent a direct association between extended performance and efficiency (Di Meglio et al. 2010c). In particular, EU15 countries except for Mediterranean economies are those achieving higher performance and efficiency scores. Nevertheless, behind the behaviour of public services as an aggregated category, different sectoral patterns hide, particularly for education and health services. Another finding of the WP is that efficiency and 'extended performance' seem to be more complementary in private services categories included in the analysis. This may reflect an underlying different logic and motivation with respect to public services sectors, where other objectives related to equality, welfare gains or long-run stability may be drivers of the suppliers' performance.

Results suggest that it is possible to approach the impacts of services both from the conventional perspective of performance (mainly associated with productivity and growth gains) and from an 'extended performance' point of view (related to outcomes aspects) even if the proxy variables for measuring the latter have important limitations. Despite presenting exploratory results, it is hoped that this research opens a discussion rather than closes it. These contributions are very relevant and timely also in the context of various, recent initiatives for better measurement and understanding of societal progress in a changing world.

Final remarks

The WP1 aims at achieving a better comprehension of the role played by services, and in particular, by public and private services in European economies from a macroeconomic perspective, including both theoretical and empirical analysis. To this end, the focus is set on understanding the similarities and dissimilarities between public and private services across countries; the challenges that they face; the explanatory factors of their growth and the diverse impacts they may have on economic growth and welfare. The analysis has been developed at an aggregated and disaggregated level, considering public and private services sectoral composition. Finally, the study has been carried out for the enlarged EU, but within an international comparative framework.

Taking into account the full set of research questions defined in the introduction and the set of outcomes from this WP, the main overall conclusion of this research is as follows. The ever-increasing and dynamic role of services in modern societies has led to increasing levels of interaction between public and private services and to the development of mixed forms. Moreover, across the enlarged EU, the dominant trend is towards the increasing participation of private services in total employment, although a diverse macro and meso mapping of service economies in close correlation with social and institutional models can also be found. Furthermore, the variety of service economies in the EU can be explained on the basis of the different roles played by factors such as the state, social changes, labour market institutions and previous developments in the evolution of public, private and mixed services. This WP has also proven that although private and public services have made significant contributions to aggregated growth in the

EU in recent years, their impacts should also be assessed on the basis of a multidimensional approach which takes into account outcomes and quality aspects.

The central role played by services in modern economies and in particular, the new service economy, bring about challenges to both researchers and policymakers. For the former, the development of an approach that comprehensively captures the integration of services in any economic activity emerges as an interesting and, at the same time, challenging research avenue which implies moving from existing notions and statistics to new categories and concepts. For policy makers, services should constitute a dimension of any political initiative even within industrial policies schemes. The design of policy actions should take into account the increasing integration and inter-linkages between services and industry.

Furthermore, the heterogeneous nature of service economies identified in this WP imposes several challenges on policymakers. Since services represent a dimension of any economic activity and are particularly important for enhancing competitiveness and innovation, there is a need to address services horizontally within existing economic and industrial policies. Furthermore, there is a critical need to develop policies that deal with the special characteristics of services innovation and R&D; the regional localization of services; imperfect information between agents involved in the provision; qualifications, employment and entrepreneurship; and policies which cope with the remaining gaps in knowledge and statistics.

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Chapter 2: Public and private service innovation and impact assessment

Introduction

The goal of WP2 is to address more deeply one of the most important developments in service economies outlined in WP1, i.e. innovation in services. This major development is addressed for both public and private services. WP2 has two main objectives: 1) to account for innovation in public and private services according to key facets: nature, modes of organization, determinants, and 2) to examine the impacts of innovation in public and private services on productivity growth and employment. For each of these objectives, this WP combines the following approaches: surveys of the theoretical and empirical literature; empirical analysis of innovation surveys; cross-sector, international comparisons, theory development. Thus this WP seeks not only to provide a state of the art on innovation in (public and private) services but also new empirical results and theoretical developments.

The starting point of WP2 is the assumption that contemporary advanced service economies are characterized by what could be called an “innovation gap” (Djellal and Gallouj, 2009a). Strictly defined, this innovation gap measures invisible or missing innovation, that is the difference between what the traditional innovation indicators (R&D, patents, the technologist definitions of innovation) are capable of capturing, and the reality of innovation activities undertaken in a given economy. However, the innovation gap is not limited to the question of the nature of innovation. It more generally measures our misunderstanding of innovation in services and it may therefore also be addressed in the following fields: the development of theoretical frameworks for innovation in services, the shift in sectoral empirical investigations, the varieties of innovation models, the performance measurement, the public policy. WP2 provides a synthesis of main findings as regards all these issues. It therefore contributes to filling the gap of innovation understanding in services.

A contribution to the integrative perspective of innovation in services

Service literature distinguishes four theoretical perspectives, which provide a useful heuristic grid to explain the different ways of addressing innovation in the services: assimilation, differentiation, inversion and integration (Gallouj, 1994, 1998; Gallouj and Savona, 2009). The *assimilation* perspective analyses innovation in services just as innovation in manufacturing, focusing on their relationships with technological systems. As far as it focuses on innovation adopted from manufacturing sectors, the assimilation perspective is also one of *subordination*. The *differentiation (or demarcation)* perspective focuses on services specificities, and aims to capture innovation activity where the traditional (technologist or assimilation) gaze perceives nothing. The *inversion* perspective reflects the “revenge” of the service sector: it emphasizes the active role of knowledge intensive business services (KIBS) in other sectors’ innovations. The *integrative or synthetic* perspective provides a more balanced view of innovation in services. This perspective is based on a characteristics-based approach of the product. It seeks to provide the same analytical frameworks for both goods and services, and for both technological and non-technological forms of innovation (Gallouj and Weinstein, 1997). The integrative perspective seems to fit very well with modern economies in which the boundaries between goods and services are blurring. WP2 provides two contributions to the integrative perspective.

The first contribution (Gallouj and Toivonen, 2009) tackles the issue of how to make the process nature of services more visible in the characteristics-based service innovation model developed by Gallouj and Weinstein (1997). It argues that the invisibility of the service process in the original model has resulted in minor use of the model for detailed-level analyses within individual services. In the supplemented model four new aspects are added: a separate category for the process characteristics, the 'front office - back office' division, the customer's technology and process, and the distinction between direct and indirect utilities. The new model is applied in three empirical cases, which depict KIBS, industrial services and consumer services (workplace design provided by architects, solution services provided by equipment manufacturers, and 'Fifty plus' services provided by insurance companies).

The second contribution (Windrum, 2009) develops an integrative framework that enables one to study the way in which the preferences, competences, and knowledge of multiple public and private sector actors interact in the development of new services paradigms. It examines the key factors that affect the success or failure of ServPPINs. It distinguishes between those factors that affect the success/failure of the services that are developed by ServPPIN, and those factors that affect the effective functioning of an innovation network. A key issue is that policy-makers, public-private providers and consumers are the agents of path dependencies that create, support and maintain an existing service paradigm. These same agents can also be the harbingers of structural change. An important question is how heterogeneity and changes in the preferences and competences of these key actors arises.

Empirical investigations seeking for service innovation specificities: from KIBS to public services.

The first studies devoted to the specificity of the nature of innovation in services concerned a particular category of services (considered to be the most representative of the specificities of these activities), that is, knowledge intensive business services. These empirical studies of a qualitative nature were firstly extended by implementing quantitative surveys aimed at quantifying these, once the particular forms of innovation were recognized. But these typological studies have above all been revitalized by the proliferation of areas of empirical investigation. We have therefore left the area of pure services and knowledge intensive services (KIBS, banks, insurance firms), to take an interest in the specificities of innovation in services that are often considered to be less noble or less knowledge intensive (transport, cleaning, elderly care, tourism). It would be boring and pointless to explain the many ad hoc typologies outlined in the different activities. What should be retained from these studies is that the non-technological forms of innovation, which generally escape traditional tools, are identified everywhere.

WP2 contributes to the reinforcement of qualitative empirical investigations in the field of public services. Thus the contribution by Luise Li Langergaard and John Damm Scheuer (2009) (see also Fuglsang, 2010) is focused on the specificities of public sector service innovation. The analysis suggests that public sector service organizations have characteristics which make them distinct from private sector organizations and which influence the process of service innovation: Public sector service organizations are operating in highly professionalized and institutionalised settings, are influenced by political value changes and struggles. They are influenced by trends – as New Public Management – suggesting how to organize and manage which spread among politicians and administrators that are implemented top-down as well as by changes and innovations emerging bottom-up

as well as horizontally – that is through networks and network collaboration. Public sector service organizations react to user needs and preferences through the day-to-day interaction with citizens at the service level, bottom-up. They also react to democratically decided and administratively top-down implemented policy initiatives. Public sector service organizations are moreover production units where production may vary from regulation and resource allocation to service and welfare. They are operated using distinct types of professional knowledge and production technologies varying from rule governed administration to production in governmental, regional or local council institutions providing road maintenance, assuring water supply, teaching school children, providing care for the elderly or sick and more. These organizations operate in one or more networks that may consist of administrative and/or political representatives, stakeholders from interest organizations, personnel, professional and competing organizations as well as the users/recipients of the services produced. The organizations are regulated through different types of governance tools spanning from authority to network and market relations. They have different types of buffers or liaison mechanisms between the organization and the production core and the technical and institutional environment. As a consequence of these characteristics public sector service innovations can be diverse and varied – top-down, bottom-up, formalized and policy based, organisational and initiated by employees/professionals. With the inclusion of the users in a formalized manner, or as 'bricolage or tinkering' that is more informal trial-and-error processes leading to improvements over time. Co-evolution is suggested as one concept that captures the complexity of public sector service innovation. Coevolution is defined as the joint outcome of managerial intentionality, environment, and institutional effects. Coevolution assumes that change may occur in all interacting populations of organizations. Change can be driven by direct interactions and feedback from the rest of the system.

The nature of innovation in services: technological vs non technological

Innovation in services cannot be reduced to technological innovation, as the following examples, among others, demonstrate: a new insurance contract, new financial instruments, a new area of legal expertise, new formats for restaurants, retail outlets or hotels, a new leisure concept, etc. This does not mean that these innovations are not based or cannot be based on a tangible technology (information or telecommunications systems, for example), but that the innovations and the associated technologies are not one and the same thing and that, in some cases, the technology can be dispensed with. In other words, it cannot justifiably be argued that innovation occurs only when the novelty is embodied in a technical system.

In services, process innovation, just like product innovation, may be intangible. It may consist of methods, that is a script defining the words, actions and movements of each individual involved (methods used by consultants as well as in restaurants, cleaning or care protocols, etc.), as in a theatre play or film scenario. Some of these methods could be based on technical systems (computerisation of recruitment methods), while others might be embodied in tools (legal expert systems), but this is not a necessary condition for innovation.

Non-technological forms of innovation are taken into account, since recently, in OECD Manuals and in innovation surveys (CIS). While in its 1992 edition, the Oslo Manual only covers *technological* process and product innovation, in its latest version (2005), it also takes into account *marketing* and *organizational* innovations. These revisions are very welcome, however some progress still needs to be made as regards certain types of innovation Including: non-technological product innovation (for example a new insurance contract or a new financial product, a new field of expertise in consultancy), non-technological process innovation (methodologies, protocols), ad hoc and tailor-made innovation, social innovation.

Some progress is also needed as regards innovation in certain types of services activities: innovation in public services, innovation in complex packages called new formulas or new concepts (for example in trade and hostelry).

On the basis of recent surveys conducted in EU (CIS), one can formulate a certain number of general results as regards innovation and its nature (Fuglsang, 2010; Gallego, 2010; Savona and Musolesi, 2010; Windrum et al., 2010):

- Services are very active in terms of innovation in all developed countries. They cannot anymore be considered as laggard compared to manufacturing.
- Certain services are more innovative than others (for example KIBS)
- The latter may even be more innovative than some manufacturing sectors.
- Non-technological innovations (i.e. organizational and marketing innovations) take an important place in services.
- There is relatively more non-technological innovation in services than in manufacturing. However invisible (non-technological innovation) also plays an important role in manufacturing industries as well.

These results have also been confirmed by the the work of Rubalcaba et al (2010) who conducts an exploration of services innovation specificities with respect to innovation in goods. It mostly analyses disparities between services and goods innovation behaviours and also tests explanatory reasons behind innovation impacts in Europe (twelve countries), using data collected in the third EU Community Innovation Survey. Results confirm some specific behaviour in goods and services industries, although heterogeneity among activities and type of indicator should be taken into consideration. Moreover, results underline, on the one hand, the importance of interactive aspects of innovation, not only as regards the services sector but also the goods industry, and, on the other, the relevant association of some intangible elements (i.e. organisational changes) with impact dimensions associated with innovation in services. The qualitative and organisational aspects of services innovation impacts are outstanding.

Models of innovation in services: the shift from closed to open innovation models

One can distinguish in service activities two groups of models of innovation: 1) the traditional linear (or closed) model; and 2) the model of open innovation.

Linear models come within the scope of the assimilation perspective which was evoked previously. The idea is to apply to services existing industrial models: the NPD model, i.e. the stage-gate model which articulates phases of market research; service ideas; concept development; testing; launch. In management sciences there is a fertile theoretical tradition advocating the application to services of new product development (NPD) methodologies, whereby new services are designed in accordance with planned, systematic processes developed by applying a theoretical perspective known as New Service Development (NSD).

However, it is the open innovation model, which seems to be the most relevant. Nevertheless it should be noted that « open innovation » is a broad concept, which encompasses different practices which have the particularities of being cooperative, interactive and non-necessarily formalized.

It first of all includes the well-known Kline and Rosenberg chain linked model (1986), which describes innovation as a complex interaction framework between three different chains (innovation, knowledge, science chains).

It also includes several non-programmed or emergent models such as:

The model of rapid application, in which once the idea has appeared it is immediately developed in a service provision (Toivonen, 2010).

The practice-based model: which consists in identifying changes in the service practice and developing and institutionalizing them.

The bricolage innovation model, which describes innovation as a consequence of on the job, non-planned activities consisting of adjustments to random events, and to trials and errors processes (Fuglsang, 2010).

The ad hoc innovation, which may be defined as the process of construction of a solution to a client firm (new) problem (Gallouj, Weinstein, 1997). This process requires the client participation. It is not programmed and coterminous with the service provision process. It is recognized as innovation only afterwards (*a posteriori*).

The open innovation model also encompasses several cooperative models: a) the model of consultant-aided innovation, i.e. a model in which external consultants play a role of external R-D department, b) various types of customer/demand-driven innovation dynamics, and c) new forms of public-private cooperation within services, which we have called PPINs in this project. This question of relationship between public and private organizations is examined through the problem of the sources of information for innovation and the problem of cooperation.

The open innovation model and the use of external sources have been revised by the work of Battista et al, (2011). It is suggested that a paradigm shift is taking place, from the old innovation model based on internal R&D to a new innovation model based on the intensive use of external sources (search depth) for innovation. This work tests this using Eurostat SIC4 data for 40 sectors in 18 countries. The findings suggest a more nuanced understanding of the role of external search is required. Internal R&D and firm size rather than search depth are found to be the key factors affecting the performance of radical innovators. External search is identified as an important factor amongst incremental product innovators. These findings are consistent with the old innovation model. Even if the external sources for services innovation such as in the case of public-private innovation networks can play a role, the empirical evidence at EU level caution against suggestions that a paradigm shift has occurred.

As regards the sources of information for innovation, the four national short papers carried out within WP2 (Fuglsang, 2010; Gallego, 2010; Savona and Musolesi, 2010; Windrum et al., 2010) converge towards the following results. The main (external) sources of information used in the innovation process are the following ones: clients, suppliers and competitors. Universities and public research laboratories are the sources of information which receive the lowest scores. However, it should be noted that conference and scientific journals receive high rank scores, which means that business respondents may have indirect relationships with academic bodies.

The focus of the literature on cooperation for innovation has been the manufacturing sector. The identification and the analysis of the cooperation behaviours of service firms have been much less covered by the literature. WP2 also focuses on the question of innovation cooperation behaviour of service firms with public actors (universities and public laboratories) (Fuglsang, 2010; Gallego, 2010; Savona and Musolesi, 2010; Windrum et al., 2010). First, it shows that there are sectoral specificities (between manufacturing and services and also within services). Second, it shows that cooperation increases the probability of innovation.

The performance gap in public and private services

In the service economy, the problem is not only in the definition and measurement of innovation. It also lies in the definition and measurement of performance. One can thus also identify a « performance gap », which measures the difference between the reality of performance in an economy and the performance assessed by traditional economic tools (mainly productivity and growth). It reflects a hidden performance, invisible to these tools (performance in terms of sustainable development, from the socio-economic and ecological viewpoint). This is addressed in WP2 from a methodological viewpoint.

The first methodological contribution is provided by Djellal and Gallouj (2009c). It is devoted to an old question, but which faces a sharp renewed interest: productivity in its relationship with public services. Public services constitute a particularly difficult challenge for productivity (its definition, its evaluation, but also its strategic implementation), insofar as they add to the traditional difficulties induced by the service dimension of the output (its intangibility, interactivity, non stockability), other difficulties related to its public (or non-market) dimension (absence of market prices, collective consumption, public service principles, distinction between direct and indirect consumers). This work accounts, on the one hand, for these analytical difficulties, and on the other hand, for a certain number of measurement experiments (traditional index methods, frontier techniques). It also highlights the advantage of more critical alternative frameworks (multi-criteria analytical frameworks based on a definition of output as a social construct), which question the relevance of the productivity concept.

Another methodological contribution (Djellal and Gallouj, 2009a) is devoted to an analysis of the innovation-performance relationship in contemporary developed economies. The two « gaps » relating to innovation and performance blur the innovation-performance relationship. They lead one to question the legitimacy of some public policies which support innovation. Indeed, in order to carry out their diagnosis, public policies generally favour the relationship, which links visible innovation (mainly technological innovation: which is based on R&D and which gives rise to patents) to visible performance (growth, productivity), whereas other relationships involving invisible innovation and invisible performance should be taken into account.

From innovation and performance gaps to policy gap

Public Policies for innovation suffer from a double bias: they are manufacturing and ST biased. They tend to: focus on public research and industrial sectors, in particular high technology; promote technological innovation (based on scientific and technical R&D activities and patents appropriation); favor scientific and technological training.

It is the Assimilation (scientific and technologist) perspective which is still dominating. Policy should move to Demarcation or Integration. It should promote invisible innovation. It is thus necessary to emphasize *innovation and R&D policies that are specific to services*, in other words, policies which also favor non-technological forms of innovation and R & D. It is also necessary to support *services innovations* (and more generally invisible innovations) *within manufacturing and agricultural sectors*. Public policies should also support (in the education system) the development of specific skills needed for non-technological innovation. The works from Den Hertog and Rubalcaba (2010) and Rubalcaba et al (2010) have proved the "rational rationales" for service innovation policies and the need to explore new approaches to the topic.

All services are concerned by these innovation policies. But some sectors appear to be more concerned than others. For example KIBS, which contribute strongly to the innovation gap, both through their own internal non-technological

innovation, but also by that which they produce for their customers. This is also the case for the numerous proximity services and also public services at various levels.

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Chapter 3: Concept and role of public-private innovation networks

Introduction

For a long time innovation was considered to be of no importance in service industries. Contrary to manufacturing in services, productivity increases by innovation are impossible because of the very nature of the service product. Also cooperation between different actors was absolutely suspicious: because of antitrust reasons any kind of collaborative behaviour was suspect to social welfare distorting collusion. Furthermore, cooperation between private and public actors were outside the scope of theoretical considerations in economics because of a fine-grained division of labour which arranges public activities only in cases of market failures where private actors would never exert any economic activities because of missing profit opportunities.

Our project deals with the phenomenon of innovation networks between private and public actors in the service industries, the so-called ServPPINs. Already the term indicates that including ServPPINs in economic theory challenges major views which solidified within economics: No relevance for innovation in service industries, no cooperation between economic actors in general and no cooperation between private and public actors in particular. To say it frankly, our explanandum ServPPINS is not existent in mainstream economics. Therefore, developing an economic theory of ServPPins demands both, an eclectic approach combing the rare bits of theories in industrial dynamics and public finance which at least touch innovation and services and cooperation between public and private actors, and a radical approach getting rid of major obstacles in the treatment of innovation like the prevailing equilibrium orientation and the idea of perfect rationality also in innovation processes.

For many years the empirical phenomenon of ServPPINs was discovered and their importance for the organization of innovation processes in the service industries was highlighted within empirical research. In order to develop an overdue theory of ServPPINs we chose as a starting point an analytical approach which resolves the phenomenon ServPPINS into its basic components which are actors and linkages among actors.

This approach corresponds with the best practice in mathematics, namely graph theory which already developed in the 18th century, and is used to describe graphs i.e. mathematical structures composed of nodes and edges, which are pair wise connected. Only recently, graph theory found a renaissance in complexity theories which add to the complicated architecture of graphs a complex dynamics describing algorithmically the evolution of networks. These so-called network theories are perfectly suited as a general framework for the description of complex innovation networks between public and private actors in service industries: they acknowledge for the heterogeneity of actors (i.e. nodes) and their different roles in the networks (i.e. public or private) and allow for open developments because of innovation which might cause a structural transformation of network architectures because of the complex organisation.

Besides this very abstract view of ServPPINs without doubt a theory of ServPPINs has to acknowledge the particular functions of this organizational form concerning the particularities in service industries as well as the mutual learning and knowledge combination supposed to constitute the major advantage of network organization in innovation. To apply these theoretical considerations on innovation networks in services we need to develop a multi-actor framework offering scope for the heterogeneity of actors, their motives and incentives, their different knowledge

as well as the varied service characteristics. Also a dynamic framework to deal with the changing nature of innovation networks in time is needed. These concepts are finally summarized in a taxonomy of innovation networks involving the language of graph theory. This unified theory of ServPPINs then is used to develop a new policy rationale suited for designing ServPPINs.

Theoretical Building Blocks

Services and Innovation

Concerning the importance of innovation in service industries three approaches in service economics are identified to be relevant: In the so-called assimilation approach (Barras 1986), which considers service industries to be very close to manufacturing industries and therefore expects no service-particularities, networks are an enabling organizational form that eventually leads to the creation of new services. In the demarcation approach (Gallouj and Weinstein 1997) which contrasts service industries sharply from manufacturing, the role of innovation networks manifests in the interaction between service providers and the users in 'joint production' processes. Innovation networks therefore dominantly comprise a user-producer dimension. In cases these interactions involve different providers, also 'networks of providers' might emerge. In the synthesis approach (Djellal and Gallouj 2000), which pragmatically combines the assimilation and demarcation approach, the idea of external relationship innovation, defined as the establishment of particular relationships between service-firms and other partners (customers, suppliers, public authorities or competitors) becomes prevailing. The synthesis approach in service economics therefore shows already a close affinity to the theory of industrial dynamics which we draw upon for identifying the effects of innovation networks as well as the role of learning in networks.

Innovation and Networks

Concerning mutual learning in collective innovation processes, innovation networks are identified as a promising organizational form of industrial R&D in industrial dynamics (Buchmann and Pyka, 2011). In this theoretical approach the importance of the innovation networks stems from the possibility to combine heterogeneous knowledge which might lead to extraordinary success in innovation, and the possibilities of extending labour division also in innovation processes thereby simultaneously exploiting the competencies of the different actors more deeply and exploring the technological opportunity space more widely. Connections between actors in innovation networks can be used for two purposes: knowledge flows and financial flows. In many cases highly specialised actors develop new knowledge for other actors in various forms of contract research. In this case the knowledge flow is reciprocated by a financial flow. Also in cases venture capital firms cooperate with start-up companies this particular combination of knowledge and financial flows can be observed in innovation networks. More frequently, however, are mutual knowledge flows resulting from joint innovation processes of various actors cooperating in the networks. It is rather important to note that the connections between actors in the networks are subject to considerable changes in the course of time: on the one hand, innovation processes are long lasting and different knowledge requirements might turn out during the process. On the other hand, and even more substantially, the learning and innovation performance exert strong positive feedback effects into the network. The density of connections in knowledge areas which turned out to be prolific can increase non-linearly, exploited knowledge areas instead might be characterized by a sudden dissolving of network ties.

New Public Sector Management

Whereas the above mentioned theoretical concepts of service economics and industrial dynamics reflect the private perspective in economic theory of innovation in services, the increasing need to incorporate innovation networks in the discussion of service innovation is also recognised by the public sector and policy maker's literature. An increasing importance of a service-dominant logic is to be observed in the literature of New Public Sector Management in particular and Public Finance in general. Because the service-dominant logic is a customer- or client-centred logic, in the networked or citizen-centred governance model (Hartley 2005) public managers become explorers rather than clerks and citizens are co-producers rather than clients. This has major implications for public actors, especially against the background of a transformation of the welfare state into a "competition state". Here it is argued that new forms of arm's lengths re-regulation appear in and across nations. The purpose is to promote competition in a pro-active way. This notion of a competition state also implies a discourse of networked structures and networked governance that ascribe the government actor a proactive role in its promotion and maintenance.

These developments make it necessary to think of public private collaboration in broader terms than those suggested by principal agent theory or public choice theory. The goal is not just efficiency in a positive sense but also in a normative perspective long term adaptability, reliability and robustness in an open development. ServPINNs emerge not just because of problems with waste of resources, but also as a result of growing complexities. From these considerations a rationale for administrative reforms and public-private cooperations emerge which implies a growing network orientation and interaction between public and private actors in services. This discourse also represents the shift in the emphasis from pure Public Private Partnerships (PPP) towards Service Public Private Innovation Networks (ServPPPIN).

The focus on the pro-active role of public actors in ServPPINs follows the development from traditional public administration theories to the more recent approaches of new public management and networked governance or citizen-centred governance. This development already reflects the role of public private innovation networks in the provision of public goods and services focusing on decentralized information, knowledge and competences. The public actor is attributed a more active role in initiating and organising the generation and dissemination of new ideas. This need for a pro-active public actor is even reinforced by the privatisation and internationalisation of many public activities as well as the severe demographic changes and ecological challenges. Thus, if there is a public need but no private incentive to innovate in this direction, the public actor has to make the effort and initiate and coordinate a public-private innovation process himself. This new 'job description' for public actors does not restrict itself to the simple provision of financial resources along with the physical infrastructure and institutional framework, but increasingly requires the public actor to take a leading role in initiating and pushing innovation processes. In the network related literature the actors performing such activities are also referred to as 'enabling actors', 'facilitators' or 'connectors' in the creation and maintenance of innovation networks.

The different and changing roles of public and private actors in innovation networks, highlighted in the paragraphs above, the functioning of linkages among actors to serve as channels for financial as well as knowledge flows and the pronounced complex dynamics of network structures are all relevant not only for innovation networks composed of private actors in manufacturing-based industries, but also for public private innovation networks in service industries, our ServPPINs. E.g. public actors might play the role of network triggers, network financiers, users as well as knowledge contributors and also change their roles in time. In almost the

same manner, private actors are potentially users as well as producers, financiers and coordinators as well as innovators in ServPPINs. Furthermore, the ServPPINs we are observing in our case studies are anything else but constant and stable formations but continuously change in time depending on the stage of knowledge and market development. From this description it clearly turns out that ServPPINs are both complicated constructs composed of heterogeneous actors interacting in various domains, and complex formations changing their structure and nature in time. To acknowledge for the large heterogeneity of actors and the complex interactions between them we have to develop a multi-agent framework referring to the multi-characteristic approach in demand theory. To acknowledge for the complex dynamics the theory of industry life cycles will be developed further to a theory of innovation network life cycles.

Multi-Agent-Framework

To consider the functions, interests and multiple-layered sets of relationships and interactions of the various actors that might be involved in a ServPPIN we develop a multi-agent framework (e.g. Windrum, Ciarli and Birchenhall 2009). This multi-agent framework provides the core organising concept for the ServPPIN study as a whole. By drawing attention to three core themes in network analysis, i.e. network constitution, network interactions, and network dynamics it hints strongly at the temporal dimension and allows us to identify and understand the functions and interests of the various actors that might be involved in a ServPPIN in time. The multi-agent framework is supposed to provide guidance to the identification of the various sources and processes of innovation and how they are interlinked.

In the 'service characteristics' approach in its original form (Saviotti and Metcalfe 1984), the 'service characteristics' are related to a set of 'technical characteristics'. This set of technical characteristics, in turn, is directly related to the underpinning technologies the services are based on. The process characteristics include tangible assets (such as plant and equipment), intangible assets (such as brand name, copyright and patents), human resources (such as education, training, experience and skills of individual staff), and organisational resources (such as corporate culture, organisational structure, rules and the procedures of the firm) that range from design to production to marketing. Product innovations alter the vector of technical characteristics and, hence, quality of service characteristics, while process innovations alter the vector of process characteristics, enabling the innovating firms to reduce production costs and, hence, price.

The focus on product and process innovations in the original model does not allow considering interactions between agents as well as other forms of innovation, such as organisational innovation, input innovation, and changes in the supply chains. In order to make the model better applicable to services, the original service characteristics approach is extended in three directions: First, 'process characteristics' are replaced by 'producer competences'. In services, it is often difficult to separate process characteristics from product characteristics. Therefore, process characteristics are to be considered as tangible and intangible technical characteristics. In this light, producer competences are part of the 'product' while process characteristics are outside the product. The second adaptation is the distinction between an intangible service and a physically mediated service. This emphasizes the importance of organisation systems and innovation in the area of intangible services, while many other services include both physical elements as well as intangible elements. The third important difference concerns the inclusion of the supply chain. This allows for the consideration of intermediate inputs and thus business-to-business services. Within the modified framework it becomes possible to analyze multi-agent networking in the development and provision of service innovations.

The multi-actor framework is operationalised by the 'co-production' and the 'ad hoc innovation theses'. While emphasizing a high degree of interaction between users and the producers of service outputs the two key issues are that services do not require the active participation of users but can provide highly standardized packages and this co-production is frequently tied to outsourcing with little or no interaction between provider-client knowledge and competence bases. The 'ad hoc innovation', in turn, characterizes a non-reproducible solution to a specific problem. What is being described is not an innovation as an artefact but an innovation process as a cumulative and joint learning process.

Our multi-agent framework includes policy makers and public sector service providers, as well as firms and consumers. This is a necessary condition to investigate interactions between economic, social and political spheres which is crucial for understanding innovations in service sectors, such as health, that have a significant public sector component. The upshot is that the discussion of innovation is no longer confined to private sector firms. In our model agents' competences and interests and their co-evolution can be analyzed. Different agents define their competences and preferences with respect to alternative technologies and, thereby, reveal their interests. In turn, the development and diffusion of radically new innovations alters the competence bases and preferences of consumers, firms, and policy makers over time. Finally, our model captures all five types of innovation originally introduced by Schumpeter: organizational, product, market, process and input innovations. A radical innovation not only alters the dimensions of the service characteristics vector but also the competences and preferences of the agents. Hence, the model captures the central neo-Schumpeterian message of long-run technological and economic change.

The multi-agent framework hints on the functions, interests and multiple-layered sets of relationships and interactions of the various actors that might be involved in the life of a ServPPIN (Windrum and Garcia-Goni 2008). It draws attention to three core themes in network analysis, i.e., network constitution, network interactions, and network dynamics, and hints strongly at the temporal dimension of each. To further explore this temporal dimension in detail, we transfer the life-cycle concept to innovation networks. This allows us to improve our understanding of the character, growth, constitution and evolution of ServPPINs.

Innovation Networks' Life Cycles

Wherever the concept of life-cycles is invoked, the discussion is invariably accompanied by the elaboration of a 'phase model'. Most partnership and network life-cycle models adopt a three or four-phase configuration to portray the trajectory of innovating partnerships (Tidd and Bessant 2009). The initial phase 'preparation' or 'forming' is characterised by the development of a clear picture among various stakeholders as well as the clarification of drivers, benefits partners, and their respective contributions. In the 'development' phase it is about the sharing of ideas, the establishment of a 'shared vision' as well as the establishment of basic rules and operating mechanisms. In the third phase, the so called 'implementation' or 'function' phase, the operationalisation of the innovation network is taking place along with the finalisation of agreements, the establishment of structures, agreed roles, lines of communication, milestones, leadership, and decision-making and accountability mechanisms. Thus, at this stage the true 'partnership' working in the sense of knowledge capturing, sharing and deployment processes are taking place. Common standards are established and the individual expectations are formulated along with a sharing of risks and rewards and the actual growth or contraction of the network. In the fourth phase that is referred to as either the 'fulfilment', 'closure' or 'sustaining' phase, the initial and core goals are reached in the case of network success.

A Taxonomy of ServPPINs

So far we have drawn a complex picture of public private innovation networks in service industries which encompass the static dimension focussing on the combination of heterogeneous knowledge of various actors and their varying roles in the networks and the dynamic dimension focusing on structural transformation, mutual learning and growth as well as decline processes of the networks. Furthermore, the innovation networks were analyzed from a private perspective as well as from a public perspective. To bring together these different approaches and to develop a unique theory of ServPPINs the recourse to mathematical graph theory and its modern occurrences in complexity theories and social network analysis turned out to be advantageous. Social network analysis offers a set of indicators which allow disentangling complicated network architectures and describe individual roles as well as general network attributes. Recent approaches from complexity theories allow the analytical description of network dynamics. Returning to our graph theoretical description of ServPPINs as graphs composed of edges and nodes we are in the position to reformulate the dynamic theory of ServPPINs as a sequence of potential values of indicators from social network analysis and simultaneously considering the heterogeneous attributes and roles of the different actors, in particular private and public actors.

For this purpose we translate the network theories into a taxonomy of ServPPINs which integrates the various theoretical concepts. This taxonomic approach applying social network analysis then is used to derive policy conclusions which do have to differ substantially from more conventional policy conclusions because of the uncertain character of innovation, the focus on processes instead of equilibria and the heterogeneous character of involved agents.

The first step in developing a taxonomy of innovation networks has to be the identification and characterisation of the different stages in network evolution. Reflecting the life-cycle concepts allows distinguishing different forms of innovation networks in time. Including the public actor dimension we need to distinguish additionally the mode of network formation. In numerous empirical studies (Doz et al. 2000) it is shown that there are basically two modes of network formation: It can either be created in a planned manner by a single actor or a small group of actors, or it can spontaneously emerge. We argue that the mode of network formation also has major implications for the future growth and the resulting structure of the network. Incorporating these two modes of network formation and their implications for the evolution of an innovation network as a second dimension to our taxonomy enables us to distinguish networks that are at the same stage of their evolution.

A taxonomy requires that the observable differences between the distinct types of innovation networks can be quantified in order to make networks empirically comparable. With Social Network Analysis (SNA) we have such a methodology at hand that captures the social dimension of interaction as the fundamental process within innovation networks. By the combination of these concepts we develop a typology of innovation networks that meets the requirements of investigating the characteristics and dynamics of ServPPINs. For example, in a dynamic perspective, it turned out that the structures of the resulting networks can be sharply distinguished: While the spontaneous network resembles a scale-free-network, the planned network ends in a star network.

Our taxonomy allows us to identify the advantages and shortcomings of observed network structures as well as to derive practical advice on how to avoid or overcome potentially existing limitations or problems. In order to improve the empirical applicability of our taxonomy we introduce some empirically verified alternative developments. In the case of spontaneous networks preferential

attachment is an important mechanism describing entry processes into the innovation network. Linking to a central actor provides an actor with better access to the knowledge that flows within the network. Yet another argument for preferential attachment (Barabasi and Albert 1999) is reputation. As degree centrality is also a measure of prestige and influence, the new actor profits from being linked to a central actor because his own prestige and reputation is enhanced. This, in turn, will increase his prospects of collaborating with other attractive partners. Growth by preferential attachment has a severe impact on the observed pattern formation and the resulting network structure. If the probability of a new actor to connect with an already existing actor depends on the latter's degree, the networks produced by this algorithm show a skewed, scale-free distribution of their degrees. Those actors who were relatively central (i.e. had above average degrees) in the first stage of the network life-cycle grow even more central in the course of time – especially during the growth stage.

In the case of the planned network a likely scenario is the retreat of the central actor. We provide two explanations for this scenario: First, every actor, including the central actor, has only limited resources at its disposal. Once these resources are exhausted he has to cut back in his investments and withdraw from his central position. A second rationale is that the enabling actors' only intention might be to initiate the network formation and ensure its efficiency by composing and structuring it according to his perception before retreating from his central position. This indeed is often the case in networks initiated by public actors. The public actor takes the role of the enabling actor, triggering the network formation and designing its growth. At a certain stage this public actor retreats from the network, maybe turning his attention to similar projects elsewhere.

The interpretation of the SNA indicators of our stylised network evolution shows that the enabling (central) actor plays a crucial role for the functioning and stability of the planned network at all stages of its life-cycle. Thus, if he retreats from the network without any preventive measures, the network would inevitably collapse and dissolve. Thus, his retreat needs to be carefully planned and organised. By delegating the responsibility to different actors, the retreating central actor ensures that their capacity is not exceeded and, at the same time, renders the possibility for labour division and specialisation. This scenario of a 'delegating retreat' envisages the division and delegation of the retreating public actor's functions and power on the shoulders of several other actors. These newly established central actors can be private or public actors. They have been members of the network for quite some time, maintain direct ties to their relevant peers within the network, and have proven to be capable of handling this responsibility. All actors serving a certain function, working on the same problem or belonging to a certain technological field will be linked to the respective central actor. This allows for closer and more intense interaction within these groups of rather homogeneous actors and thereby leads to the establishment of further direct links between these formerly peripheral (i.e. barely connected) actors. The resulting network structure is characterised by a group of central actors (i.e. the central core) that interact with each other and the members of their respective (partially overlapping) cliques of homogeneous actors.

Thus, the two alternative scenarios of 'growth by preferential attachment' in the case of a spontaneous network or the 'delegating retreat' of the central actor in the planned network lead to a similar network structure. Additionally, the resulting network shows the characteristic of a small world: relatively short average distances and a relatively high clustering coefficient. This enables the creation and exchange of complex knowledge and ensures quick knowledge diffusion within the network. Thus, the mode of network formation does not necessarily determine the network structure at later stages of the network life-cycles. Depending on the growth-process of spontaneous networks and the network-shaping activities of the

enabling (central) actor in the planned network, we could also observe some convergence towards a small world network structure.

A Policy Rational for ServPPINs: Avoiding Evolutionary Inefficiencies

The major advantage of the graph theoretical based theory of ServPPINs can be found in the discussion of policy conclusions which have to differ substantially from standard policy conclusions in innovation policy. Taking serious the epistemological caveat of true uncertainty and acknowledging for the heterogeneity of actors involved in innovation processes irretrievably implicates the loss of the policy benchmark, namely the social welfare optimum. This, however does not mean, that policy is doomed to refrain from manipulating innovation processes.

In neoclassical welfare economics innovation policies are treated similar to any other kind of economic policies: Within its particular set of assumptions (substantial rationality and equilibrium) market failures are repaired. The task for policy makers is to restore the optimal incentives for an efficient allocation of resources in a static and a dynamic perspective. Due to well-defined economic decision problems the choice of policy instruments follows standard efficiency considerations.

This neoclassical framework is not suited for the analysis of innovation processes and their impact on economic development. The central point of criticism is the assumption of substantial rationality which is in conflict with the true uncertainty being constitutive feature of innovation. The assumption of substantial rationality is misleading and even counterfactual as innovation processes would no longer take place in such a framework. If innovation processes are treated realistically, they are no longer to be envisaged as optimization processes but as a cultural evolutionary process. This consideration of true uncertainty has strong implications for innovation policy. Uncertainty is qualitatively very different from market failures. Uncertainty is a condition-sine-qua-non of innovation processes and cannot be repaired. Furthermore this uncertainty also characterises the policy makers and their incomplete knowledge, which results in a high probability of failure of policy actions. The painful consequence is that the benchmark of a social optimum is inevitably lost. Also the efficiency concepts are no longer applicable to design and to evaluate innovation policies. Economic evolution in principle is an open process which does not follow an ex-ante given and well specified goal. Thus, failure is on the order of the day.

The goals for an innovation policy can then 'only' be to identify and support prolific conditions for innovation processes and to avoid bottlenecks for a future-oriented economic development. Efficiency concepts are no longer applicable because no well specified goal can be derived ex-ante. Instead, innovation policy has to focus on the innovation process itself. It has to be designed and evaluated according to the ability to avoid evolutionary inefficiencies whenever possible. As evolutionary inefficiencies we define situations which clearly restrict potentials for future development.

Four necessary conditions for an innovation-driven economic development can be distinguished: (i) Exploration of new techno-economic opportunities in order to increase the variety of knowledge fields. (ii) Exploitation of techno-economic opportunities to realize the economic benefits of innovation processes. (iii) Mastering the dynamic trade-off between exploration and exploitation activities in order to provide for a rich variety of knowledge assets in the long run and simultaneously excel in a small subset of knowledge fields in the short run. (iv) For the knowledge generation and diffusion processes to work adequately and to unfold the beneficial effects for an economy, the relevant actors have to be interlinked.

Each of these four prerequisites is endangered to be not fulfilled and to jeopardize innovation-driven economic development. Accordingly, four different

sources of evolutionary inefficiencies can be derived: (i) exploration inefficiencies, (ii) exploitation inefficiencies, (iii) balance inefficiencies and (iv) network inefficiencies.

Exploration inefficiencies arise if the research orientation of an economy is biased towards an applied orientation. Sooner or later this leads to a depletion of opportunities and a slowdown of the technological and economic progress. This would also affect the foundation rate of new companies. Exploitation inefficiencies are caused by a low research intensity due to either a missing awareness of the existence of innovation competition, e.g. the not-invented-here syndrome (Katz und Allen, 1982) or missing absorptive capacities (Cohen und Levinthal, 1989). Another reason in this respect might be the shortage of adequate competences in the labour force. Concerning balance inefficiencies a too early concentration on a particular set of knowledge (i.e. exploitation) can lead to lock-in effects that drastically reduce the possibilities of development. At the same time the economic actors do not get rid of exhausted techno-economic opportunities in time and stay for too long in the previous successful technologies (Eliasson, 1991). Quite opposite, balance inefficiencies might also be caused by a too high variety of competing knowledge fields when a new industry has to move into the exploitation stage. Without the development of a dominant design (Abernathy and Utterback, 1975), the agreement of interfaces which allow for complementarities among different technologies and industrial norms. Network inefficiencies result from missing and/or malfunctioning links among economic actors participating in innovation processes which hampers the diffusion of new knowledge or hinders cross-fertilization opportunities. Such inefficiencies can also be caused by too large networks which imply too high coordination efforts and allow for a strategic control of knowledge flows e.g. gatekeepers and structural holes (Burt, 1992, Ahuja, 2000) or decreasing network dynamics which exclude actors with dissimilar knowledge. Network inefficiencies are to be considered as a general concept which is superimposed to the other inefficiency concepts. Innovation processes organised in innovation networks therefore shift the attention of innovation policy to the network inefficiencies. The following interactions between network inefficiencies and the other evolutionary inefficiencies are possible: In the exploration stage such inefficiencies could result from missing links among universities and other basic research-oriented institutions and applied research-oriented firms. Exploitation inefficiencies could result from a knowledge selection within the innovation network which repeats the not-invented-here-syndrome on the network level. Similarly, balance inefficiencies could result from a lock-in effect in which promising alternatives are excluded at a too early stage. In the context of networks this could also apply to the selection of the members. If potential members with certain knowledge are excluded the network increasingly aligns and novel combinations become less likely due to insufficient heterogeneity of the knowledge within the network. Missing links among actors also hamper the establishment of common norms and standards. Thus, because of the outstanding role that innovation networks play in complex innovation processes, the network inefficiencies are clearly superimposed to these evolutionary inefficiencies and therefore offer promising starting points for innovation policies.

But, what policy-guideline remains after the loss of a benchmark? Instead of pursuing a static social optimum innovation policy needs a process-orientation which is in line with the systemic and evolutionary approaches in innovation economics and advises a rationale for innovation policy which focuses on the avoidance of bottlenecks. Even policy makers cannot escape the uncertainty that is characteristic of any innovation activity. Thus, focussing on well-specified technological goals in a mission-oriented policy design (Ergas, 1987, Cantner and Pyka, 2001) inevitably provokes misdirected developments. Although failure per se cannot be excluded, the risk to waste public money is considerably smaller when the focus of innovation policy is on knowledge generation and diffusion i.e. follows a

diffusion-oriented design (Ergas, 1987, Cantner and Pyka, 2001). In this perspective, the structures and dynamics of innovation networks become the focus of attention as well as the starting point of action in innovation policy. We argue that a network-oriented policy-design is expedient for two reasons: First, because of the outstanding importance of innovation networks in the organization of R&D processes, they offer a promising starting point for a process-oriented innovation policy and second, network inefficiencies are superimposed to other evolutionary inefficiencies and therefore are to be considered as a entrance point for endeavours to manipulate innovation processes. Although one could principally expect innovation networks to emerge and to develop in a self-organisational way, obstacles in their emergence, misguided developments and malfunctioning links cannot be excluded (e.g. Pyka and Windrum, 2003). This is where the network inefficiencies enter as a target for policy intervention. The creation, the growth and the closure of innovation networks can be influenced by innovation policy instruments. Public actors themselves can enter innovation networks and play important roles as network facilitators, network triggers etc. in order to correct for the above mentioned evolutionary inefficiencies like e.g. advance the knowledge transfer between basic and applied research by strengthening university-industry-linkages. In order to do so policy cannot restrict itself to the initiation and creation of such networks but has to accompany them in a pro-active way, influencing their composition and structure wherever necessary or desirable. Social network analysis and the graph theory might be helpful instruments for the identification of such needs of intervention. The structures and dynamics of innovation networks are characterized by specific patterns which are observable through a number of indicators describing networks. In a process-oriented perspective, innovation policy can infer from these indicators and their development during the life-cycle of a certain industry to decide whether and how to intervene in order to avoid potential network inefficiencies.

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Chapter 4: Case study methodology

Introduction

Case studies are an important component of the ServPPIN project. Three key sectors were selected for case study research within the ServPPIN project: health care (WP4), knowledge-intensive services, including tourism (WP5), and transport (WP6).

By drawing up a set of case studies from these sectors, the aim is to gain insights into the organisation and functioning of public-private network collaborations, and into the innovations which these networks produce.

The other key objective was to gain insight into the drivers and key events which effect the development and performance of the innovations produced by ServPPINs, while taking into account sector and geographic specific factors. The case studies have been strategically chosen to capture the key concerns of the ServPPIN goals and the important long-run issues facing the EU - competitiveness (the Lisbon Agenda), changing demographics, health, energy, and the environment.

Developing a common research framework enables us to report common ground within this syntheses report for WPs 4, 5 and 6, and to establish differences between sectors. This facilitates stronger claims for the reliability of the findings reported in the following chapters. Further, the findings provide important inputs for WP7 on policy.

Methodological Basis for Analysis

Definition of ServPPINs

An important starting point was to define a ServPPIN. ServPPINs are a new phenomenon; one which is now being observed across the EU. This phenomenon differs to previous trends, such as the privatisation and outsourcing of public service provision, and contractual public-private partnerships (PPPs) in which service delivery or the financing of infrastructure is undertaken by private sector businesses. ServPPINs are *collaborative alliances* between public and private sector organisations; alliances which bring together and develop complementarities and synergies between the different knowledge, competences, and services that each partner specialises in. That is to say, each partner has its specific role and specific contribution to service innovation within its network. It is also important to note that 'Third Sector' organisations (charities, non-government organisations NGOs, not-for-profit businesses) can be key players in ServPPINs. Indeed, one of the striking findings of the project (not anticipated at the outset of the research) was the extent of Third Sector participation in the health sector, and the leading roles that some Third Sector organisations play in health sector ServPPINs.

The collaborative innovations which ServPPINs develop are built upon, and add value to, these difference knowledge and competence sets in order to create and delivery new/improved services. For this kind of complex innovation process, ServPPINs offer an effective mode of organization that is of growing importance in service sectors. The innovations which these ServPPINs generate are essential to improving productivity and welfare in the health sectors of EU nations.

Selection of Cases for Analysis

A set of common criteria for the selection of cases was established by the ServPPIN research consortium, and were applied in WPs4, 5 and 6.

1. There must be a concrete innovation which aims to lead to an improvement in service characteristics
2. There must be a constellation of public and private organisations (also possibly Third Sector) that is central to the realisation and development of this concrete innovation.

1.1.1 Operational Research Questions

Another major feature of the research project has been the development of a common set of Operational Research Questions for all case studies (WPs 4, 5 and 6). This plays an essential role in identifying some general findings regarding public-private networks and the service innovations which they produce.

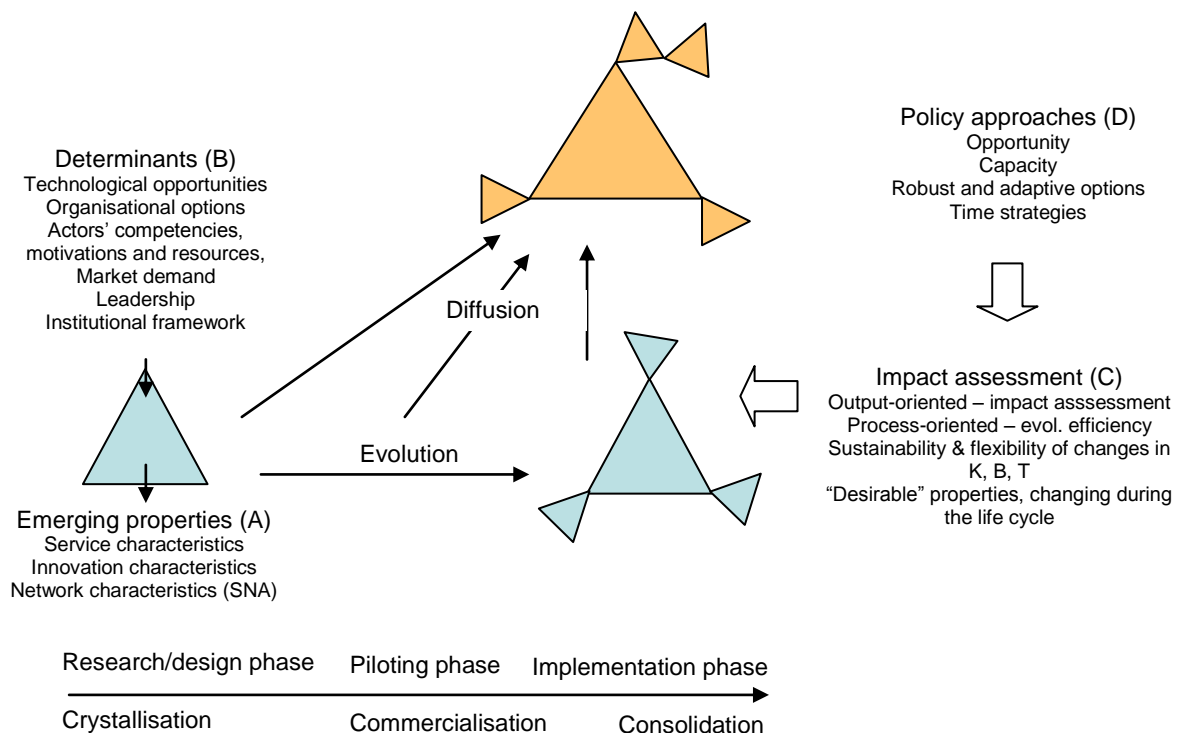
The document 'Operational Research Questions for ServPPIN case studies' (Green 2008) developed and codified a set of research themes identified in earlier document 'Guide for ServPPIN Case Studies: Framework and Guidelines for the Selection and Implementation of Case Studies in WPs 4, 5 and 6' by Matthias Weber, Paul Windrum, and Jon Sundbo (2008), and in the original Technical Annex for the ServPPIN project.

It should be noted that not all of the research questions will be addressed in every case study. Differences in national circumstances and conditions, and the different stages of the innovation life cycle are likely to mean that some research issues are more relevant than others for particular ServPPINs.

In addition to those issues identified in the Operational Research Questions, researchers were free to identify and explore additional issues that may be important within their case studies.

Based on the ServPPIN workplan and some additional considerations from the first ServPPIN workshops held in Manchester and in Vienna, four blocks of guiding questions for the case-studies were specified. The way in which these four blocks fit together within the overall framework is shown in Figure 1.

Figure 1. Blocks of research questions for ServPPIN case studies (WPs 4, 5, and 6)



Source: Weber, Windrum, and Sundbo (2008)

Below is the set of 'Operational Research Questions' (Green, 2008) that have been used across the case studies.

A: THE AGGREGATE CHARACTERISTIC FEATURES AND PATTERNS OF SERVPPINS, BOTH STATIC AND DYNAMIC

1. What are the distinctive features of ServPPINs in terms of their service, innovation and network characteristics? What is their purpose?

What are the distinctive features and aims of the ServPPIN -

- a. How is the network constituted (who are the various partners and what is their role in and contribution to the network)
- b. What is the network designed to achieve - what is the purpose of the partnership, what is the nature of the innovation, what services are to be established (or are the subject of renewal or improvement)
- c. What partner(s) initiated the network
- d. What partner(s) have been responsible for leading the network
- e. What forms of partnership arrangements and formal contracts are in place (and how are these policed and managed)

2. In what ways do the features of public-private service networks change over the life-time or cycle of the ServPPIN (such features can include network membership and the roles played by different organisations)? How do public and private sector organisations define their roles within a ServPPIN), (for example, via their respective knowledge bases)?

Roles of network partners and evolution over time -

- a. What are the respective roles of the partners in the network
- b. How does your organisation define its role in the network and what is the basis of your organisation's involvement in the network (contribution of specialist knowledge, provider of technologies or support services etc.)
- c. How has the role of your organisation changed over time
- d. How has the role of partner organisations changed over time
- e. What power does your organisation have to (a) direct activities and decision-making, and (b) establish the rules of the network
- f. Is your organisation accustomed to working in innovation networks - is networked innovation an increasingly common form

B: FACTORS AND MECHANISMS THAT INFLUENCE THE EVOLUTION OF SERVPPINS

3. How does the institutional context influence the innovation and diffusion process? Are regional and national differences important?

The impact of 'context' on innovation and diffusion -

- a. What are your views on the ways in which the ServPPIN has changed over time
- b. What are the factors and issues that have driven evolution
- c. Is there anything in the local or national policy context (or economic context) that has influenced development
- d. How much of the evolution has been deliberate and controlled, and how much is a response to contingencies

- e. What are the positive outcomes with respect to evolution, and what problems have been encountered as a result of development

4. What are the key factors that determine success at each stage of the life cycle?

- a. What factors have impacted on success (or failure/problematic development) as the innovation network and innovation have progressed
- b. What actions were taken by network partners in order to secure successful progression
- c. Are there any features of this particular ServPPIN that have contributed to success (leadership, communications, management structures etc.)

5. Leadership and innovation. What role does leadership (individual, organizational and institutional) play in the creation, diffusion and adoption of innovations? Who are the key actors? What different types of leadership style and requirements can be distinguished in ServPPINs?

- a. What form of leadership has characterised the ServPPIN (charismatic, contractual, top-down, oligarchic, single-leader, multiple leaders, democratic, distributed responsibility etc.)
- b. What organisations or partners have taken a key role in leading the ServPPIN
- c. Is the leadership role widely recognised and perceived to be legitimate
- d. To what extent has leadership been successful (and have any problems or tensions arisen)
- e. Have different forms of leadership (or different sources of leadership) been necessary as the innovation and network has progressed through various stages of activity
- f. What is the effect of the presence of public and private sector actors on leadership – would a different form of leadership be expected if partners were from one or other sector rather than both

6. How is service co-production by the public and private organisations within a ServPPIN managed and (re)structured (and how does this impact innovation processes and innovation trajectories?)

- a. What structures and mechanisms exist for the management of service co-production and the progression of innovation
- b. What are the main features of the management structure
- c. To what extent are mechanisms formalised
- d. How have management structures and mechanisms changed over time
- e. What were the drivers for change and who were the key figures in the change process
- f. What is the perceived impact of management structures and mechanisms on the development of the innovation and on the innovation process generally
- g. What elements of or directions in management are perceived to be particularly helpful and positive (and what elements are perceived to be negative or damaging)
- h. To what extent (and why) has the approach to management (or management style) contributed to the success (or otherwise) of the innovation

7. How do service innovations interact with technical and organizational innovations, and do we find differences between service sectors?

- a. What different forms of innovation can be identified within the innovation case as a whole (service, organisational, technological and product, delivery-oriented, business models, policy, regulatory etc.)
- b. What are the relationships between different forms of innovation
- c. To what extent has the production, implementation or diffusion of an innovation required complementary innovation (for example, to support local accommodation or adaptation)
- d. What sector-specific characteristics, processes, policies, regulatory instruments or conditions are found to impact on the interactions between different forms of innovation
- e. In what ways (if at all) does the public-private nature of the innovation relationship shape the interaction between various forms of innovations

8.1. What is the process of interaction between the organisations involved in a ServPPIN?

- a. What formal and informal structures exist for communication and co-production
- b. To what extent are interactions codified
- c. What factors are implicated in a successful management, communications and interactions architecture

8.2. How do service users adopt innovative strategies and take innovation into account in the course of internalising/externalising services of various types?

- a. To what extent is complementary innovation required on the part of service users (in order that an innovation can be exploited successfully)
- b. To what extent is 'absorptive capacity' an issue for producers and users of the innovation – what 'capacities' or capabilities are required to ensure successful deployment
- c. To what extent is innovation driven by expressed or latent (and assumed) demand
- d. To what extent does the innovation developed within a ServPPIN stimulate or facilitate downstream innovation for users

8.3 How do innovative service providers model user requirements in service design and in the process of new service development?

- a. What mechanisms exist for market research, prototyping, and usability testing etc.
- b. How important are such mechanisms, how are they structured and to what extent are outputs used to shape the innovation and product design process
- c. To what extent (and how) are the views and preferences of potential users taken into account in innovation and service development

9. What are the governance structures and processes that determine the nature and dynamics of interactions between ServPPIN partners?

10. To what extent can knowledge generated in one particular service innovation project be 'captured' and 'stored' by the innovating organisation, and to what extent it can be productively re-used in new projects (the 'ad hoc innovation' debate)?

- a. What mechanisms exist for knowledge capture and management at the level of individual network partners and the network as a whole

- b. How much emphasis is placed on knowledge capture and re-use (are any concrete examples of knowledge re-use available)
- c. To what extent does the issue of knowledge capture and re-use raise concerns with respect to the sharing and exploitation of IP

11. How do service innovations (here: ServPPINs) diffuse and across geographical, institutional and organizational boundaries, and what are the conditions conducive to diffusion?

- a. To what extent is diffusion feasible, desirable or relevant with respect to the specific innovation in question
- b. To what extent has there been a deliberate effort to stimulate diffusion
- c. Where diffusion has been supported or attempted, what are the key features of the diffusion strategy
- d. What elements of the diffusion strategy were successful and beneficial (and why) and what elements were productive
- e. What are the main barriers to diffusion
- f. What sector-specific conditions and characteristics either support or hamper the diffusion processes

12. What are the consequences of ServPPINs for innovation appropriation regimes?

- a. What are the characteristics of appropriation regimes within ServPPINs (and how do these differ from those found in alternative innovation environments)
- b. Does innovation within ServPPINs require a different approach to appropriation and the allocation of credit or returns
- c. What are the implications of ServPPIN working for contracting arrangements (and do these differ by sector, geography, the nature of innovation etc.)

C: QUESTIONS ON ROLE AND IMPACTS OF SERVPPINS

13. What is the role of ServPPINs within innovation systems? What is their impact on growth, employment, and welfare?

14. What is the impact of public-private service innovation on growth and welfare for relevant stakeholders involved in or affected by service innovation? What are potential impacts in cases of innovation networks that are not yet very advanced along their life-cycle?

15. What forms of innovations are ServPPINs particularly good at? Why and in what respects are ServPPINs better/worse than alternative organisational models? What would have happened if the ServPPIN had not been realised? (the 'additionality' issue – see above)

D: QUESTIONS ON POLICIES TO SUPPORT SERVPPINS

16. What are the policy implications of ServPPIN formation and ServPPIN activities for nation states and for the EU?

17. What types of policies are required to promote ServPPINs? How does the structure and culture of policy within these networks influence the creation, diffusion and adoption of innovations?

E: KEY ACTORS (PUBLIC-PRIVATE ENTREPRENEURS) – HOW ARE NETWORKS CREATED AND MANAGED?

18.

- a. What are the personal characteristics that typify leaders and key actors in ServPPINs? (such individuals might be expected to be driven and ambitious, socially gregarious, 'natural networkers' etc.)
- b. What individual competencies are required for successful network leadership (e.g., knowledge and skills; project management capability; personal capital, charisma, respect and gravitas; an ability to 'speak the language' of key stakeholders; access to decision-makers, physical and human resources, internal and external expertise)
- c. What network building capabilities are required in network leaders – how do such leaders engage other actors to build a network with the required capabilities and dynamics (what capabilities are evident with respect to specific examples of innovation)
- d. To what extent is membership of professional, peer and trust networks, or communities of practice important to individuals in their efforts to develop and manage successful ServPPINs
- e. To what extent is prior experience of network building implicated in successful management of ServPPINs
- f. What is the role and significance of 'learning via experimentation' (for example, changing network membership or changing the focus of innovation at various stages of the innovation process)
- g. How do network entrepreneurs go about the linking of different organisations into a network, and how do such entrepreneurs deal with issues of network attrition, friction or conflict resolution (what concrete examples can be found via case analysis)

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Chapter 5: Public-private ServPPIN networks and service innovation in health

Introduction

The ultimate goal of WP4 is two-fold. First, to identify a set of generic features of public-private networks in health: i.e. their membership, their construction, and their operation. Second, to identify a set of factors which enable or hinder the development and diffusion of the innovations which these networks produce.

A set of individual case studies were developed in each of the partners involved in WP4: UK, Denmark, France, Austria, Spain, Norway and the Netherlands. These case studies were guided by the 'Operational Research Questions' (Green 2008; Weber, Windrum, and Sundbo 2008) that were developed for all case studies in health (WP4), KIBS (WP5), and transport (WP6) of the ServPPIN project. In so doing, the intention has been to develop some general findings regarding public-private networks and the service innovations which they produce.

Main findings

ServPPINs are a new phenomenon; one which is now being observed across the EU. This phenomenon differs to previous trends, such as the privatisation and outsourcing of public service provision, and contractual public-private partnerships (PPPs) in which service delivery or the financing of infrastructure is undertaken by private sector businesses. ServPPINs are *collaborative alliances* between public and private sector organisations; alliances which bring together and develop complementarities and synergies between the different knowledge, competences, and services that each partner specialises in. That is to say, each partner has a specific role and makes a specific contribution to service innovation within its network. It is also important to note that 'Third Sector' organisations (charities, non-government organisations NGOs, not-for-profit businesses) can be key players in ServPPINs. Indeed, one of the striking findings of the project (not anticipated at the outset of the research) was the extent of Third Sector participation in the health sector, and the leading roles that some Third Sector organisations play in health sector ServPPINs.

The collaborative innovations which ServPPINs develop are built upon, and add value to, these difference knowledge and competence sets in order to create and delivery new/improved services. For this kind of complex innovation process, ServPPINs offer an effective mode of organization that is of growing importance in service sectors. The innovations which these ServPPINs generate are essential to improving productivity and welfare in the health sectors of EU nations.

The innovations produced by ServPPINs in the health service case studies belonged to one of the following four possible categories:

- Knowledge services which are intangible (e.g. health education programmes).
- Technology mediated services (e.g. strongly connected with new medical devices, or new IT hardware or software products).
- Organisational / process innovations. These may improve the efficiency or effectiveness of patient-facing service delivery, and/or administrative back office activities.
- The construction of innovation networks themselves

Another important consideration is the stage of the innovation life cycle. In WP4 we identified two distinct stages. The first is the pilot/ trial stage of an new innovation. This may include clinical testing of a new drug, a new education programme, or a new process innovation. The second stage is the roll out / diffusion phase in which the innovation is rolled out across a health organization, a region or a national health system.

The majority of radical innovations fail. This is as true for health service innovations as it is for product innovations in the private sector. In health, innovations tend to fail either because a ServPPIN fails to develop a demonstrable new/improved service at the trial/pilot stage, or else it fails to roll out or diffuse the innovation.

Some issues which affect the success of an innovation may be more prevalent at one stage of the innovation life cycle than another. One may also observe differences in the factors which affect the functioning of the ServPPIN producing the innovation at different stages. For this reason, it was important to have a set of case studies which observed ServPPINs at different stages of the innovation life cycle.

Characteristics of ServPPIN Networks

A key finding of our research is that health ServPPINs tend to contain a small number of partners. The vast majority of case studies contain networks with between 2 and 5 partners. The one notable exception was the Austrian automated external defibrillator(AED) case study, with 8 partners. This network is unusual in that it contains a network of health organisations and a supporting supply chain of firms that produce the AEDs. Hence, health ServPPINs are not social networks. They are more akin to the types of strategic alliances and research consortia found amongst private sector firms, and amongst university-industry consortia.

A second key finding is the leadership role played by Third Sector organisations. In around half of all case studies, Third Sector organisations were the initiators and leading partners within their ServPPINs. The role of Third Sector organisations in ServPPINs is one of the most striking, and unanticipated findings of our research. At the outset of the research project we were aware that Third Sector organisations could play a role in ServPPINs – for example, charities acting as representatives of specific patient groups – in the health sector but we did not expect Third Sector organisations to play such an important leadership role in ServPPINs.

'Third Sector' organisations is a broad category. It contains charities, non-government organisations (NGOs) and also not-for-profit businesses. These interests, drivers and leadership styles may well differ significantly amongst this category. For example, the interests and leadership style of a not-for-profit business may be closer to a private sector business than to a charity organisation.

With regards to network composition, most case studies comprised public and private sector partners, or third sector, public and private sector partners. This latter finding adds further weight to the previous observation regarding the dominant role that Third Sector organisations play in the health case studies – in all cases where a Third Sector organisation is a member, the network is lead by the Third Sector organisation.

A third finding is the striking absence of end users – i.e. patients – in our case study networks. This is despite the fact that health policies in many of the countries which we studied have been encouraging greater direct patient participation in health. It is also striking given the growing academic and policy literature on the importance of user engagement in innovation. In our case studies, at least, patient participation does not appear to be a factor determining the effective functioning of ServPPINs, or the success / failure of the innovations. This is not to say that ServPPINs do not understand patients' needs. They do. This knowledge is built up through a combination of long-standing interactions with patients and also through the trialling of their innovations. The patient-advocacy role played by Third Sector partners is also important in this regard.

Our case studies provide insights into the importance of complementary competences (including skills and knowledge) amongst network partners, and commensurability between partners. The literature on complementary competences, skills and knowledge in strategic alliances between private companies, and in research consortia is well developed. Absorptive capacity is found to be a key issue within the health ServPPINs. The knowledge of partners must be differentiated, but not so far removed that members cannot understand or exploit partners' knowledge.

ServPPINs build upon, and add value to, the various knowledge and competence sets of partners in order to create and deliver new/improved services. ServPPINs appear to offer an effective mode of organisation for this kind of complex innovation process.

Equally important is the non-rivalrous commensurability of partners within the ServPPIN. Where there were more than one private sector organisation present within a ServPPIN, or more than one third sector organisation, these organisations are not direct rivals, and are not from the same field.

Windrum and Koch (2008) discuss the existence and motivations of public sector entrepreneurs. Jain et al. (2009) found that engaging in commercialisation leads academic researchers to build new professional identities, although their academic identity tends to remain their primary identity reference. The ability of public and private sector entrepreneurs to (a) communicate with one another, and (b) understand the drives and motivations of partners, is an important aspect of successful ServPPINs.

Critical Success Factors

The case studies identify a set of key factors which can positively or adversely affect the successful operation of a ServPPIN, and the innovation it produces. We consider these under two generic categorisations: internal factors within ServPPINs, and external factors. Internal factors can include many factors, such as technological opportunities, social relations, the rationalities of the public and private sector, financial resources, and anticipated benefits and risks. External factors are those events or developments, external to the ServPPIN network, which may create pressure on network partners to be innovative, or else determine the success or failure of the ServPPIN and its innovation. These factors can include legal frameworks, government policy and regulation, and economic cycles.

Internal Factors

The importance of finance is identified in each and every case study. Finance is a key factor in the case studies which failed to diffuse or reach the diffusion stage. One of the key attributes of a partner – in addition to complementary knowledge and competences – is its access to finance.

A key factor determining the take up and diffusion of the innovation is the ability to enrol medical practitioners (doctors and nurses in hospitals and/or family doctors and practice nurses). Networks benefit if they contain a prestigious medical practitioner or representative group.

A factor which strongly affects the strength of the network is the intra-organisational position of its members, i.e. the positions which individual network members hold within their own organisations. Not only must they be champions / gatekeepers, they must have power and authority within their organisations to ensure ongoing commitment and ongoing resources to the ServPPIN. This was very dramatically emphasised by examples where key individuals left their organisations. The result was the end of the ServPPIN, or else a radical reconstruction of the ServPPIN and its aims and objectives.

Trust is a further important factor affecting the success or failure of a ServPPIN network. This has been identified elsewhere, for example in research on private sector collaborations. What is perhaps more surprising is the fact that formal contracts were only present in around half of the case studies. This indicates a particularly high degree of trust amongst the ServPPIN partners. This could well be related to another key factor: previous contacts. It appears that, in our sample of case studies at least, there is a high proportion of members with previous contact experience – either in terms of organisations having previously worked with one another, and on some occasions, personal contacts. A further correlating factor could be the commensurability and non-rivalry between the ServPPIN partners (see above).

External Factors

Prior to starting our research project, we had expected the external policy environment to have a strong influence on ServPPINs. It is somewhat surprising that we found only a few external factors to be critical in the health case studies, and that these were deemed particularly strong factors by case study interviewees. The most notable external factor was structural reorganisation – i.e. the reorganisation of responsibility for local services and/or the reorganisation of organisations. This seems to have been a key factor in half of the case studies.

The second external policy factor identified is government finance and incentives. However this factor was only highlighted in a minority of cases. This may indicate that funding incentives for innovation are not being fully exploited across the countries included in our case studies.

Final remarks

WP4 has sought to identify a set of general findings across a sample of health sector ServPPINs in the EU. For this reason we have been careful to define ServPPINs and to exclude cases which are more akin to public-private partnerships (PPPs). We have also set out a method for limiting discussions to a common set of Operational Research Questions, and to only consider responses to Questions with a sufficiently high weighting.

This search for a set of robust and reliable findings for the WP4 health sector studies is in accordance with the overall aim of the ServPPIN project to generate generic knowledge about public-private networks, and service innovations which they produce.

The results presented here have certainly raised questions about a number of preconceptions and expectations about ServPPINs, and move us significantly towards a set of stylised facts which can be addressed in future quantitative research.

The case studies have yielded a set of 'stylised facts' about ServPPINs in health:

ServPPINs are organisational networks, not social networks. ServPPINs are alliances between public, private and third sector organisations, and typically contain a small number of these organisations.

ServPPINs are professional networks. A striking feature of our 10 case studies is the absence of patients (end users). This does not appear to affect the functioning of our health ServPPINs, or be a critical factor affecting success or failure of their innovations. It may be that health practitioners' knowledge of patients' clinical needs and long-standing interactions with patients, plus the trialling of innovations and the advocacy role played by Third Sector partners in these ServPPINs may explain this.

Third sector organisations play a key role in the construction, management and leadership of health sector ServPPINs.

One should not mistake the ending of a ServPPIN as an indicator of failure. ServPPINs are goal orientated networks. They typically come together to develop a particular research project and then disband. Only in a small number of cases is the construction of a network the end goal.

Social and business networks do have a role to play. There is evidence that ServPPIN partners have prior experience knowledge of one another, either as

organisations or through personal ties. Partners in one ServPPIN project may subsequently meet up in another project.

Network composition is an important feature in ServPPINs. There needs to be complementarities between the competences of partner organisations, and with regards to access to finance and other resources. Further, commensurability and non-rivalry is found to be a key factor where more than one partner is from the private sector or third sector.

The roles played by individual public and private sector entrepreneurs are essential for success. First, these entrepreneurs need to hold key positions within their own organisations, enabling them to ensure long term commitment of resources and the support needed to develop the ServPPIN innovations. Second, these entrepreneurs need to be able to understand the different contexts and backgrounds of their partners in order to overcome the binary divide between public and private sectors.

Trust is a distinguishing feature of the health ServPPINs. The fact that formal contracts are only seen in half of the cases can in part be explained by good understandings of partners and previous connections between key members. Just as important is the non-rivalrous composition of the members. Each has different needs and interests. One may be interested in the commercial exploitation of the innovation, while another gains from the clinical benefits of using the innovation in practice.

Enrolling practitioners: a key factor determining the take up and diffusion of the innovation is the ability to enrol medical practitioners (doctors and nurses in hospitals and/or family doctors and practice nurses). Networks benefit strongly from having a prestigious medical practitioner or representative group within their membership.

External factors: external as well as internal factors can affect the innovative success of a ServPPIN, although it is noticeable that external factors are not cited as frequently. The two most noted external triggers of innovation are (1) structural reorganisation – where policy makers shift responsibility for service provision from one organisation to another, policy forces change to the internal structure of an organisation, and (2) funding incentives.

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Chapter 6: Public-private ServPPIN networks and service innovation in knowledge intensive services and tourism

Introduction

Research questions and analytical method

Research questions

The case studies of the knowledge intensive services (KIS) presented here had the following objectives:

1. To investigate the character and efficiency of public-private innovation partnerships within knowledge intensive services (KIS).

The intention was to find patterns within the networks that can predict successful innovation processes.

2. To investigate the role and impact of knowledge intensive services (KIS) within ServPPINs.

The intention was primarily to investigate whether and how private service firms can contribute to innovation within fields that traditionally have been considered public services.

3. To assess the impact of the selected ServPPIN projects on public service quality and performance.

This will be undertaken in the discussion of the policy implications of the findings (section 4 below).

Analytical method: Condensation

In the following, the analysis of each research question is given a section of its own. The first question concerning the public-private partnership relates to the character of networks and the networks' development. This issue is basic to the entire analysis and hence it is dealt with first. It is followed by an analysis of the innovation process and how KIS firms may contribute to more efficient innovation within public services if a public-private network exists. Finally, the policy implications will be discussed.

The research questions posed in Chapter 4 will be analysed within the framework outlined above. Each of the questions can be placed within one of the three objectives. Whilst the questions form part of the analysis, specific answers to each of these questions will not necessarily be provided. The questions are mutually connected in a more complex pattern than befits individual answers to individual questions. Thus we have aimed to provide a general and more holistic understanding and explanation of these issues. Despite this it must be said that the questions have been valuable in guiding the case studies.

The analyses provided here are based on a cross-case method. Each case study has been carried out to investigate the core dimensions stated in Chapter 4. The case reports have been structured according to the core dimensions. The results of each case study have been summarised in the standard result templates, which makes it easy to compare the case studies from the different countries. The researchers' assessments and classifications of the qualitative data from the case studies (interviews, documentary material etc.) provide the basis for the final templates. The research results have been condensed in that the rich detail of each case study has been whittled down to its essence, the results then have, via the

result template, been compared to establish the general features of KIS public-private network innovation. The sacrifice in terms of detail is made up for by the context independent clear generalisations which can be drawn. The detailed, context-dependent information can still be found in the case reports.

The results are generic for KIS and not specific for countries or single KIS industries (tourism is in this work package included in KIS). This approach is in accordance with the overall aim of the ServPPIN project which is to generate generic knowledge about public-private networks and service innovation. The research objectives are rather broad, thus the results might be fairly complex. The aim of the analysis is to investigate whether it is possible to find clear patterns from such complex results.

After establishing the main generalisations that can be made, other important findings will be analysed. The core dimensions and the result templates include a section reserved for “unexpected results” in which new factors of importance to public-private network and service innovation are placed. Such findings can provide valuable new knowledge that has not been considered in the project’s hypotheses or assumptions.

The chapter ends with a conclusion based on the discussion sections of each case report and the result template. The conclusion will include a discussion of the policy implications of the findings.

The networks

The first objective listed above concerns the character and development of the networks. The basic questions are: What is the character of the networks and do they have a life cycle?

Character of the networks

To answer the first question, the findings of the case studies suggest that four factors characterise public-private networks:

- *Initiative*: Was the initiative to start the network taken top-down by the top management or bottom-up by individuals outside top management
- *Initiator*: Did the initiative for the network come from a private firm, from a public organisation or from a semi-public organisation
- *Crucial factor*: Was the crucial factor for the further development and survival of the network an individual entrepreneur or an organisation
- *Network life cycle stage (NLC)*: The hypothesis is that a network goes through a life cycle with three stages: 1) prototype-industry, 2) commercialisation and entrepreneurial activities, 3) consolidation and firm growth. The stages are explained more fully in the model provided by table 2.

The network life cycle factor will be analysed in the next sub-section.

These factors may be assumed to be crucial for the creation of a network, for the network’s survival and for how the network functions. We look for invariance between these factors to see if there is a pattern. If that is the case, we may be able to explain the function and success of public-private networks. Each case has been selected because an innovation has been developed, which is the success criterion.

The character of the factors in each case is listed in table 1 allowing for comparison.

Table 1. Factors of networks

<i>Factors</i>				
Case	Initiative 1)	Initiator 2)	Crucial factor 3)	Network Life Cycle hypothesis 4)
Megaflex DK	B	PR	E	+
New Vocational Education and Training Programmes DK	B	PR	O	+
Fruit festival DK	B	PR	E	-
Local tourism development DK	T	PU	O	-
Etourgune ES	T	SP	O	+
Segur ES	T (B)	PR	O	+
Knowledge-diffusion program ES	T	SP	O	-
Training program ES	T	PU	O	+
Allergie Alpin AU	B	SP	E	+
Serfaus-Fiss-Ladis AU	T	SP	E	+
Farmstar FR	B	SP	O	+
Geowine FR	T	PU	E	+
Galileo Masters FR	T	PU	O	-
Sophia FR	B	PU	O	-
Golden Thread SL	B	PR	O	-
Venture Factory SL	B	PU	E	+
Bank of Tourism Potential SL	T	PU	E	+
ECDL training SL	T	PU	E/O	+

- 1) Initiative The initiative was taken top-down by top management = T
or it was taken bottom-up by individuals outside top management = B
- 2) Initiator The initiative for the network came from a private firm = PR
or it came from a semi-public organisation = SP

- or it came from a public organisation = PU
- 3) Crucial factor The crucial factor for the development of the network was an individual entrepreneur= E
 The crucial factor was an organisation= O
- 4) NLC hypothesis The hypothesis is that a network goes through a life cycle having three stages: 1) prototype-industry, 2) commercialisation and entrepreneurial, 3) consolidation and firm growth (cf. table 2)
 Hypothesis supported = +
 Hypothesis not supported = -

There is no obvious invariance in table 1. The factors are combined in all variations in the cases and there are no particular patterns. The data reveals no national differences or differences between the various kinds of service industries included in this case population.

However, some patterns can be found:

- When the network is initiated by a public organisation, then, if the crucial element is an entrepreneur, the life cycle hypothesis is true, if the crucial element is an organisation, then the life cycle is denied.
- When the network is initiated by a semi-public organisation, then the life cycle is true in any case, both when the crucial element is individual entrepreneur or an organisation.
- When the network is initiated by private actors, then no pattern can be found.

This leads to the conclusion that many types of public-private networks can lead to innovation success. From this analysis there are no necessary conditions that must be fulfilled in order to achieve innovative success. This is of course scientifically disappointing because we do not find any scientific laws of the development of public-private networks. For political practice, the message is both positive and negative. It is negative because there is no single factor that a political system can influence to design a successful public-private network. It is positive because many types of network that emerge or are constructed may be successful. The barriers to innovative success do not seem to be in the character of the network. A top-down, organisational based network may have as good a chance for success as a bottom-up entrepreneur-based loosely coupled one.

Attention should be paid to semi-public institutions as being important in public-private innovation networks. Such institutions include labour market institutions (collaboration between employers and unions), humanitarian organisations, local or national tourist boards, NGOs etc. These semi-public institutions are often initiators of the networks and they can function as mediators between the public and the private partners and thus smoothen the network process. Semi-public institutions should be included in the policy concerning public-private networking as well as in the scientific understanding of networks.

Network life cycle

Table 2 below depicts a life cycle pattern; the cases have been examined to establish whether or not they fit this pattern.

Table 2. Network life cycle stages

<i>Dimensions</i>					
<i>Stages</i>	Knowledge base	Resources	Network membership	Demand	Policy
Proto-industry/	Specific and scattered	Public funding	Universities and government	No articulated	Geographically and

crystallization stage	(geographically and institutionally)		research institutes	demand	technologically scattered; mission oriented
Commercialisation and entrepreneurial stage	Specialised knowledge / local diffusion leading to regional competence clusters	Venture capital funding and resources provided by large (established) firms in order to get access to new knowledge	Private firms (often start-ups) enter the networks or establish their own networks, large scale participation of public actors	First articulation of demand with a large adjustment gap between potential demand and instant demand	Cluster-oriented, regulation (providing legal framework supporting knowledge diffusion); diffusion-oriented
Consolidation and firm growth stage	New knowledge becomes paradigmatic for the industry	Venture capital is rolled back; internal funding and intrapreneurship become dominant	Declining participation of public actors	Well articulated demand generating revenue streams for innovative successful firms	Regulatory regimes and anti-trust

Of course there is an element of subjectivity in this method: how should we assess whether a complex development of a network follows a simple theoretical model? Would different researchers assess the cases differently? Such issues and uncertainties are always connected to qualitative methods. Taking that into consideration, we must conclude from table 1 that many cases follow the proposed life cycle pattern, but many do not. The life cycle model is a useful tool for understanding certain networks, but it is not a model that can predict the development of any network. Some networks have another life.

The only invariance in table 1 that comes close to a correlation is that the life of networks that do not follow the life cycle model of table 2 are those in which an organisation is the crucial factor (only one case is an exception from this invariance). This points to an institutional factor. The life cycle model predicts that the innovation process starts with an organised network in which a public partner plays a major role and thereafter an increased market based commercialisation of the innovation following the normal product life cycle. This happens when the entrepreneur is the crucial factor for the survival of the network. The network then lives a "natural life", i.e. a life that is based in the market and social structures of the society. Organisations (which mostly mean public political organisations) follow a certain goal that does not necessarily lead to the market launch of a service, but mixes this goal with other – perhaps political – purposes. The network does not, in this case, follow the life cycle model. The last stages of the life of the network can, for example, lead to political initiatives and regulations instead of launching innovative services.

The development of networks from ad hoc entrepreneurial to permanent learning networks

A different network life cycle has been observed in some of the case studies. Many of the networks started as informal, sometimes fairly loosely coupled, networks. Most of them are oriented towards ad hoc innovation (cf. Gallouj 2002) developing one or a few innovations. Entrepreneurs are crucial to making networks function and developing innovations. Some develop into more permanent networks. They change character and become to resemble learning networks. A series of innovations may be the result.

When the network changes character, the organisation and administration must also change if the network is to survive. The network becomes better organised, the entrepreneurs matter less and a professional administration is often a condition for the network's survival. New types of leaders and task-orientation are required. The pioneer spirit is replaced by more permanent social structures ("scene-makers" are replaced by "scene-takers" as has been earlier observed within tourism networks cf. Mattsson, Sundbo and Jensen 2005). The members of the network start using the network for other purposes than the original service innovations. The network often becomes a system of mutual exchange of general knowledge and learning about service production and provision.

In a second, more organised stage of a network's life, the power balance in the network may shift. For example, private service providers may gain more power over public user-institutions than in the first entrepreneurial stage. The network can acquire a more hierarchical and bureaucratic character and the production of the services, and, eventually, further innovation processes, can be outsourced to service firms. The network may in this phase also be locked-in to a certain trajectory (cf. Dosi 1982), which may lead to further innovations, but they will not be as radical and the network will not be as creative as in the first stage.

It is important to be aware of this shift in the networks and the new demands that it implies. If the network partners or an external facilitator (e.g. a public organisation) are not aware of it, the network may disintegrate when the first entrepreneurial stage is over and permanency is a possibility. It is unlikely that all networks will survive, but the society and involved parties may sometimes benefit from the networks survival in a new form. This potential may be lost if the necessary organisational and functional changes of the network are not taken care of.

Innovation

This section analyses the results relating to the second objective settled in the Introduction. This part of the analysis goes into greater depth concerning the life of the networks and how innovations emerge in them. Three factors in particular have been emphasized in the case studies, namely drivers of and barriers to innovation, and the influence of institutional factors on the innovation process. These three factors will be analysed systematically for all cases based on the result templates. By doing so, we can establish the general drivers, however, the method does not allow us to conclude whether some drivers are more important than others or generate greater innovation success.

Drivers

The drivers of innovation in the networks found in the cases are summarised in table 3 below, and a threefold classification has been made: 1. External events. These are events or societal developments outside the network which have created a pressure on the network partners to be innovative. 2. Personal and social factors that have led to focusing on innovation and the establishment of a public-private network. 3. Public or semi-public institutions that have established a public-private network or supported one.

The classification has been made inductively based on the condensed result templates. Firms as total organisations do not appear as drivers. A firm is rarely a driver as such; individuals within the firm are the drivers. This conclusion comes from the fact that we have found no cases in which a service firm has a public-private network based innovation as an offensive core strategy. Service firms enter such public-private innovation networks either because of market pressure or because of individuals within the firm having seen the innovative possibilities in the network.

Table 3. Drivers of innovation within public-private networks

	Examples
1.External events	
Significant external event	<i>A tourist attraction is so influential that it leads to further tourism innovations</i>
Technology and technology suppliers	<i>New IT becomes a necessary means within the service area</i>
Market demands	<i>New market demands and the maturing of old service areas</i>
Market threats	<i>Threat from competitors leads service firms to enter a public-private innovation network</i>
Quality problems	<i>Lack of quality in existing services puts on pressure for innovation</i>
Knowledge complementarity	<i>Two knowledge institutions, typically a public organisation and a firm, have complementary knowledge competencies which can be used innovatively if they form a network</i>
2. Personal and social factors	
Entrepreneurs	<i>Private or semi-public entrepreneurs that form and drive an innovative public-private network</i>
Political entrepreneurs	<i>A politician that creates an innovation network and struggles for getting it politically important</i>
Large firms' power	<i>Large corporations are powerful, and if they join a network, this network gets political and business power</i>
Basis in local community	<i>If a local public-private network involves many parties from the community, it will enhance the chances for innovation success</i>
3.Public or semi-public institutions	
Public programs	<i>New public programs or the establishment of public centres can support the network and the innovation process</i>
Public regulation	<i>Public regulation and new laws can lead to innovations which are developed in public-private networks</i>
Public institution support	<i>Powerful public institutions join or support the network which enhances the probability for innovation success</i>
Semi-public coordination	<i>A semi-public coordination institution can secure a successful innovation process</i>

All three types of drivers are important. They can be found in different combinations in the case studies. Both internal and external factors can be drivers. Some of the well-known innovation drivers can be found in public-private networks as well: Technology development, market pressure, entrepreneurship and public regulation and procurement. Besides that, it is remarkable that public and semi-public institutions can matter as innovation drivers in networks by being champions

(cf. Pinchot 1985). However, this demands that the public institution has a particular drive and strategy. Often it also demands corporate entrepreneurship within these institutions as several cases show that the speed and maintaining of the network innovation process very often depend on entrepreneurial individuals in the network.

Barriers

The barriers that have been found in the case studies are summarised in table 4 below. The barriers can be classified into four main categories. 1. Network competence problems: the actors in the network do not have the necessary competencies, cannot exploit complementary competencies or are unable to utilise external sources for innovation (which can be called open innovation). 2. Public-private differences in organisational traditions, task orientation etc. 3. Appropriability problems (which are connected to knowledge services are often highly intangible products). 4. External factors (outside the network).

This classification has also been made inductively based on the result templates. The result is that internal as well as external factors can be barriers to innovative success in a public-private network. However, if we look at the barriers most often found in the case studies, the internal ones count for much more than the external ones, which were rare. This points to there being few absolute barriers to successful innovation processes in public-private networks which can not be overcome. The main barriers lay within the network and in the parties themselves.

Table 4. Barriers to innovation in public-private networks

	<i>Examples</i>
1. Network competence problems	
Capacity	The network does not have the time resources or the necessary competencies to make the innovation
Lack of complementary competence	The parties of the network do not have, or can not exploit, complementary competencies (which then may become a source for conflict)
Lack of ability to utilise a competence of the other partner	Private firms do not have the ability and competence to utilise public research institutions as an innovative actor in the network
Lack of orientation towards open innovation	The participating firms are not oriented towards open innovation, i.e. towards external sources for innovation
Entrepreneurial exit	A driving entrepreneur (public or private sector) leaves the network (thereafter the network disintegrates or stops being innovative).
Time factor	Innovation takes time, and sometimes the network parties are impatient; they leave the network or stop the innovation process
2. Public-private differences	
Trust	Trust is a core condition for the success of networks. This is also the case for public-private innovative service networks
Rigidity in the public sector	Bureaucratic rigidity within the participating public institution can impede innovation. The public partner may prove not to be really interested in innovation
Interest conflict	The public and the private partners have different interests,

	some public partners have conflicts of interest or some private firms have. This may stop the innovation process.
Different cultures	Different cultures and different ways of expressing tasks and problems (different "languages")
Imbalance between firms	Imbalance between large, dominating firms and SMEs in the network may disintegrate the network and impede the innovation process
Firms too small	The involved firms are too small to really carry out an innovation process. They do not have the resources or the competencies
Lack of local community support	If the public-private network is local, lack of interest and support from the community can be a barrier to innovation (e.g. within tourism)
3. Appropriability problems	
Knowledge services intangible	The intangible nature of knowledge services makes it difficult to quickly create a cash flow and thus appropriate a KIS innovation
Short-term profit perspective in private firms	A short-term profit perspective in participating private firms may make them impatient and they leave the network or stop the innovation process before the innovation is fully developed
4. External factors	
Technology	Dependence on new technology, typically IT, may impede the innovation process if the network do not have sufficient capacity within that technological field
Labour	Lack of competent labour to carry out the innovation process or produce the innovated service
Capital	Lack of venture capital
Economic cycles	Economic cycles, for example the emergence of a crisis (or sometimes an economic prosperity) may make it difficult to realise or market the intended innovation

Most barriers are related to the social function of the network and the ability to exploit the competencies of the network partners. These are factors that are well-known from studies of the knowledge economy and organisational learning (e.g. Argyris 1982).

One result regarding appropriability should be emphasized: the intangibility of knowledge services makes it difficult for firms to get a rapidly growing cash flow profit from innovation. The intangibility and complex nature of knowledge services also makes it difficult to develop radical innovations. This is a special problem for knowledge services. It is known from research that the KIS area is very innovative (Jensen, Mattsson, Sundbo 2001), but this result points to the KIS firms not being as innovative as they could be and the diffusion and development of the single innovations are not as fast and widespread as they could be. Public-private networks are not necessarily a means that by themselves can overcome this barrier. It is therefore important that the networks focus on the participating knowledge service firms and should be able to benefit quickly (in money or other terms) from the innovation if these firms are to maintain their motivation for continuous participation in the public-private innovation network.

The bureaucratic rigidity of the participating public institutions has also been found to be a barrier to innovation. This is not surprising. One may perhaps be surprised that this barrier is not mentioned more in the case studies than it is. One may conclude that the public institutions often seem to be able to adapt to the

innovative situation despite their rigid bureaucratic basis. We may here call attention to the importance of single entrepreneurs or champions (supporters of the innovation process) in the public institutions. In some cases, the innovation process stopped and the network became disintegrated or less active when such a public entrepreneur left the network (for example because of change of job).

Institutional factors

An issue that has been researched in the case studies is the influence of institutional context on the innovation process in public-private service networks.

It is mentioned in most case studies that one or more public programs or organisations have been a condition or an incentive for the establishment of the network. These can be public funds that give financial support to innovative networks, awareness committees, public research organisations or other public organisations that work for the development of innovation or public-private networks. This institutional context has rarely been decisive for the innovation except when it concerns public research organisations, which in some cases have been directly involved in the innovation process. The results demonstrate that a public effort gives results, even when the public institution is not always directly involved in the network or the innovation process.

The public institutions mentioned are most often national institutions, but also regional and local institutions are also referred to. EU institutions are more seldom mentioned. It is pointed out in the case reports that local and regional institutions (regional administrations, municipalities, regional committees etc.) often become more open and less rigid if they become directly involved in the network and innovation processes. Innovation in public-private service networks thus also contributes to changing public institutions.

The public institutions mentioned are organisations, committees etc. Policy is also cited as an institutional factor, but only in some cases. In the tourism cases local and regional policy often referred to. Tourism seems often to be a part of local industrial policy. National policy is mentioned as an institutional context of some importance in a few, primarily education, cases. It only concerns labour market policy.

In some cases, the "third sector" is spoken of as an institutional context. In these cases, labour market institutions are mentioned, these co-operate between unions and employers, chambers of commerce and local or regional tourism boards that are associations. This "third sector" or semi-public context should be emphasized in public-private innovation network policy since it can be an important factor in ensuring innovation success.

The conclusion is that public and semi-public institutions, and sometimes policy, provide a context and an incentive to establish public-private networks, but they are less decisive for the innovation process within the network and the maintaining of the network. Here the drivers and barriers mentioned above are the crucial factors.

Other important findings

Besides the planned investigations following from the analysis model, we have in the case studies discovered other interesting factors worthy of discussion. They will be presented in this section.

Social aspects of the network

The networks are not only functionally rational ones. They are also a place for social interaction and the building of social relations outside the innovation purpose. Social relations can be useful in the long term because if people know each other, it makes it easier to establish a new network in the future if that is necessary. It is important to be aware of this social function of the networks. It is often a condition for innovative success because the latter in services is very dependent on social interaction and thus social sympathy and antipathy. Innovation in services is very rarely only a matter of technical development and objective research.

There are also cases in which the innovation activities in a public-private innovation network change the attitude of the population of the surrounding community. In some tourism cases, for example, the view of the community concerning tourists and tourism business activities has changed producing a more conducive environment for destination innovations which involve the community.

Entrepreneurial fit

In some networks, entrepreneurs are crucial for the maintaining of the network and innovative success. The cases have also revealed the importance of the existence of two entrepreneurs – one from each sector. These two entrepreneurs can ensure support and acceptance in their respective sectors and it is crucial that these two entrepreneurs have positive attitudes and good relations to one another so-called entrepreneurial fit. In the opposite case, the network will probably disintegrate and the innovation process will end in a mess.

It has in some cases been crucial for success that the public sector has collaborated in the creation of the network, but has left the management to one or more entrepreneurs from the private sector.

Competition within the network – large companies' powerful position

Several case reports reveal the existence of competition between the firms within the networks. This is not surprising, but it may nevertheless be destructive for a network. The public partner may have a problem if the networks do not work because of inter firm competition. The public parties may compete with one another. There is an aspect of power to all networks and public organisations - infighting can be destructive. Obviously, it is possible that the public parties could be in conflict with or have different aims from the private parties. However, this situation has not been reported in the case studies to the same extent as inter-firm competition.

Large companies in particular can be very powerful given their economic power; they can have large innovation capabilities and large political influence. This often creates an imbalance between the large companies and small firms within a network. The large companies sometimes follow their own interests, which leads the small firms to be less interested in the network and participating in the innovation process. Such imbalances should be taken care of if the small firms are to have any role in networks in which both small and large firms are participating.

Research institutions active partners

Despite the expectations from general research results about the low use of research institutions in service innovation (European Commission 2004), several case studies report that there has been close collaboration between innovative public-private networks and research institutions. The research institutions are sometimes members of the network and sometimes outside collaborators.

Public-private innovation networks characterised by reliability and robustness

In the project, Fuglsang (2009) has proposed to use Hood's (1991) work to distinguish three sets of values in the debates about administrative design of public-private networks:

- 1) Sigma-type values with the heading "Keep it lean and purposeful". The key word being "frugality" i.e. matching of resources to tasks for given goals.
- 2) Theta-type values with the heading "Keep it honest and fair". The key word being "rectitude" i.e. achievement of fairness, mutuality, and the proper discharge of duties.
- 3) Lambda-type values with the heading "Keep it robust and resilient". The key word being "resilience" i.e. achievement of reliability, adaptability and robustness.

Fuglsang then proposes two hypotheses that can be tested in our case studies, namely: 1) Public-private partnerships (more institutionalised and contract-based) are associated mainly with Sigma-type values (frugality) whereas public-private innovation networks are associated with Lambda-type (robust and resilient). These hypotheses have shown to be quite valid in some of the cases which are grounded in Lambda-values.

Cumulative effects of collective learning procedures

Some of the Serv-PPIN studied were characterized by the strength of their cumulative learning effects. But in the absence of any formalization of the evaluation of the innovation (both by public and private actors), these cumulative effects could lead to a technological lock-in, as there are no evidences that it provides a better solution than the former and competing services.

A new type of innovation: Educational

The case studies have discovered a new type of service innovation that can be added to the ones that are normally referred to (product, process, organisation, market and business model). The new type can be called educational or pedagogical innovation. In several cases where the KIS was educational services, the product innovation has been new forms of education. In one case, the pedagogical approach of the management towards a particular type of employees was an innovation.

One might state that these innovations are product or process innovations, however, it can be useful to consider the educational or pedagogical service innovation of a particular category. A special effort must be made to create this type of innovation and for a firm, it is the ability to develop educational or pedagogical innovation a special competition parameter.

Conclusion and policy implications

In this section, a general conclusion will be discussed in relation to the question: Is the public-private networks more successful in innovating than a public sector or private firms would be? This will be answered on the basis of the case studies. Thereafter we will discuss the policy implications of the case.

Are public-private networks more successful in innovating than a public sector or private firms would be?

This is of course a difficult question to answer exactly, particularly as the cases were selected because the public-private networks had been assumed to be innovatively successful (which we, however, could not know was true before we had

investigated it). The question does, however, raise the core issue. Even though we can not give a decisive answer, we will discuss the question based on the assessment and discussion of the individual cases.

In most cases, the researchers found that the public-private network was successful in developing service innovations. Although it can not be decisively concluded that these networks were more successful than either a pure public organisation or private service firms would have been, several findings and arguments which support this view are stated in the case reports. The strongest being:

- *Complementary assets*

The public and the private actors have different perspectives and resources (knowledge, capabilities, other networks etc.) which when combined sustained the innovation and made the network successful.

Public-private networks have brought benefits to private partners in the form of improved credibility and wider dissemination and to public partners in form of incentives and activities for policy implementation.

The public sector provides financial support and gives validity to the activities, while the private firms provide the content of the services and close contact with business practice.

- *Flexibility*

The networks are more flexible and open to different stakeholders.

- *More business-relevant and efficient public research*

More business-related information flows towards the public sector, thus public research becomes more connected to enterprises' needs for future research developments.

The network enhances technology centres' efficiency in diffusing knowledge because the network provided them with more resources.

- *Increased learning capacity*

Firms have gained increasing learning capacities as results of the collaboration with public research centres.

In some case studies it was impossible to conclude anything about this question and only in one case was there a clear conclusion that the public-private network has been less successful than a public sector or private firms probably would have been.

Policy implications

- *Networks matter*

The primary policy message from the WP5 analysis is: Public-private service innovation networks work within knowledge services and tourism thus it is beneficial to bet on them. Public effort in the form of awareness campaigns, committees, incitement institutions, opening the resources of research institutions and funding leads to establishment of networks and innovation. Public effort can also be important in the late stage where the networks should be more institutionalised and managed to continue. Effort at all levels – national, regional, local and EU – matters.

Networks should be encouraged to grow, based on the personal relations that have been created within them. One network can lead to other networks thus a network of innovative networks can be created. Even when a network folds; new networks will often emerge.

It may often be an advantage to extend national networks to an EU level. The model has been tested at a national level and it can work at a higher level.

- *Support to the function of KIS networks*

Technology providing companies can be active external partners in the innovation process. An active effort to find such partners can be a good idea.

There is often very limited flexibility in the organization of networks as regards of national programmes funded by public institutions. In this sense, it has been reported that there is a very limited scope for project tasks rearrangement. This does almost not permit any shift or change from the initial project proposal, which usually do not match with the investigation course. This fact mainly affects innovative public actors, which find significant difficulties and barriers to adjust to new research perspectives, and leads to some problems regarding research context evolution and variations over time. Hence, further consideration for allowing some kind of network flexibility, to reach a non-static organization that cannot adapt to context changes, would be of particular interest.

Public-private innovation networks as open platforms for innovation and public economic support to different stakeholders – institutional actors, business actors or individuals – that enter the innovation processes can be a good combination, particularly in tourism.

Innovation processes in public-private networks take time. The political system should be aware of that. This is no argument for long-term economic support to every public-private network. Sometimes the progression of network activities really dies and such networks are not worth maintaining. Public support authorities should make a careful assessment in every single situation. It is also important that the participating firms understand that innovation takes time. They are often impatient. Public network promoting institutions should aim at making this clear to the participating firms.

It is important that the experiences of successful public-private service networks are diffused to other parties. Here the public sector can play a role.

- *Political barriers*

Ideology still plays a role. Sometimes firms are only oriented towards the public sector should outsource the service. The public sector may just be against outsourcing. These two attitudes do not, of course, promote public-private networking. However, it was only in remarkably few cases we found these ideological positions.

Often barriers to successful innovation in public-private innovation networks are at the local level. Municipalities and communities must change their attitude towards the task. This demands more than formal national policy and institutional effort; we talk about social change that may be very fundamental for a community. The way to break the social heritage could be that the national political level emphasize the field and create a national awareness of it as important. The local political level should be involved in the development of the field and institutions of local public-private networks (probably with state grants) could be set up

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Chapter 7: Public-private networks and service innovation in transport

Introduction

WP6 aims to examine ServPPINs in the area of transport. Innovation in transport services can be of various kinds, as reflected in the cases selected. They range from system innovations requiring the integration of new technological, organisation and social innovations in order to provide a completely new type or quality of service (e.g. as in the case of information systems, or car-pooling), via new standards (e.g. for inter-operability of train services), to new organisational models for the realisation and provision of better transport services (e.g. by way of delivery partnering).

The case studies represent a novel approach that combines the analysis of structural and institutional features of the networks as derived from secondary sources with in-depth interviews that help explain the influence of different factors driving the evolution of networks over the course of the network life cycle. In this way, we can understand the drivers and barriers that affect the development and performance of ServPPINs while controlling for sector and geographic specific factors. The case studies were guided by the 'Operational Research Questions' (Green 2008; Weber, Windrum, and Sundbo 2008) that were developed for all case studies in health (WP4), KIBS (WP5), and transport (WP6) of the ServPPIN project.

Due to the complexity of the transport cases, three case-studies have been conducted in most countries (Austria, Norway, France). In the UK, two very detailed cases were investigated, and one case in Hungary, with the Hungarian partner having significantly less resources than the other partners. These cases should cover different types of transport innovations and networks, but it was foreseen to have also one common case in all countries related to traffic information and management systems.

Main findings

The types of service innovations that are reflected in these cases vary significantly. We distinguish five main types of innovations in WP6, and a single innovation can cover several of these types.

- Technological or technology-mediated service innovations (e.g. real-time multimodal traffic information services, electronic ticketing, agency service for commuter carpooling, logistics internet services) which are strongly connected to a technological product, component or device (e.g. electronic displays at bus & tram stations; specialist software that compiles passenger transport usage data; recording and display of vessels on an electronic navigational chart)
- Organisational and process innovations: service innovations implying a change in organisational structure, processes and practices (e.g. traffic information services that are based on extensive knowledge exchange processes within and between the administrative departments of different municipalities; services that aim to change the mobility behaviour of urban citizens by a shift towards environmentally friendly transport modes; river information services with strong impact on the management of sluicing). In fact, some of the case-studies are looking specifically at processes of change in public administrations as a result of getting involved in innovation activities in public-private service networks that require an opening up of organisational borders and the adoption of – at least some – practices and cultural features of the external private cooperation partners.
- Network as an innovation: as a special case of organisational innovation, the construction of an innovation network can in itself be regarded as the purpose of the innovation (e.g. the involvement of service provider & users on the national and the European Level to increase the efficiency of the European inland waterway transport system)
- Market innovation: One case, the establishment of battery charging points for electric vehicles in Oslo may also be considered as a market innovation, in the opening up of a market for producers of the technical equipment for battery charging depots as well as in the generating of new customers for the energy utility network owners.
- System innovation: the category of system innovation is of particular relevance to transport and stresses that a combination of several of the preceding types is covered by a single case in order to create a novel service and underlying delivery system for a large set of different user groups (e.g. regional traffic information system comprising all traffic modes designed for pedestrians, cyclists and car drivers as well as an traffic planning and controlling tool for administrative activities of municipalities, traffic manager and the police)

Most of the innovation networks under study are large scale and aim at creating and maintaining a new type of service based on new developments in transport telematics, requiring a large-scale solution to be in place (e.g. a traffic information and ticketing system) and inducing a number of changes of the organisational process of the network partners. Most service innovations are based on existing experience and solutions and developed rather incremental in one of the several aforementioned categories.

In the majority of cases the network comprises more than 10 partners, either from public or private sector (public transportation service providers, public authorities, private technology and service providing firms, equipment manufacturers, software developers). Public research organisations and third sector organisations (non-profit environmental and interest organisations) participate only

to a limited extent. Furthermore, the cases are characterized by a marginal involvement of users.

The main driver for the development of innovative transport services is in most cases a sort of “public mission”: the intention to increase the quality and efficiency of public transport. Some of the well-known innovation drivers can be found in public-private service innovation networks as well: technological developments (e.g. the breakthrough of internet technologies and mobile communication systems offer new technological opportunities for intelligent transport systems), economic and social reasons (the modernisation of public transport services increases the opportunity for personal mobility and support economic development and growth) as well as environmental aspects (e.g. urban traffic congestion, pollution and climate change induce policy measures and regulations which promote and facilitate the development of new services to reduce greenhouse emissions). In several cases New Public Management (NMP) and public procurement processes stimulated various types of public-private-participation schemes for providing public services. It is striking that in none of the cases customer demands lead to the implementation of new transport services.

Characteristics and patterns of evolution

In our research cases tend to dominate that were initiated top-down by the public sector. This may not be very surprising because ensuring the efficient operation of a transport system is still regarded as an important public task in most countries, even if the prominence of the public sector in providing the services may vary. In several of these cases the main impulse is given by a semi-public organisation (e.g. private transport company owned by public bodies) that was either set up explicitly for the purpose of enabling the creation of a ServPPIN or that was expected to change in several of its internal dimensions in the course of the emergence of the ServPPIN. These semi-public institutions are often the crucial carrier organisations or the central network node of the networks, and they can function as mediators between the public and the private partners and thus as a smoothening factor for the network process.

Leadership in transport ServPPINs is characterized by public-private entrepreneurs. In about half of the cases, a strong entrepreneurial drive has been crucial. The surprising observation, however, was that entrepreneurship is not solely a matter of the private sector, but that entrepreneurship is equally important in public and semi-public organisations. The extent to which public entrepreneurship can manifest itself is obviously a matter of the degree of autonomy that is assigned to the public administration, i.e. once a political decision in favour of a specific project/initiative has been taken. This assessment is backed by the observation that “entrepreneurship” in the public sector seems to be more frequent if the public sector is assigned sufficient autonomy and if the organisational culture is supportive to such a sense of initiative. Whether this is the case or not is obviously a matter of deeply rooted (national) political-administrative cultures and of the institutional framing for administrative action.

With respect to the project architecture, we can observe often a mix of bottom-up and top-down elements. A small core project team, which initiates and governs the network top-down, is embedded in a large network of more or less loose coupled partner, which contribute to the network bottom-up. On the other hand, in the course of network evolution, networks that were initiated top-down need to develop bottom-up mechanisms (i.e. informality and trust to enable learning and exchange without excessive transaction costs. To develop such cooperative mechanisms the emergence of an open and collaborative culture is key to success. The organisational boundaries need to be opened (in order to facilitate collaboration and integration of activities), whereas bottom-up networks need to develop

stronger hierarchical elements in the course of their professionalization (bottom-up network tend to start as informal, sometimes fairly loosely coupled networks). When they develop into more permanent networks, they change character and become a) more professionalized in terms of internal management, and b) develop learning mechanisms to help ensure the sustainability of the network.

The case studies reveal that public and semi-public institutions, and sometimes public policy in the broader sense, represent important institution factors shaping and providing incentives to establish public-private networks. In the case of transport, they can even be decisive for the success and sustainability of an innovation network. The contribution does not so much lie in a direct involvement in research and innovation activities, but rather by being important partners on the demand-side, by providing funding, by defining important institutional and regulatory conditions, and by leveraging cooperation with further partners.

Critical Success Factors

The case studies show that both internal and external factors can be decisive for success and failure of ServPPINs. Internal factors refer to network related drivers that reflect features and characteristics of the network that mobilize and motivate collaboration, such as technological capabilities, social relations, the rationalities of the public and private sector, financial resources, and anticipated benefits and risks. External factors are events or societal developments outside the network, which determine the achievements of the network partners, such as political interests and influence, governmental regulations and legal frameworks. The analysis shows that in principle all types of the following drivers are important and can be found in different combinations in the single case studies, but most drivers and barriers are related to the social function of the network and the ability to exploit complementary competencies of the network partners. These are factors that are well-known from studies of the knowledge economy and organisational learning (e.g. Argyris 1982).

Internal Factors

Our research reveals that one of the most important factors for successful collaboration and the joint generation of knowledge is the definition of a joint business case, in which every partner is aware of his role, contribution and benefits. This includes a guiding vision of the future evolution of the network, joint branding and marketing of the generated service as well as a clear and simple model for the distribution of intellectual property rights and financial benefits. Each partner must be able to identify a benefit for his/her own organisation, either immediately or in the foreseeable future. Diverging interests (e.g. self-interests of private suppliers) increase the complexity of the initiatives and result in serious delays. If, in addition, conflicts of interest (e.g. development of competing service systems) come into play, the likelihood of establishing a successful innovation network decreases significantly. Closely associated to these are problems of appropriability. Transport service innovations are related often to issues of access to proprietary information (e.g. on traffic flows) that is crucial to the innovation in question. Public or semi-public actors can help overcome such appropriability problems by centralising the control over the crucial information and at the same time providing fair access and use. In some of the transport cases studies, resistance to collaboration could only be overcome by strong public policy intervention (e.g. in the case of public and semi-public transport organisations unwilling to cooperate).

A strong leadership, characterized by strong and credible technical expertise as well as high social competences of an entrepreneur from the public or the private side, proves to be essential to balance the interests of all partners. An elaborated project organisation helps to foster and coordinate communication on

and between all network levels. The importance of a strong lead at the strategic and the operational level, with clear roles and division of labour, becomes apparent in those cases, where the innovation process stopped and the network became disintegrated or less active if such a project manager left the network (for example because of change of job).

In several successful cases the existence of a double leadership can be found. It can take the form of complementary roles on the public side and one in the private side of an innovation network, but it can also be found in cases where roles have been divided between external entrepreneurship and internal project management. The external role is, for instance, focused on negotiations with the political environment to ensure general support for the network, whereas the internal role is about leadership with regard to the cooperation between the network partners. It is important to observe that these roles can change in the course of the life cycle. In several cases, it has been crucial for success that public sector entrepreneurs took a strong lead role in the creation of the network, but that lead role was later on left to one or more entrepreneurs from the private sector.

In addition to a strong leadership the integration of specialised organisations and experts with high reputation, expertise and international contacts proves to be a key factor for the successful definition and implementation of the new services. Most of the services are based on the leverage of experience and existing knowledge. In an incremental approach expert know-how and existing solutions are exploited and recombined to generate innovative services. Quick wins and achievements mobilize the network partners. Though, some cases demonstrate that the participation of large specialized firms with high reputation can also have negative impacts. Particularly large companies can easily become to dominate an innovation network. They have big economic power, they can have large innovation capability and large political influence, and they can "capture" the public sector organisations by knowledge asymmetries. This often creates an imbalance within a network that can hamper cooperation. The large companies sometimes follow their own interest, which leads the small, often private partners to be less interested in the network and participating in the innovation process. Such imbalances should be taken care of if the small firms have an important role to play in networks where both small and large firms are participating.

This leads us to another critical success factor, the compatibility and commensurability of partner. Public-private collaboration is mostly induced by a lack of capabilities and knowledge of the public bodies aiming to realise new public transport services. Two or more knowledge institutions, typically public organisations and private firms, have high levels of complementary knowledge competencies, which can be used innovatively if they form a network. Thus, information asymmetry is on the one hand a precondition for network formation. But in some cases problems occur (e.g. in the specification of a tender for public transport services) when the cognitive distance between partners is too big. Lack of knowledge and absorptive capacity on both sides hinders communication and the ability to exploit complementary competences of the partner. Bureaucratic rigidity, different organisational cultures and different ways of expressing tasks and problems (different "languages") in public and private sector organisations are challenging for the joint implementation of a new service as well.

Finally, personal links and prior acquaintance are often mentioned as key factors that facilitate the realisation of innovation networks. Several project partners are part of the networks due to existing contacts of the project coordinator, the project manager or other players of the public administration. In several cases the experts know each other from the informal "transport management community"; they share similar technical interests, professional identities, although based in different organizations. Several members can build on existing, long-established collaborative relationships that have withstood the test of

many years. This is a well-known finding from the organisational literature on networks, stressing the role of trust for reducing transaction costs. This applies both to the internal workings of innovation networks and to the external relationships with stakeholders and other political masters.

External Factors

It is mentioned in most case studies that one or more public programmes or organisations have been a pre-condition or an incentive for the establishment of an innovation network. More concretely, this can take the form of public (research) funding or other forms of financial support to innovative networks, the involvement of public research organisations, or other public or semi-public intermediaries dealing with the development of innovation and/or public-private networks. In the transport cases, this institutional context has often been decisive for the early phase of the innovation network life cycle.

Public R&D funding programmes have been shown to be influential drivers of network evolution, not only by simply providing additional funding that allows to integrate other experts and helps to avoid time and cost consuming procurement procedures. It also requires the innovation networks to move towards a next stage of professionalization. One of the formal requirements to apply for funding is an elaborated project plan which advises the applicants to define a reasonable project organisation (project goals, working packages, time plan, etc.). Such a project organisation gives guidance throughout the project and hinders sloppiness. Time pressure while writing the proposal helps to reach decisions between partners and to find simple solutions for seemingly unsolvable problems.

Political concerns and interests influenced in several cases the successful implementation of the transport services. Powerful public institutions join or support the network, which enhances the probability for innovation success. Public regulation and new laws, like the climate and energy action plans can lead to innovations, which are developed in public-private networks, but policy measures are also effective to ensure the public utilisation of the developed transport services (e.g. the National Action plan for waterway transport). The absence of a reliable legal framework for the new agency service for commuters hindered the successful diffusion of the service. Political pressure has in some cases also been necessary to ensure the collaboration of public or semi-public organisations in innovation networks (e.g. for the provision of proprietary traffic data). Competing political manoeuvring can also disrupt or derail an innovation.

Impacts

Most of the transport services under study are large-scale solutions, integrating several transport modes with the intention to change the mobility behaviour of the population of an entire region towards more environmental friendly transport modes. To assess if the new services reach this goal is in most cases a difficult undertaking.

In general, a shift towards public transportation is observable in past years, but most of these services are part of a comprehensive approach to improve the transport situation of the region including a set of initiatives, policy measures and public regulations. Thus, the interviewees in the case studies often emphasise that the new developed services are just one piece in a jigsaw. On the one hand, it is impossible to isolate and identify cause and effect of single measures and to determine to which extent these services contribute to the general improvement of the complex urban traffic situation. On the other hand, some transport services, like the Austrian Danube River Information System, suffer from being only regional developments, which limits the overall aim to increase waterway transportation that

starts and ends in most cases beyond Austrian borders. In only one case, the improvement of the public transport situation induced by a new service is attested: According to public authorities the real-time traffic information services in Oslo contributed considerably to the goal of a 20% reduction of travel time for passengers. The authorities considered the service highly successful and conclude that this measure, together with others measures, explains an increase in the use of public transportation in Oslo since 2006. In Hungary, a higher quality of the passenger services due to the development of an integrated information technology system in a bus company is stated.

Second, several of the analysed services are still in the implementation and diffusion stage and it is too early to assert whether the innovation actually will result changes in the mobility behaviour and in the reduction of the greenhouse gases. For example, in a case study about the implementation for a battery charging case system for electric vehicles in Oslo only 50 of the 400 charging points have been put up so far and it is too early to pronounce whether the establishment of the charging points will result in more use of and more users and drivers of electric vehicles. A free online traffic information system in Vienna is online since April 2009, but the public administration states that changes in the mobility behaviour cannot be expected before two or three years.

And third, the actually use of these services is often unknown. In countries with open traffic systems it is difficult to assess the actual number of passengers using public transport services. In most cases detailed reporting systems on the acceptance and usage of the services are not implemented. This is the case for example in an agency based carpooling service for commuters in Austria. According to data from the 2001 census the occupancy level in commuter traffic has dropped to just 1.07 persons per car. Studies point out that increasing the occupancy level to two persons leads to a profit in travel time and a loss of CO₂ emission of 30%. A conservative assessment based on experiences in Germany and Austria indicates a possible annual saving of more than 5 million car journeys with an economic benefit of at least 15 Mio EURO. Meanwhile, the carpooling service for commuters is realized in Austria, 1.700 users are registered, but, in fact, it is unknown how many rides are realized.

What might be seen as an indicator for the acceptance of new web based traffic information systems is the website access. Due to an intensive marketing, an intelligent traffic information system in Austria, is popular in and beyond the traffic community. In the first month of internet presence in 2009 15,000 routings were calculated. Based on these results, the public authorities showed interest in an expanded version for entire Austria.

The successful implementation of the new service increased in several cases the reputation and prestige of the partners. Being part of the development of large-scale transport solutions enhanced the visibility of the network of public and private sector organisations. Several of the initiatives started with a regional version, the successful implementation lead to nationwide solutions. In order to reduce the emission of greenhouse gases carpooling for commuters, for example, became one of the recommended measures in climate protection programmes and transport concepts of the Austrian federal states. In some cases the partners of an innovation network took part in European research projects to formulate and establish European standards. Due to the successful implementation of the Danube river information system, the Austrian Supreme Shipping Authority holds now a leading position in the definition and formulation of national and European standards and is part of a network of more than hundred national and European organizations related to the development of river information systems in Europe.

Finally, the development of the transport services in public-private collaborations induced several organizational changes in public administration. Public institutions realize that extending their network of contacts might offer them

opportunities to refer to expert colleagues for advice in the future. Collaboration with private companies introduces more commercially-oriented practices which is perceived to have improved working disciplines significantly. Public administration's staff is reported to have become more target-oriented and to have evolved enhanced capabilities with respect to meeting deadlines. The collaboration also assisted competence development within public administration and has helped to shape the ways in which this organisation manages its interactions with external, private sector actors. The implementation of a river information system will cause the automatisisation of sluicing services within the next five to ten years. This will change the management of sluicing and concerns 140 civil servants.

Final remarks

The case-studies provide in-depth insights into the mechanism that underpin the evolution of innovation networks, but they are less useful for deriving generalised insights. Moreover, the cases that been selected because the public-private networks were expected to be innovatively successful (which we, however, could not know was true before we had investigated them). However, the cases provide evidence that can either support or weaken the hypothesis that private-public innovation networks have something special to offer when it comes to service innovation.

In most cases it was assessed by the researchers that the network was not only successful in developing service innovations but that the public-private character presented specific advantages for that purpose. Although it can not be decisively concluded that these networks were more successful than either a pure public organisation or private service firms would have been, several findings and arguments which support this view are stated in the case reports. The strongest arguments supporting the conclusion that public-private networks are more successful in developing service innovations are described below.

Complementary assets

The public and the private actors have different motivations and resources (knowledge, capabilities, other networks etc.) that could be combined to create the innovation, made the network operate and contribute to its diffusion. These complementary assets can be of various types, as discussed in the critical success factor section.

The public sector provides financial and other types of support and gives legitimacy to the activities, while the private firms often provide the content of the services to be delivered and close contact with business practices and markets. In transport, there are also several public goods that are administered by the public sector in order to be made available to a broad range of private sector actors who need to provide complementary contributions to the service innovation.

It is an important counter-factual exercise to reflect upon the question whether the innovation would have been realised if there had not been a specific collaboration between public and private sector. At least in the case of the large-scale system innovations studied, it is questionable whether these would have been possible without a strong and active role of public sector organisations. And due to the combination of public sector leadership with competitive market-based mechanisms (e.g. procurement, selection processes for research projects, etc.) a driving force for quality and excellence was established that is nevertheless embedded in public policy objectives.

Benefits to the partners

The ServPPIN also needs to deliver complementary assets to the individual organisations that are participating, in particular the private ones that are free to contribute or not. The cases show that public-private networks have brought benefits to private partners in form of improved credibility, of wider dissemination and visibility of their competencies, and of access to the knowledge of other network partners' competencies. The public sector partners often share similar interests and benefits, but in addition they can gain from other forms of political incentives and legitimation, reflected in their role in the implementation of politically defined objectives for transport.

Flexibility and increased learning capacity

The innovation networks are flexible and open to different stakeholders. Different types of cooperation models are possible that allows for combining public and private sector contributions in different ways, though constrained by the limitations of what the political and organisational cultures allow. In other words, by starting with a public-private network approach, an experimental setting is provided that allows testing and exploring different models for the realisation of service innovations. This offers to both public and private sector partners a broader scope for learning than single sector approaches. Firms have got increasing learning capacities as results of the collaboration with public partners, and vice-versa.

References

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Chapter 8: Policy aspects of ServPPINs

Services constitute a major share of the economic activity in all European countries. The development of the service sectors in various European countries took different routes and patterns, as has been laid out in WP1, and different models of service development evolved over time. Service growth was driven by various factors. Innovation, besides changes in final and intermediate demand, was one of them.

ServPPINs can contribute to the development of the service economy in Europe, because they are capable of performing some specific tasks in the innovation process:

- ServPPINs can utilize complementarities and synergies between heterogeneous partners in the process of knowledge creation;
- They facilitate the match between technology and demand by involving consumers, NGOs, etc.;
- They help to translate social preferences not reflected by market prices into demand;
- They account for the growing complexity of many contexts and technologies;
- They support systemic innovations and transformations that require the involvement of a large number of heterogeneous partners.

The aim of this chapter is to address policy issues around ServPPINs and service innovation in general. We bring together the results of the theoretical and empirical work packages of ServPPIN with recent concepts of science, technology and innovation policy. We will first discuss the rationales for policy intervention – the reasons why policy could or should interfere in the innovation processes of private firms. In addition, it is also necessary to discuss the rationales and characteristics of public sector innovation in order to understand policy rationales with respect to ServPPINs. In a second step, we will discuss possible policy interventions in three fields related to ServPPINs.

The policy context of ServPPIN

The new Europe 2020 growth strategy highlights the need to strengthen economic growth in Europe with a stronger focus on the social and environmental dimension. This means promoting EU smart growth based on knowledge and innovation as main drivers of growth, being inclusive; aiming at high-employment, but still delivering social cohesion, and sustainable; both in a competitive and environmental (resource-efficient and greener) terms.

This underpins that strong influence is expected on research and innovation policy in order to achieve new and promising processes ensuring that innovative ideas can be put in the market and create growth, quality jobs and help address European and global societal challenges. But, to succeed, this must be combined with entrepreneurship, finance, and a focus on user needs and market opportunities. In this context and regarding the area “8.1.2 Structural changes in the European knowledge economy” of the call, ServPPIN addresses how public and private services are agents and receivers of structural change, facing knowledge challenges by the ways of service innovation and, in particular, by new collaborative agreements and networks emerging from the public-private interactions.

In this sense, service-oriented innovation policy is not necessarily aimed at specific individual’s service sector: in contrast, it can be seen as a predominantly horizontal policy, going across sectors, based on service innovation being considered as a systemic dimension useful for any kind of economic activity, thus, encouraging the development of public-private innovative networks.

Rationales for science, technology and innovation policy intervention in services

Policy interventions to address challenges related to innovation of firms are usually discussed in terms of “market” and “systemic” failures (see Rubalcaba, 2006; Steinmueller, 2010 for a recent survey). *Market failure* arises because societal benefits from innovation are higher than private benefits. The classic example is market failure due to the presence of externalities: new knowledge may benefit not only the firm which developed it, but also other firms. These firms, however, do not compensate the creator for this knowledge, which leads – from a societal point of view – to underinvestment in innovation. It could, however, be also argued that this type of failure does not occur because of a market co-ordination failure, but because of bounded rationality of actors which leads to a systematic misjudgement about future conditions. Hence, it may seem more appropriate to speak of allocative failure rather than market failure (Pyka, 2010).

Systemic failures, in contrast, are structural, institutional and regulatory deficiencies as result of poor interactions among economic agents (mostly firms, universities and government) which lead to sub-optimal investment in knowledge creation and other innovative activity (van Cruysen and Hollanders, 2008). The idea of systems failures is based on interactive innovation models that were developed since the 1980s (Lundvall, 1992; Nelson, 1993; OECD, 1992). Core of these models

is that the innovation process is characterized and requires continuous interactions and learning by doing between different actors.

Market (or allocative) and systemic failure arguments have been applied to and extensively discussed in the context of service industries (European Commission, 2009, chapter 3 and 4; Rubalcaba, 2006; Rubalcaba et al., 2008; van Cruysen and Hollanders, 2008). This literature shows that some types of allocative and systems failures lead to underinvestment in innovation in services in particular. This due to the particular characteristics of services and service innovation (see also WP1 and WP2 of the project):

- Services are **immaterial and intangible**, which also implies that they are difficult to store, to export, or to resell by the owner. Another aspect of intangibility is that many service innovations are difficult to protect with patents and other protection mechanisms.
- Services are often **not well-defined, distinguishable products** like physical goods. It is often difficult to say how a service provided from one firm differs from the service of its competitor.
- The production of services often requires the **involvement of the client** ('co-production'), which implies a high degree user intensity, consumer specificity and product variation because many services are customized. The user-producer integration often makes it difficult to distinguish between the production, transaction and consumption stage of a service. Moreover, if services are tailored to the customer's needs, standardization is usually low, and a high degree of trust in user-producer relations is required.
- The high degree of expert involvement and expert knowledge requires a labour intensive, craft-like production process in many services. As a result, services offer only **limited potential for automatisisation** and scale economies.

Based on the specific characteristics of services we can identify areas where allocative and systemic failures seem more likely in services than in manufacturing. Public intervention to foster service innovation seems appropriate in these areas (Rubalcaba et al., 2008, p 55ff; van Cruysen and Hollanders, 2008, p 18ff). Access to external funding, for example, is a central issue for innovation in services, because service firms tend to get public funding for innovation less frequently than manufacturing firms (Rubalcaba et al., 2008, p 80). Another issue are intellectual property rights, which are found less frequently employed in services than in manufacturing firms. Due to the high degree of expert involvement, the supply of qualified personnel seems to be even more crucial for service innovators than for manufacturing firms. Other areas are listed in the two aforementioned publications.

As laid out in WP3, ServPPINs are collaborative alliances between public and private sector organisations; a main driver of ServPPINs is to bring together and develop complementarities and synergies between the different knowledge, competences, and services that each partner is specialised in. This need arises, on the one hand, from the growing complexity of many contexts and technologies, which requires heterogeneous knowledge. On the other hand, recent developments in public management make it necessary to think of public-private collaboration in broader terms, not just financial.

This collaborative element of ServPPINs makes policy rationales that relate to systemic failures arguments particularly relevant for this study. This also includes the concept of evolutionary (in)efficiency discussed in WP 3. Both ideas, systemic failures and evolutionary inefficiency, are rooted in neo-Schumpeterian, evolutionary economics and industrial dynamics (Hanusch and Pyka, 2007; Metcalfe, 1995) which assumes true uncertainty, bounded rationality of agents and rejects the equilibrium assumption of neoclassical economics for the analysis of innovation and technological change. Hence, concepts of allocative failure – which is, in the end, policy intervention to restore a socially efficient allocation of resources – are rejected by this literature. However, we do not consider allocative

failure as irrelevant for ServPPINs. Results from the case studies reveal for example that the access to finance is a crucial problem for the development of innovations in ServPPINs.

From policy rationales to policy intervention

ServPPINs can successfully deliver services innovations, and they are particularly well suited for systemic innovation requiring the integration of a diverse range of competencies from public and private sector organisations. Providing conducive conditions for and support to this kind of networks should thus be facilitated by policy.

There is, however, no simple rule on how to foster and develop public-private innovation networks that would allow an easy prediction of success or failure based on the types of actors involved or where the initial initiative came from. Instead, several different development models exist, for which equally different intervention strategies need to be established. This makes it difficult to formulate general principles of how to promote ServPPINs. Moreover, public policy has two fundamentally different inroads available to influence ServPPINs, namely either to act as a member or leader of a ServPPIN, or to establish conducive framework conditions and targeted support measures (e.g. collaborative research funding, symbolic support, etc.).

The results of the project suggest three broad areas of possible policy intervention. All three areas are targeted towards more growth through the stimulation of innovation in services and ServPPINs in particular.

Strengthening service-specific innovation and innovation capabilities of firms

WP 1 shows that services are among the most dynamic industries and account for a considerable share of growth and welfare in European countries. To increase these contributions policy should strengthen service-specific innovation and the innovation capabilities of service firms. The case studies have pointed to various areas for policy intervention. Some of these areas have also been identified from previous studies on innovation policy in services (Cunningham, 2008; Rubalcaba et al., 2008; van Cruysen and Hollanders, 2008).

Funding

A lack of finance turned out to be an important barrier to network development. It seems to be difficult for heterogeneous networks to mobilize support to an extent that generates the funding necessary for setting up an innovation activity. Possibly, innovation networks are perceived as being more risky than conventional single-organisation innovation activities, for which venture capital and other sources of funding can be mobilized more easily.

The funding problem is not ServPPIN-specific. According to van Cruysen and Hollanders (van Cruysen and Hollanders, 2008), CIS4 results indicate that a lack of finances is widespread among both, manufacturing and service firms. Services may be less dependent on external funding than manufacturing firms because of lower overall innovation cost; however, service firms may have even more difficulties to find financing from banks or venture capital markets because of their often intangible innovations.

Policy should try to improve access to external financing and design public support for innovation in a way that does not exclude services and non-technological innovation. Special focus should be laid on start-up phase of ServPPINs. Funding is more important in the early stage whereas demand-side instruments (e.g. procurement, regulation) matter more for the later stages. ServPPINs also require different forms of support than individual organisations,

which tends to be neglected in funding schemes. Funding opportunities for ServPPINs have support a network, not a individual firm, and the network may change over time. In terms of evaluation, it is often difficult to say if the network has been successful, because success is less clearly cut than it may seem at first sight. A successful network does not necessary have to exist forever, but it can also be replaced by a different organisational configuration (e.g. by creating a more hierarchical entity) once the innovation has been developed and is being realised at a large scale.

Awareness and training

The case studies have pointed out that individuals and their competencies in keeping together a network and bringing different actors together are key for success. Hence, management competencies are key for the growth of ServPPINs. Policy could foster the emergence of ServPPINs by raising awareness for these specific needs and providing potential actors in ServPPINs inside the public administration but also in firms with the necessary skills to succeed.

In addition, public policies should also support the training of qualified personnel for service innovation in general. Due to the heterogeneity of the sector, it is difficult to say what type of qualification is needed in particular; services require a wide range of qualifications. Hence, more education with a focus on new services skills, specific skills needed for non-technological innovation, vocational training and more mobility of personnel would increase the supply of qualified personnel for service innovation.

Intellectual property rights and standards

In heterogeneous networks the commercialisation and protection of an innovation may be more complicated than inside a single organisation. Various actors may have different opinions about commercialisation; universities tend to publish and disclose their results, while firms try to protect the results from duplication in order to maximise commercial returns. It is thus essential to define IPR issues at the beginning of a ServPPIN; policy could help by raising awareness for IPR issues in services.

The case studies have also showed that standard-setting is important when it comes to moving a network to the phase of wider uptake and diffusion of a service innovation. Many service innovations rely increasingly on IT-based infrastructures, for which common protocols and standards are crucial. The areas of transport and health services provide many examples of this, but also in tourism and knowledge-intensive services cases could be identified where standards were crucial for success. Policies to foster standardisation in services could also facilitate the emergence of ServPPINs.

Adapting innovation policies to the needs of services

It has been argued in WP 2 that public policy is taking too little notice of the specifics of service innovation. Public support schemes are still focussed on science-based, technological innovation predominantly found in manufacturing. As a result, public policies for innovation may be biased towards innovation in manufacturing and towards science-based and technological innovation, leaving other, non-technological forms of innovation aside. This may lead, as a consequence, to less support for innovation in a number of service industries and service-specific innovation in general.

It is thus necessary to emphasize innovation and R&D policies that consider the specific features of services. In other words, policies need to deal with the special characteristics of some types of services innovation including support for non-technological forms of innovation. Again, there is a considerable degree of heterogeneity within services: evidence from the CIS shows that public support for innovation in KIBS is on par with support for innovation in manufacturing, while other services have considerably lower shares of firms that received public support

(van Cruysen and Hollanders, 2008). It is also necessary to support services innovations (and more generally non-technological innovations) within manufacturing industries. Public policies should also support the development of specific skills needed for non-technological innovation via the education system.

Facilitating co-operation and networks involving service firms

A second important task of public policy with respect to ServPPINs is to facilitate co-operation and networks of service firms. Empirical evidence from the CIS reveals that service firms are less likely to co-operate for innovation. In particular, co-operation with universities is considerably lower in services than in manufacturing industries (see also WP2). One noticeable exception are knowledge-intensive services. The lower co-operation rate is, at first, linked to a lower innovation intensity in many services which in turn also reduces incentives for innovation co-operation. However, the finding may also point to systemic failures or network inefficiencies in the case of services. In other words, innovation performance of services could be increased, if additional links with other firms, universities or the government are established. Systemic failures may be related to missing institutions, the inability of the system to function free in the presence of externalities, or path dependency leading to 'lock-ins' in the course of the establishment of a technological system.

There are two fundamentally different ways for policy to influence ServPPINs and reduce network inefficiencies. First, policy can establish conducive framework conditions and targeted support measures to encourage co-operation and the emergence of networks (Cunningham, 2008; Rubalcaba et al., 2008; van Cruysen and Hollanders, 2008). This includes measures to enable firms for co-operation. Service firms often lack the necessary resources for establishing and maintaining for long-term co-operation. In addition, service firms may also lack the necessary absorptive capacities to utilize external knowledge and benefit more from co-operation. Public policy may also enhance interaction by directing funding to networks, rather to individual firms. Public policy could also support match-making and help in the identification of potential co-operation partners. It has also been suggested to increase science-business co-operations with the promotion of academic spin-offs and the establishment of science and parks, where exchange between universities and firms is encouraged by proximity. Another crucial factor is trust, which is an important resource for reducing transaction costs in the network. Trust, however, is difficult to create by public policy. The case studies show that trust is based to a considerable degree on experience from previous contacts. Programmes that foster research co-operation, like the framework programmes, or platforms that promote other forms of exchange, like the European Technology Platforms (ETPs), Joint Technology Initiatives (JTIs), or similar activities can therefore be regarded as measures to build up trust that facilitates future network formation.

A number of countries have already taken up these or similar measures. However, as noted above, there is still a bias towards science-based, technological innovation in these programmes, and a bias towards manufacturing industries (see also Cunningham, 2008).

A second way for public policy to support and guide the emergence and development of ServPPINs is to act as a member or even a leader of such a network. In particular, public sector actors can play a pivotal role in ServPPINs that realise systems innovations, and are crucial in areas where services of public interest are to be provided and modernised (e.g. in health or transport). The case studies have demonstrated that an individual key actor is often crucial for initiating a ServPPIN and driving it forward. This can be a private entrepreneur, a policy-maker, or a representative of a local community. Private and public actors complement each other in a double leadership in some cases. This can take the

form of complementary roles of both parties, or in a division between internal and external tasks. Double leadership can also ensure better support in their respective sectors. This form of leadership also points to the social aspects of the networks. It is often based on social factors such as personal links and prior acquaintance ('entrepreneurial fit').

The pro-active role of a public network leader turns out to be a very important determinant of success in some cases. A pre-requisite for such an active role of public actors is that these actors hold key positions in their own organisations, which enables them to ensure long-term commitment. Hence, the extent to which 'public entrepreneurship' can unfold is a matter of the degree of autonomy of civil servants, which, in turn, depends on the organisational and political cultures in place in various countries.

Empowering the public and the Third sector for co-operation

The results of the project also highlight a need for change in the public sector. The project acknowledges that the first priority for public services is NOT to be innovative – public administration has to carry out laws, and many other public bodies directly act on behalf of laws. However, these activities can be organized in different ways, and there is an undeniable lack of efficiency and service innovation in some public services across Europe. This should, however, not automatically lead to the conclusion that employment in public services has to be reduced; instead, what is needed, is more innovation and a better performance, both in terms of quantity and quality, of public services. Moreover, inefficiencies may also be difficult to identify because of externalities; public services may be inefficient in itself, but unfold benefits in other sectors of the economy.

There are various ways to spur innovation in public services. First, ServPPINs require a great deal of flexibility from public sector organisations, which are often said to show a rather limited flexibility only, in organisational as well as in contractual terms. The extent to which 'public entrepreneurship' can unfold is a matter of the degree of autonomy the public administration is willing to assign to civil servants. The case studies show various examples of public sector entrepreneurs that are the driving force behind network evolution. Public actors are confronted with major difficulties and barriers when it comes to adjusting to new innovation perspectives and to changes in the research context over time. New organisational models for public and semi-public actors are thus an issue that needs further research. Setting up dedicated entities in public or joint public-private ownership may offer on the one hand the necessary flexibility and on the other hand the embedding in the public policy context. Favouring experimental approaches is vital for learning more about the operation of such models. It may also be advantageous to equip public services with autonomy and some experimental funds to try something new.

Second, policy should also help administrations to link to science. Connecting the administration to science may help to avoid evolutionary inefficiencies and would help the administration to pick up innovation and science in general. One way to bring administration closer to science is more scientific training for the administration. Third, it has been suggested to introduce (private) incentives into public services for the development of ServPPINs and public-private co-operation. Entrepreneurial initiative is not located in the private sector only.

In addition, the results point to the need for more and new forms of collaboration between public and private services. This also includes going beyond the traditional division between public and private. Here, it is important to distinguish ServPPINs from public-private partnerships which generally aim at realizing public-private investment projects, but do not have a strong innovation component. We should not

go for private or public models BUT for the interrelationships between both types. The analysis revealed a considerable variety of patterns in terms of actor configurations (degree of involvement of public, private and third sector organisations) and actor initiative (e.g. bottom-up versus top-down). Interestingly, the type of actor configuration does not seem to be a major factor influencing the success of a network.

The public sector should not monopolize public services; civil society, end users (social innovation) and the Third sector may provide them more efficiently. Humanitarian organisations, NGOs, local tourism boards, etc often initiate networks and act as a mediator between public and private partners and between demand-side and supply-side of innovation. Policy should take the specific role of this type of organisations into account in the promotion of ServPPINs and various modes of cooperation between public and private sectors should be exploited. Public and third sector institutions, and sometimes policy, provide a context and an incentive to establish public-private networks, but they are less decisive for the innovation process within the network and the maintaining of the network. The role of the public sector is more than that of a facilitator of networks and all kinds of interactions. From a macroeconomic perspective, mixed services play a role in economic growth and economic performance (public-private combinations) and increase productivity of other economic industries and areas.

Policy support over the life-cycle of ServPPINs

The nature of innovation and possible obstacles to innovation considerably change over the life-cycle of a ServPPIN (Pyka, 2010). The rationales for policy intervention therefore are also likely to change over the life-cycle.

In the early stages of a ServPPIN, a central function of public policy is funding. Moreover, there are some examples where the public sector has taken the leading and coordinating role in the initial phases of the network life cycle, given the appropriate competencies and capacities were in place. Innovation policy should also aim at creating conditions which allow a variety of actors to join the network to ensure a broad knowledge base.

In the later stages of the life cycle in the course of network evolution, the shift from a local, experimental network to a larger scale activity is probably the most critical phase. This step is characterized by professionalization and broader geographic coverage. The goal of public partners at this stage is accompany the network. Standard-setting to support the emergence of a dominant design is another public task which becomes important at this stage of a service innovation. Moreover, demand-side instruments (e.g. procurement, regulation) matter for these later phases of network evolution.

It has to be noticed, however, that policy intervention is not necessary in all cases. Successful networks tend to create their own internal drivers, by establishing joint visions to support commitments and mobilisation, or by establishing new types of internal learning mechanisms. Moreover, there is no uniform pattern of evolution along various stages in the life cycle of a PPIN, either. Both, top-down and bottom-up networks can succeed. In the latter case, a crucial task of public policy is to replace the pioneer spirit by more permanent social structures ('scene-makers' vs. 'scene-takers') in the course of the life cycle. Top-down networks, in contrast, may need to nurture co-operative mechanisms in order to ensure sustainable cooperation. The examples studied show that the balance of power, e.g. between public and private sector organisations with their respective rationales, may well change in the course of network evolution.

Finally, ServPPINs frequently, for various reasons, cease to exist. This, however, should not necessarily be seen as an indication of its failure. Some networks have simply fulfilled their purpose of enabling the shaping of an innovation that is subsequently implemented in a market-based or hierarchical setting. In other cases, new networks may be created on the basis of the social and professional ties that resulted from the previous network.

To sum up, policy intervention with respect to ServPPINs may touch various fields. They include, at first, policies to promote **R&D**. Here, more joint participation of public and private partners, the promotion of engagement in R&D activities and more projects for further research on services, public-private interactions, innovation networks and social innovation seem desirable.

Second, **Innovation policies** should focus more on the support of public-private innovative networks beyond PPP and foster support to service innovation, clusters and innovative industrial policies.

Public procurement can also levy ServPPINs, in particular during the phase of consolidation. Public procurement can promote innovation and quality, and increase networking between public and private partners. The consolidation of ServPPINs can also be supported by standards.

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Chapter 9: Summary, major findings and future research

ServPPIN is a research project that focuses on the contribution of public and private services to European growth and welfare and on the role of public-private innovation networks (PPINs). Public-private innovation networks are conceived as flexible organizational platforms that allow the merging and sharing of dispersed knowledge among participants as well as sharing the risk of financial engagement in uncertain innovation processes. In addition, they bring together and develop complementarities and synergies amongst public and private service organizations.

Understanding the role and impact of public-private services is a major research undertaking that requires breadth in scope and detailed in focus. Thus, an integrative analysis at the macro, meso and micro levels is followed. The project is organised around 9 working packages (WP), applying their research at those levels. In particular, the WP 1, 2 and 3 focus on the present and the future most relevant aspects of the service economy, service innovation and networks analysis. WP 4, 5 and 6 brings the analysis at a more specific level, undertaking case studies on public-private innovation networks in the field of health, knowledge-intensive and

tourism, and transport services. WP 7, 8 and 9 are the tools by which the work of elaboration of policy implication, diffusion of knowledge and management of the project is planned and realized respectively.

This synthesis aims at integrating the main theoretical and empirical findings of the project. The emphasis is put on the theoretical review work and the insights gained in the context of the different levels of empirical work.

The role of public and private services in European economies

At present, the most advanced and developed nations and many developing and transition economies are service-based societies. Over the last decades, economic growth, wealth creation and the composition and structure of employment have been affected by the expansion of the tertiary activities which have grown within a type of 'servindustrial' society where interrelations between goods and services are of primary importance (Rubalcaba and Di Meglio, 2009; Maroto, 2009). Moreover, contemporary service economies are facing several challenges as regards the sources of structural change (Savona and Lorentz, 2009), the patterns of transition economies (Burger and Stare, 2010; Palócz and Oblath, 2010), environmental issues (Djellal and Gallouj, 2009; Gadrey 2009a), social considerations (Gadrey, 2009b), gender and job quality topics (Iglesias-Fernández et al., 2010; Dueñas-Fernández et al., 2010) and the internationalization of service activities (Visintin, 2009).

The ever-increasing and dynamic role of services in modern societies has led to increasing levels of interaction between public and private services and to the development of mixed forms (Rubalcaba and Di Meglio, 2009). Beyond PPP there is a variety of organisational arrangements for services provision in which both the public sector and private agents (private firms, non-profit organizations, and voluntary associations of citizens) may cooperate and interact (Di Meglio, 2010). In this framework, ServPPINs have emerged as an important organisational mode between public and private sector organisations. These *collaborative alliances* bring together and develop complementarities and synergies between the different knowledge, competences, and services that each partner specialises in. ServPPINs are a new phenomenon; one which is now being observed across the EU. This phenomenon differs to previous trends, such as the privatisation and outsourcing of public service provision, and contractual public-private partnerships (PPPs) in which service delivery or the financing of infrastructure is undertaken by private sector businesses. Understanding the drivers, barriers and dynamics of ServPPINs within a broader macro context in which services and innovation in services play a central role is a major task undertaken by this research project.

At present, the dominant trend across the enlarged EU is towards the increasing participation of private services in total employment, although a diverse macro and meso mapping of service economies can also be found (Di Meglio et al., 2010a). Within Europe, five service economy models emerge: Anglo-Saxon, Nordic, Continental, Mediterranean and Central Eastern European. This classification is strongly correlated with classifications based on welfare state systems and systems of capitalism. In this way, the main orientation of the varieties of service economies identified is closely connected to the diversity of social models, as well as to differences in the institutional organization of production. The variety of service economies in the EU can be explained on the basis of the different roles played by factors such as the state, social and demographical changes, labour market institutions and EU15 membership (Di Meglio et al., 2010b). In particular, previous historical developments matter when explaining the dynamics of services employment growth across the enlarged EU (Stare and Jaklič, 2010).

Private and public services have made significant contributions to aggregated value added, employment and productivity growth in the EU in recent years

(Maroto 2010a and 2010b). However, their impacts should also be assessed beyond the input/output relationship, on the basis of a multidimensional approach which takes into account outcomes and quality aspects (Di Meglio et al., 2009). While the outputs relate to the immediate impact of a service provision; the outcomes refer to its effects in the medium/long term; influenced by external factors such as lifestyle or socio-economic background.

Public and private service innovation and impact assessment

In modern service economies, a problem lies in the definition and measurement not only of performance but also of innovation (Djellal and Gallouj, 2009a). One can identify a "performance gap", which measures the difference between the reality of performance in an economy and the performance assessed by traditional economic tools (mainly productivity and growth). It reflects a hidden performance, invisible to these tools (performance in terms of sustainable development, from the socio-economic and ecological viewpoint). In the same way, contemporary advanced service societies are also characterized by what could be called an "innovation gap". Strictly defined, this innovation gap measures invisible or missing innovation, that is the difference between what the traditional innovation indicators (R&D, patents, the technologist definitions of innovation) are capable of capturing, and the reality of innovation activities undertaken in a given economy.

The "gaps" relating to innovation and performance blur the innovation-performance relationship. In order to carry out their diagnosis, public policies generally favour the relationship, which links visible innovation (mainly technological innovation: which is based on R&D and which gives rise to patents) to visible performance (growth, productivity), whereas other relationships involving invisible innovation and invisible performance should be taken into account.

As regards innovation and its nature, it becomes clear that old myths that considered innovation in services as lagging behind manufacturing cannot be upheld anymore. Services are very active in terms of innovation in all developed countries, particularly some categories such as knowledge intensive services. Furthermore, it cannot justifiably be argued that innovation occurs only when a novelty is embodied in a technical system. Non-technological or intangible innovations (i.e. organizational and marketing innovations) play an important role in manufacturing industries and, particularly, in services. This form of innovation may be identified not only in knowledge intensive services (KIBS, banks, insurance firms), but also in services that are often considered to be less noble or less knowledge intensive (transport, cleaning, elderly care, tourism) or in public services (Langergaard and Scheuer, 2009) as well. Even though market and organizational innovation have been recently included in the Oslo Manual, progress is still needed as regards the coverage of non-technological product innovation, non-technological process innovation, ad hoc and tailor-made innovation, social innovation, innovation in public services, and innovation in complex packages called new formulas or new concepts.

At present, the open innovation model seems to be more relevant than the traditional linear (or closed) model which seeks to apply to services existing industrial models. Open innovation is a broad concept, which encompasses different practices which have the particularities of being cooperative, interactive, non-programmed and non-necessarily formalized. Diverse models are comprised in this category including: interactive, rapid application, practice-based, bricolage innovation model (Fuglsang, 2010a) and ad-hoc innovation. Public and private cooperation within services, which we have called PPINs are also part of innovation models.

Concerning cooperation and interaction between public and private organizations, it is found that the main (external) sources of information used in

the innovation process are: clients, suppliers and competitors (Fuglsang, 2010b; Gallego, 2010; Savona and Musolesi, 2010; Windrum et al., 2010). According to recent surveys conducted in EU (CIS), universities and public research laboratories are the sources of information which receive the lowest scores. However, it should be noted that conference and scientific journals receive high rank scores, which means that business respondents may have indirect relationships with academic bodies.

In modern economies in which the boundaries between goods and services are blurring, service innovation is best addressed by an *integrative or synthetic* perspective (Gallouj and Savona, 2009) which seeks to provide the same analytical frameworks for both goods and services, and for both technological and non-technological forms of innovation (Gallouj and Toivonen, 2009; Windrum, 2009). Instead, an *assimilation* perspective is, to some extent, still prevailing. This approach analyses innovation in services just as innovation in manufacturing, focusing on their relationships with technological systems. The dominance of this perspective becomes clear when it comes to public policies. Public policies for innovation suffer from a double bias: they are manufacturing and ST biased. They tend to: focus on public research and industrial sectors, in particular high technology; promote technological innovation (based on scientific and technical R&D activities and patents appropriation); favor scientific and technological training.

Policy should move towards the integration perspective and promote invisible innovation. It is thus necessary to emphasize policies which also favor non-technological forms of innovation and R&D. It is also necessary to support services innovations (and more generally invisible innovations) within manufacturing and agricultural sectors. Public policies should also support (in the education system) the development of specific skills needed for non-technological innovation. All services are concerned by these innovation policies, but some sectors appear to be more concerned than others (KIBS, proximity services or public services).

On the concept and role of public-private innovation networks

Our project deals with the phenomenon of innovation networks between private and public actors in the service industries, the so-called ServPPINs. The basic functions of ServPPINs are: to coordinate innovation cooperation between public authorities and private businesses; to bring together and develop complementarities and synergies amongst public and private agents in services; to promote structural and technological change in other sectors of the economy; to identify and allow for mutual positive feedbacks between growth and welfare. From an empirical angle ServPPINs are an extremely heterogeneous phenomenon as regards actors, purposes, organization of the network and dynamics.

So far there has been no theoretical alertness of ServPPINs in mainstream economics. Therefore, developing an economic theory of ServPPINs demands an eclectic approach combining the fields of innovation networks in industrial economics (private perspective) and the application of new public management concepts to innovation networks to reflect the role and rationale of public actors (public perspective). The *integrative or synthetic* approach in service economics already shows a close affinity to the theory of industrial dynamics which we draw upon for identifying the effects of innovation networks as well as the role of learning in networks.

In addition, the so-called network theories are suited as an analytical approach to describe ServPPINs. They provide an abstract representation of networks, acknowledge for heterogeneity of actors and their different roles in the network. They allow for a description of network architectures and dynamics as well as comparison of different networks.

The ServPPINs we are observing in our case studies are anything else but constant and stable formations but continuously change in time depending on the stage of knowledge and market development. From this description it clearly turns out that ServPPINs are both complicated constructs composed of heterogeneous actors interacting in various domains, and complex formations changing their structure and nature in time. To acknowledge for the large heterogeneity of actors and the complex interactions between them we have developed a multi-agent framework referring to the multi-characteristic approach in demand theory (Windrum, 2009). To acknowledge for the complex dynamics the theory of industry life cycles have been developed further to a theory of innovation network life cycles.

A taxonomy of ServPPINs applying social network analysis has been built in order to derive policy conclusions which do differ substantially from more conventional ones because of the uncertain character of innovation, the focus on processes instead of equilibrium and the heterogeneous character of involved agents. ServPPINs are inevitably confronted with true uncertainty which is a constitutional element of innovation. If innovation processes are treated realistically, they are no longer to be envisaged as optimization processes but as a cultural evolutionary process. This has strong consequences for innovation policy since policy designs to intervene in ServPPINs cannot be exclusively based on repairing market failures. Instead of pursuing a static social optimum, innovation policy needs a process-orientation which is in line with the systemic and evolutionary approaches in innovation economics and advises a rationale for innovation policy which focuses on the avoidance of bottlenecks. Innovation policy has to be designed and evaluated according to the ability to avoid evolutionary inefficiencies whenever possible. As evolutionary inefficiencies we define situations which clearly restrict potentials for future development, such as:

- Exploration inefficiencies (e.g. an economy biased towards applied research)
- Exploitation inefficiencies (e.g. low research intensity caused by the not-invented-here syndrome, missing absorptive capacities, or shortage of adequate competences in labour force, etc.)
- Balance inefficiencies (e.g. lock-in effects, too early rejection of promising knowledge, too late exit from exhausted knowledge)
- Network inefficiencies (e.g. missing and/or malfunctioning links among actors participating in the innovation process, too large size of the network)

In particular, network inefficiencies are identified as promising targets for policy intervention. The creation, the growth and the closure of ServPPINs can be influenced by innovation policy instruments. Public actors themselves can enter innovation networks and play important roles as network facilitators or network triggers in order to correct for the above mentioned evolutionary inefficiencies through, for instance, the advance of knowledge transfer between basic and applied research by strengthening university-industry-linkages. But policy cannot restrict itself to the initiation and creation of such networks but has to accompany them in a pro-active way, influencing their composition, development and structure wherever necessary or desirable.

Lessons from case studies

Case studies provide a micro-perspective on the emergence of innovation networks over their life cycles and can give insight into drivers, actor configurations and critical events of their evolution over time. In 2008/2009, the project teams studied approximately 40 cases in the following services sectors: health, knowledge-intensive services and tourism, and transport. The case studies were carried out in seven different countries. A common research framework was

developed for the selection and implementation of the case studies (Weber, Windrum and Sundbo, 2008). Another major feature of the project has been the development of a common set of Operational Research Questions for all case studies (Green, 2008).

ServPPINs in health

The 10 case studies carried out have yielded a set of 'stylised facts' about ServPPINs in the health sector:

- ServPPINs are organisational networks, not social networks. They are alliances between public, private and third sector organisations, and typically contain a small number of these organisations (between 2 and 5).
- ServPPINs are professional networks. A striking feature of is the absence of end users(i.e. patients) in the case study networks. This is despite the fact that health policies in many of the countries which we studied have been encouraging greater direct patient participation in health. It is also striking given the growing academic and policy literature on the importance of user engagement in innovation. This does not appear to affect the functioning of our health ServPPINs, or be a critical factor affecting success or failure of their innovations. It may be that health practitioners' knowledge of patients' clinical needs and long-standing interactions with patients, plus the trialling of innovations and the advocacy role played by Third Sector partners in these ServPPINs may explain this.
- Third sector organisations play a key role in the construction, management and leadership of health sector ServPPINs.
- ServPPINs are goal orientated networks. They typically come together to develop a particular research project and then disband. One should not mistake the ending of a ServPPIN as an indicator of failure.
- Social and business networks do have a role to play. There is evidence that ServPPIN partners have prior experience knowledge of one another, either as organisations or through personal ties. Partners in one ServPPIN project may subsequently meet up in another project.
- Network composition is an important feature in ServPPINs. There needs to be complementarities between the competences of partner organisations, and with regards to access to finance and other resources. Further, commensurability and non-rivalry is found to be a key factor where more than one partner is from the private sector or third sector.
- The roles played by individual public and private sector entrepreneurs are essential for success. First, these entrepreneurs need to hold key positions within their own organisations, enabling them to ensure long term commitment of resources and the support needed to develop the ServPPIN innovations. Second, these entrepreneurs need to be able to understand the different contexts and backgrounds of their partners in order to overcome the binary divide between public and private sectors.
- Trust is a distinguishing feature of the health ServPPINs. The fact that formal contracts are only seen in half of the cases can in part be explained by good understandings of partners and previous connections between key members. Just as important is the non-rivalrous composition of the members. Each has different needs and interests. One may be interested in the commercial exploitation of the innovation, while another gains from the clinical benefits of using the innovation in practice.

- Enrolling practitioners: a key factor determining the take up and diffusion of the innovation is the ability to enrol medical practitioners (doctors and nurses in hospitals and/or family doctors and practice nurses). Networks benefit strongly from having a prestigious medical practitioner or representative group within their membership.
- External factors: external as well as internal factors can affect the innovative success of a ServPPIN, although it is noticeable that external factors are not cited as frequently. The two most noted external triggers of innovation are (1) structural reorganisation – where policy makers shift responsibility for service provision from one organisation to another, policy forces change to the internal structure of an organisation, and (2) funding incentives.

These stylized facts can guide the development of new metrics needed to measure ServPPINs, and provide insight into policy discussions.

ServPPINs in knowledge intensive services and tourism

The 16 case studies carried out have yielded a set of main findings about ServPPINs in knowledge intensive services and tourism:

- Many types of public-private networks (top-down/bottom-up; initiated by public, private or semi-public organizations) can lead to innovation success in these sectors. Therefore, there are no particular patterns or necessary conditions that must be fulfilled in order to achieve innovative success in ServPPINs.
- When the network is initiated by a public organisation, then, if the crucial element is an entrepreneur, the network goes through a life cycle with three stages: 1) prototype- industry, 2) commercialisation and entrepreneurial activities, 3) consolidation and firm growth; if the crucial element is an organisation, then the life cycle is denied. When the network is initiated by a semi-public organisation, then the life cycle is true in any case, both when the crucial element is individual entrepreneur or an organisation. A different life cycle is also found: from ad hoc entrepreneurial to permanent learning networks.
- Third sector organisations and semi-public institutions play a key role in the construction, management and leadership of in knowledge intensive services and tourism ServPPINs.
- The drivers of innovation found within knowledge intensive services and tourism ServPPINs are: (1) External events (technology, market demands, market threats, quality problems, knowledge complementarity); (2) Personal and social factors (entrepreneurs, basis in local community, etc); (3) Public or semi-public institutions (public programmes, public regulations, public institution support, semi-public coordination). All these drivers (internal and external) are important and may be found in different combinations in the case studies.
- The barriers to innovation found within knowledge intensive services and tourism ServPPINs are: (1) Network competence problems (capacity, lack of complementary competence, lack of ability to utilise a competence of the other partner, lack of orientation towards open innovation, entrepreneurial exit, time factor); (2) Public-private differences (trust, rigidity in the public sector, interest conflict, different cultures, unbalance between firms, firms too small, lack of local community support); (3) Appropriability problem (knowledge services intangible, short-term profit perspective in private firms); (4) External factors (capacity of adaptation to new technology, lack of skills, lack of venture capital, economic cycles). In the case studies, the main barriers

found lay within the network and in the parties themselves. Thus, the internal ones count for much more than the external ones.

- The social aspects of the network are important and may play a role in innovative success. The networks are also a place for social interaction and the building of social relations outside the innovation purpose. Social relations may pave the way to future collaboration relationships.
- In some networks, entrepreneurs are crucial for the maintaining of the network and innovative success. The cases have also revealed the importance of the existence of two entrepreneurs – one from each sector.
- Inter-firm competition and large companies' powerful position are factors that may create imbalances within the network that may hamper cooperation.
- The case studies have discovered a new type of service innovation that can be added to the ones that are normally referred to (product, process, organisation, market and business model): educational or pedagogical innovation. In several cases where the KIS was educational services, the product innovation has been new forms of education. In one case, the pedagogical approach of the management towards a particular type of employees was an innovation.
- Several arguments may suggest that public-private networks are more successful in developing service innovation than pure public sector or private sector: (1) complementary assets between public and private actors, (2) flexibility, (3) more business-relevant and efficient public research, (4) increased learning capacity.
- Policy should acknowledge that network matters. Public-private service innovation networks work within knowledge services and tourism thus it is beneficial to bet on them. Public effort in the form of awareness campaigns, committees, incitement institutions, opening the resources of research institutions and funding leads to establishment of networks and innovation. Public effort can also be important in the late stage where the networks should be more institutionalised and managed to continue. Effort made at all levels – national, regional, local and EU – matters.
- Policy should support the function of KIS network. Public-private innovation networks as open platforms for innovation and public economic support to different stakeholders – institutional actors, business actors or individuals – that enter the innovation processes can be a good combination, particularly in tourism. The political system and the firms participating in the network should be aware that innovation processes in public-private networks take time.
- Political barriers for ServPPINs may be found. Ideology still plays a role and may prevent public-private networking. Often barriers to successful innovation in public-private innovation networks are at the local level. Municipalities and communities must change their attitude towards the task.

ServPPINs in transport

The 12 case studies carried out have yielded a set of main findings about ServPPINs in transport:

- Most of the ServPPINs are large scale and aim at integrating several transport modes with the intention to change the mobility behaviour of the population of an entire region towards more environmental friendly transport modes. In the majority of cases the network comprises more than 10 partners. Most cases were initiated top-down by the public sector with a central agency acting as a key actor.

- Public research organisations and third sector organisations (non-profit environmental and interest organisations) participate in transport ServPPINs only to a limited extent. Furthermore, the cases are characterized by a marginal involvement of users.
- The main driver for the development of innovative transport services is in most cases a sort of “public mission”: the intention to increase the quality and efficiency of public transport. Other drivers are: technological developments, economic and social reasons as well as environmental aspects. Also, New Public Management (NMP) and public procurement processes stimulated various types of public-private-participation schemes for providing public services. However, in none of the cases customer demands lead to the implementation of new transport services.
- In transport, public and semi-public institutions can be decisive for the success and sustainability of ServPPINs mainly by being important partners on the demand-side, by providing funding, by defining important institutional and regulatory conditions, and by leveraging cooperation with further partners.
- A key success factor for transport ServPPINs is the definition of a joint business case, in which every partner is aware of his role, contribution and benefits. This includes a clear and simple model for the distribution of intellectual property rights and financial benefits, avoiding conflicts of interest and problems of appropriability.
- The roles played by individual public and private sector entrepreneurs are essential for success. Entrepreneurship is not solely a matter of the private sector, it is equally important in public and semi-public organisations, particularly if the public sector is assigned sufficient autonomy and if the organisational culture is supportive to such a sense of initiative. In several cases, it has been crucial for success that public sector entrepreneurs took a strong lead role in the creation of the network, but that lead role was later on left to one or more entrepreneurs from the private sector.
- A strong leadership, at the strategic and the operational level, proves to be essential to balance the interests of all partners in the network. In several successful cases the existence of a double leadership, one dealing with external entrepreneurship and other with internal project management, can be found.
- The integration of specialised organisations and experts with high reputation, expertise and international contacts proves to be a key factor for the successful definition and implementation of the new services. However, large specialized firms may easily become to dominate the network creating imbalances that may hamper cooperation.
- The compatibility and commensurability of partners is another crucial success factor as well as trust, personal links and prior acquaintance.
- External factors may also affect the innovative success of a ServPPIN. The external triggers of innovation identified are: (1) public funding or other forms of financial support to innovative networks, (2) political concerns and interest, public regulations and new laws.
- The development of the transport ServPPINs induced several organizational changes in public administration. Collaboration with private companies introduces more target-oriented practices which seem to have improved working disciplines significantly.
- ServPPINs were not only successful in developing service innovations; the public-private character presented specific advantages for that purpose. Although it can not be decisively concluded that these networks were

more successful than either a pure public organisation or private service firms would have been, several arguments may support this view: (1) complementary assets, (2) benefits to the partners, (3) flexibility and increased learning capacity.

Policy aspects of ServPPINs

ServPPINs can contribute to the development of the service economy in Europe, because they are capable of performing some specific tasks in the innovation process: they can utilize complementarities and synergies between heterogeneous partners in the process of knowledge creation; they facilitate the match between technology and demand by involving consumers, NGOs, etc.; they help to translate social preferences not reflected by market prices into demand; they account for the growing complexity of many contexts and technologies; they support systemic innovations and transformations that require the involvement of a large number of heterogeneous partners.

However, due to their particular characteristics, innovation in services and the emergence of ServPPINs may be hampered by market failures or allocative inefficiencies and systemic failures or evolutionary inefficiencies. The former comprise private underinvestment in innovation because of externalities, asymmetric information and incomplete credit markets, market power failure due to lack of competition, economies of scale/resource immobility, etc. The collaborative element of ServPPINs makes policy rationales that relate to systemic failures and evolutionary inefficiencies arguments (e.g. capability failures, sub-optimal lock-ins by implementing actors, infrastructure failure, lack of supportive institutions, network inefficiencies) particularly relevant for this study (Pyka, 2010).

The results of the project suggest three broad areas of possible policy intervention to overcome market and systemic failures and increase the contribution of ServPPINs to growth and welfare:

(1) Strengthening service-specific innovation and innovation capabilities of firms, users and other agents.

- *Adapting innovation policies to the needs of services.* Public policies for innovation are biased towards innovation in manufacturing and towards science-based and technological innovation. Policies need to deal with the special characteristics of some types of services innovation including support for non-technological forms of innovation. It is also necessary to support services innovations (and more generally non-technological innovations) within manufacturing industries. Public policies should also support the development of specific skills needed for non-technological innovation via the education system.
- *Funding.* A lack of finance is an important barrier to network development. Policy could support the emergence of ServPPINs and service innovation in general by becoming aware of the 'double bias' and change funding practices in favour of service innovation.
- *Awareness and training.* Policy could foster the emergence of ServPPINs by raising awareness for management competencies needed for their development thus providing potential actors from inside the public administration but also from firms with the necessary skills to succeed. Moreover, public policies should also support the training of qualified personnel for service innovation in general.
- *Intellectual property rights and standards.* Policy can raise awareness for IPR issues and help to regulate commercialisation at the beginning of a ServPPIN. Policies to foster standardisation in services could also facilitate the emergence of ServPPINs. Standards are particularly important in health, transport and IT-related ServPPINs.

(2) Facilitating co-operation and networks involving service and social innovation. There are two different ways for policy to influence ServPPINs and reduce network inefficiencies:

- *To act as a member or leader of a ServPPIN.* The pro-active role of a public network leader turns out to be a very important determinant of success in some cases. Hence, the extent to which 'public entrepreneurship' can unfold is a matter of the degree of autonomy of civil servants, which, in turn, depends on the organisational and political cultures in place in various countries.
- *To establish conducive framework conditions and targeted support measures.* Public policy may enhance interactions by directing funding to networks, rather to individual firms. It could also support match-making and help in the identification of potential co-operation partners. In addition, programmes that foster research co-operation can be regarded as measures to build up trust that facilitates future network formation.

(3) Empowering the public sector and the third sector for co-operation: the role of civil society. The results of the project highlight a need for change in the public sector:

- ServPPINs require *increased flexibility* from public sector organisations, in organisational as well as in contractual terms. Public sector entrepreneurs may be the driving force behind network evolution. New organisational models for public and semi-public actors are also an issue that needs further research.
- Policy should also help administrations to *link to science*. One way to do this is more scientific training for the administration.
- Public sector should introduce (*private*) *incentives* into public services for the development of ServPPINs and public-private co-operation.
- Policy should take the specific role of *civil society, end users and the third sector* into account in the promotion of ServPPINs and various modes of cooperation between public and private sectors should be exploited.

The rationales for policy intervention are likely to change over the life-cycle of a ServPPIN. In the start-up phase, funding, building and mobilizing innovation networks may be the main functions whereas in later stages, the goal moves to professionalize the ServPPIN and support the emergence of a dominant design with standard-setting regulation, and procurement and other demand side instruments.

To sum-up, policy intervention for further development of ServPPINs may touch various areas:

- **R&D policies:**
 - Joint participation of public & private partners
 - Promotion of engagement in R&D activities vs. diffusion of knowledge
 - Projects for further research on services, public-private interactions, innovation networks and social innovation
- **Innovation policies**
 - Support to public-private innovative networks beyond PPP
 - Support to service innovation, clusters and innovative industrial policies
- **Public procurement**
 - Promotion of innovation and quality
 - Promotion of networking between public and private
- **Standards** in services as instruments for public-private cooperation
- **Employment and skills** for social and service innovation
- **Regional policies** for innovation

- Impacts on other policies:
 - Horizontal: internal market, competition
 - Vertical: health, transport, tourism, etc.

Policy-makers should also take into account that heterogeneity across EU countries, service sectors and innovation actors' matters.

Conclusions, future research agenda and policy implications

ServPPIN tackles the key developments and impacts of public-private services provision and of public-private innovation networks (PPINs) at three levels of analysis: macro, meso and micro. At *macro level* the main outcomes of the project are related to new service developments, service innovation and the contribution to growth and welfare. The project studies the stylized facts on public, private and mixed services; their similarities and dissimilarities across the enlarged EU; the challenges of the EU service economy; the explanatory factors of services growth and assesses the performance and efficiency of services.

At present, the ever-increasing and dynamic role of services in modern societies has led to increasing levels of interaction between public and private services and to the development of mixed forms. Moreover, across the enlarged EU, the dominant trend is towards the increasing participation of private services in total employment, although a diverse macro and meso mapping of service economies in close correlation with social and institutional models can also be found. Furthermore, the variety of service economies in the EU can be explained on the basis of the different roles played by factors such as the state, social changes, labour market institutions and previous developments in the evolution of public, private and mixed services. ServPPIN has also proven that although private and public services have made significant contributions to aggregated growth in the EU in recent years, their impacts should also be assessed on the basis of a multidimensional approach which takes into account outcomes and quality aspects.

In addition, the project addresses the different dimensions of public and private service innovation and examines the impacts of innovation on productivity, growth and employment. Services, particularly the knowledge-based ones, are very active in terms of innovation in all developed countries. Besides technological innovations, non-technological or intangible forms of innovations play an important role in services despite not being comprehensively captured by statistics yet. Along with the problems related to the measurement of innovation, lies another one concerning performance. Thus, an innovation and a performance 'gap' are identified in contemporary advanced service economies. ServPPIN aligns with the integrative perspective of innovation in services, also studying service innovation specificities in the field of public services. Public and private innovation networks can be partly related to the 'open innovation' modes and social innovation models which have the particularities of being cooperative and interactive.

At *meso level* the main outcomes relate to theory developments under multi-institutional frameworks, the concept of innovation network life cycle and the study of the role played by evolutionary inefficiencies in the networks. The application of social network analysis allows acknowledging for the heterogeneity of actors in the network and their different roles. From this focus on networks, we derive a new rationale of innovation policy that can be summarized under 'avoiding evolutionary inefficiencies'. This approach seeks to avoid situations which hamper the economic development. Such network inefficiencies concern the amount of existing links among the relevant actors, the size of the network, its structure, and the different roles that the individual actors play within the network. In this perspective, the structures and dynamics of innovation networks become the focus of attention as well as the starting point of action in innovation policy.

At *micro level*, ServPPIN followed a case study approach. In 2008/2009, the project teams carried out 40 case studies in seven different countries in the following sectors: transport; health services and in knowledge-intensive services and tourism. Case studies provide a micro-perspective on the emergence of innovation networks over their life cycle and give insight as regards drivers, actor configurations, impacts and critical events of their evolution over time. The key role played by the third sector and entrepreneurship in many PPINs is stressed which is also closely connected with rising social innovation.

Results have shown the importance of cooperation and interaction in innovative service networking between public and private agents -and civil third sector, allowing exploiting potential complementarities and synergies in areas such as credibility, dissemination, speeding up the process of agenda setting and decision making, more comprehensive view of the problems, legitimacy, resources, efficiency, flexibility, public research more efficient, learning capacity and knowledge transfer. ServPPINs are mainly organizational networks, often small, professional and goal oriented that can be partly considered social innovation in some cases, but they cannot be considered as social networks in full.

The success of service innovation networks can be derived from four main interrelated sources:

- e. *The role of promoters and drivers*-both internal and external- of ServPPINs is essential. Success factors require the definition and implementation of a joint business case, trust -fundamental in many of the case studies analyzed-, a good entrepreneurial fit, flexible structures, use of inputs from benchmarking exercises, and pro-innovation entrepreneurship and culture. Finance also plays a role as well as the establishment of the right strategy between bottom-up or top-bottom set up that may vary depending on the particular service innovation to be developed and the institutional context.
- f. *The integration of a particular individual innovation network within systemic and social network*, what can be reflected in the role of the role of third sector, the integration in local community, and the different facilitators from institutions such as universities or public and policy administrations and, in general, society through social innovation networks. The multi-agent framework for service innovation has been tested and can be considered as an appropriate platform where different agents interact to make a network innovative and successful. To some extent, successful ServPPINs can be considered the outcome of successful social innovation crystallized in the small, professional and goal-oriented nature of most of them.
- g. *The overcoming of barriers to ServPPINs* in areas such as the rigidity of public administrations, the mistrust and expectations mismatch, the existence of different interests and incentive systems, the problem of free riders and asymmetric information, networking competences and, in some cases, mainly knowledge-oriented services, appropriability problems.
- h. *The reduction of evolutionary inefficiencies in the life cycles* of Servppin where networks are not efficient enough to adapt to the changing phases of their life and the different external and internal elements that can drastically affect their development, their expected functioning and impact and even their own nature and composition.

The value added of this project is not limited to previous findings and conclusions but to the new research opportunities that have emerged as the work has been carried out. From the large range of topics considered, new research opportunities arise in the following fields:

- The role of civil society in public-private networks
- The economics of services
- Service innovation, open innovation and user-driven innovation
- The transformative power of service innovation in value added chain and global systemic values
- Social innovation in services
- Linkages between social innovation and service innovation
- Service innovation in public procurement
- Measures and qualitative assessment of service, organizational and non-technological innovation
- Complementarities between technological and non-technological innovation and the role of service innovation
- Skills and competences for service innovation
- Service innovation and welfare: the role of quality and accessibility in addressing societal needs
- Disruptive changes in consumers' behavior as drivers of service innovation
- Service innovation and welfare: the role of quality addressing societal needs
- Employee-based service innovation
- New service business models
- Internationalisation of services
- Servitization: Service functions in manufacturing firms
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Therefore, ServPPIN may be seen as a starting point for further investigation of the role played by public and private services and innovation networks in the enlarged EU. It has already shed some light on several topics and, at the same time, it has paved the way for further, interesting and timely investigations.

The key messages for policy-makers, businesses, trade unions and civil society actors may be summarised as follows:

- Services are essential sources for growth in modern economies. They can provide new value added to any economic activity. However, there are different ways of services development and the different service economies models are related to diverse social and institutional models in Europe.
- Service innovation is a way to improve both competitiveness and welfare. Europe presents both innovation gaps and performance gaps that cannot be addressed through the use of technological innovation only: non-technological innovation, organisational innovation and open and social innovation are essential fill the gaps.
- ServPPINs are a new phenomenon that differs to previous trends, such as the privatisation and outsourcing of public service provision, and contractual public-private partnerships (PPPs). ServPPINs are collaborative alliances between public and private sector organisations; alliances which bring together and develop complementarities and synergies between the different knowledge, competences, and services that each partner specialises in. Synergies between private and public services should be promoted to

reinforce complementarities and positive impacts. Moreover, the 'Third Sector' organisations (charities, non-government organisations NGOs, not-for-profit businesses) can be key players in ServPPINs what wider the room for social innovation.

- Public-private networks provide an opportunity to improve innovation in services, both economic and social innovation: There is a need to go beyond the traditional funding or tax-deduction schemes. The results of the project suggest three broad areas of possible policy intervention to overcome market and systemic failures, reduce evolutionary inefficiencies and increase the contribution of ServPPINs to growth and welfare:
 - (1) Strengthening service-specific innovation and innovation capabilities of firms, users and other agents.
 - (2) Facilitating co-operation and networks involving service and social innovation. There are two different ways for policy to influence ServPPINs and reduce network inefficiencies:
 - (3) Empowering the public sector and the third sector for co-operation: the role of civil society. The results of the project highlight a need for change in the public sector.

As a result of these policy implications, the promotion of ServPPINs can be based on the enhancement of related-policies such as: **R&D policies** (joint participation of public & private partners, promotion of engagement in R&D activities, projects for further research on services, public-private interactions, innovation networks and social innovation), **Innovation policies** (support to public-private innovative networks), support to service innovation, clusters and innovative industrial policies, **public procurement**, (promotion of innovation and quality, promotion of networking between public and private), **standards** in services as instruments for public-private cooperation, **regional policies** for innovation and other policy areas can be involved as well (employment & skills, internal market, competition, health, transport, tourism, etc.).