Transformative Power of Service Innovation

Call for Action on New Policy Framework (PART I/III)
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1. Introduction

Innovation can no longer be considered as a purely technological endeavour aimed at developing products and processes.

Today, innovation involves services that create new channels to the market, new business processes and new organisational and business structures to better meet the consumer’s needs and expectations. Meanwhile, the Open Innovation concept, which has been defined as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation, respectively”\(^1\), has emerged as a new model of industrial innovation. An important new development within open innovation is its increased use in service businesses, leading to Open Service Innovation. This involves a shift in innovation from a product mindset to a service mindset by placing the user at the centre of innovation. In the field of open service innovation, this finds its expression in the emerging concept of Public-Private-People-Partnerships (PPPP)\(^2\), which are composed of universities and research organisations, entrepreneurs, public entities and user communities (also known as quadruple helix), with the involvement of society at the centre. Recent years have seen the development of Living Lab methodologies, involving users as co-creators on equal grounds with the other participants, and the creation of Living Lab Organisations to experiment the theory in real-world settings\(^3\). In parallel, the Large-Scale Demonstrator concept was emerged in order to analyse and address the issues (e.g. interoperability, lack of standards, etc.) related to service innovation with the involvement of various stakeholder groups, sectors at regional/multinational levels for accelerating the market access by demonstrating the effectiveness of new technologies (e.g. key enabling technologies) and services at pre-market scale. The roles of Innovation-based Incubators and Accelerators involving service innovation into their scope, Clusters, Social and Business Networks, Alliances as well as Innovative Public Administrations are also recognised crucial in boosting service innovation.

Service innovation comprises service concepts such as new or improved services as well as introduction of service process innovation, service infrastructure innovation, customer process innovation, business model innovation, commercialisation innovation (sales, marketing, and delivery), service productivity innovation and hybrid forms of innovation used by several user groups in different ways simultaneously. Service innovation not only covers innovation in services, service sectors or service industries that are provided by service entrepreneurs and service firms, but also influences manufacturing industries through the involvement of new collaborative digital services, adding further value and significantly

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\(^1\) Chesbrough, H. 2006. Open Innovation: Researching a New Paradigm. Oxford University Press, UK


contributing to overall productivity and profitability. Western economies are highly dependent on service innovation for growth and employment (e.g. services industries account for approximately 70% of GDP). Combining services and technological advances in the manufacturing sector (e.g. new materials and processes, robotics) is expected to give rise to the third industrial revolution⁴.

Service innovation is expected to support the Europe 2020 Strategy by stimulating smart growth (mobile Internet, cloud computing, ICT services, growing sensor networks) to capture, store, manipulate and communicate increasing quantities of information to fixed or mobile network devices, thus transforming the everyday lives of people and businesses. Regarding sustainable growth, new services increasingly enable a shift towards more intelligent use and reuse of resources that will enable firms to capture significant global market shares in high-value markets such as intelligent transport systems and environmental impact management. Innovations in service systems are expected to ensure inclusive growth first by reaching out and supporting marginalised groups via smart infrastructures and, second, by developing the skills and supporting the active involvement of such groups in modern society.

Even though there is an increasing awareness and consensus on service innovation, the potential impacts of service innovation on transforming industries, value chains and economic patterns as well as its environmental and societal impacts have not been sufficiently analysed and documented to provide evidence to the policy-makers for the development and implementation of evidence-based policies to unlock the potential of service innovation.

Service innovation is expected to achieve economic transformation by reforming traditional industries as well as boosting the development of newly emerging industries. In order to make it happen, smart policy mixes involving smart specialisation and cluster strategies should be developed for strengthening the competitiveness of businesses, notably SMEs. The fast strategic move to a customer-oriented approach at firm level as well as the impact of the introduction of new enabling technologies, new products, processes, and services in business have led policymakers to reassess their economic development strategies and innovation policies. The challenge is how to shift the focus onto customer issues and how to reshape industry models accordingly into an ecosystem with supportive policy environment.

PwC intends to raise awareness on the “Transformative Power of Service Innovation” by addressing different aspects within the scope of three consecutive articles.

Part-I of this series aims to raise awareness on the transformative power of service innovation by providing a view on main industrial trends, challenges, key barriers, newly emerging concepts related to service innovation at global and EU level as well as key instruments mainly used in service innovation for better understanding the “Concept of Service Innovation” as a key factor in achieving economic transformation.

Part-II will focus on the “Transformative Power of Service Innovation” by providing case studies at the regional level by illustrating the transformative power both on the traditional and the emerging industries as well as the economic, environmental and societal impacts at the regional level.

Part-III will provide “Policy Recommendations” based on the best practices as well as failures and identified gaps on how to achieve economic transformation at regional, national and supra-national levels.

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⁴ Manufacturing and Innovation: A third industrial revolution (April 21, 2012). The Economist
Service innovation concept
2. Service Innovation Concept

Service innovation not only comprises innovation in services, service sectors or service industries that are provided by service entrepreneurs and service firms but also takes place in manufacturing industries, leading to an increase in overall productivity and profitability.

2.1. Definition

The terminology on services and service innovation varies considerably. The definitions used in the “European Policies and Instruments to Support Service Innovation (EPISIS)” study aiming to facilitate transnational cooperation between policy-makers and innovation agencies in the field of services innovation through parallel policy, strategic and operational level activities were:

- **Service activities** are used as a common headline for all economic activities based on services that aim to provide added value for companies. The term “activities” was selected to highlight the process nature of services, so this intends to cover firms in the manufacturing and service sectors and their significance across the industries.

- **Service industries** and **service sectors** (also including public sectors) refer to official macro-economic classification systems. A service company or service firm refers to a company that is officially classified as belonging to a service industry or sector.

- **Service provider** is used to refer to all kinds of companies that provide services as a part of their activities.

- **Service business** is a term that is heard in everyday language, but it is often ambiguous as it may refer to a service provider, a specific service sector, or to different business models based on services. Therefore, the term “service business” is best avoided.

- **Service innovation** is a new or significantly improved service concept that is taken into practice. It can be in the form of a new solution in the customer interaction channel, a new distribution system, a novel application of technology in the service process, new forms of operation with the supply chain, new ways to organise and manage services or a combination of these. A service innovation always includes replicable elements that can be identified and systematically reproduced in other cases or environments. The replicable element can be the service outcome or the service process as such or a part of these. A service innovation benefits both the service producer and customers and it improves competitive advantage. A service innovation is a service product or service process that is based on a technology or systematic method. In services, innovation does not necessarily relate to the novelty of the technology itself, but the innovation often lies in the non-technological areas.

Innovation in services can be defined as:

“A new or considerably changed service concept, client interaction channel, service delivery system or technological concept that individually, but most likely in combination, leads to one or more (re)new(ed) service functions which are new to the firm, change the services/goods offered on the market and require structurally new technological, human or organisational capabilities of the service organisation”.

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This definition distinguishes between several types of technological profiles and between three types of non-technological innovation:

1. new services concepts;
2. new interfaces with clients;
3. new systems of service delivery.

It is important to clearly understand the taxonomy by distinguishing between “innovation in services” and “service innovation”, as indicated in Table 1. The first concerns the innovative change within the service activity or sector itself. The latter refers to the innovative change in those organisations or companies that use innovative services or those engendering innovation.

Another approach shows the differences between four key categories on the basis of their intrinsic characteristics and their innovation processes:

- knowledge-intensive,
- network-intensive,
- scale intensive,
- external innovation-intensive.

Service innovation affects growth by means of three key mechanisms:

- As services comprise around 70% of activity in advanced economies, their innovation process will be essential for the group of innovative systems and their impact on growth;
- Certain services were and are essential in the development of some technological innovations;
- Business services, especially Knowledge-Intensive Services (KIS), are used as intermediate inputs in production, due to their positive effects on innovation in those companies that make use of these services. This includes impacts on manufacturers that provide products for the service sector.

Table 1: Modes of service innovation

<table>
<thead>
<tr>
<th></th>
<th>Innovation in services (supply approach)</th>
<th>Service innovation (demand approach)</th>
</tr>
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<tbody>
<tr>
<td>Service companies</td>
<td>Innovative services companies (Mode I)</td>
<td>Use of innovative services companies (e.g. external KIS) (Mode II)</td>
</tr>
<tr>
<td>Service activities</td>
<td>Innovative services activities (Mode III)</td>
<td>Use of innovative services activities (e.g. internal or external KIS) (Mode IV)</td>
</tr>
</tbody>
</table>

*Knowledge-Intensive Services

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<table>
<thead>
<tr>
<th>Innovative Functions</th>
<th>Main innovation components</th>
<th>Business services (some representative activities)</th>
</tr>
</thead>
</table>
| **Technological Innovation** | • Major technology incorporation  
• Major use of existing technology  
• Technological adaptation to the business necessities  
• Efficiency in the information and communication advanced processes  
• Automation of routine processes  
• Enhanced flexibility of productive structures  
• Improvement in quality | • Computing services  
• Engineering services  
• Design services  
• Communication services  
• Electronic on-line communication services  
• Quality control services |
| **Organisational Innovation** | • Efficient internal organisation  
• Integration of control and coordination processes  
• Improved selection, training and use of human factor  
• Improvement in different functional specialisations  
• Management consultancy  
• Legal audit and services  
• Personnel services (selection, training and part-time jobs) | • Efficient internal organisation  
• Integration of control and coordination processes  
• Improved selection, training and use of human factor  
• Improvement in different functional specialisations  
• Management consultancy  
• Legal audit and services  
• Personnel services (selection, training and part-time jobs) |
| **Strategic Innovation** | • Flexibility for dynamic environments  
• Positioning in complex markets  
• Strategic information on alliances  
• Information on product adequacy  
• Information on allocation and markets  
• Defense in an adversarial legal environment  
• Management services  
• On-line services  
• Audit services  
• Legal services  
• Fair and exhibition services  
• Market studies | • Flexibility for dynamic environments  
• Positioning in complex markets  
• Strategic information on alliances  
• Information on product adequacy  
• Information on allocation and markets  
• Defense in an adversarial legal environment  
• Management services  
• On-line services  
• Audit services  
• Legal services  
• Fair and exhibition services  
• Market studies |
| **Commercial Innovation** | • Competitive product design  
• Innovative commercialisation  
• Major use of opportunities  
• Business development  
• Innovative Marketing  
• Image and branding  
• Design services  
• Exhibitions  
• Advertising  
• Direct marketing  
• Public relations  
• After-sale services | • Competitive product design  
• Innovative commercialisation  
• Major use of opportunities  
• Business development  
• Innovative Marketing  
• Image and branding  
• Design services  
• Exhibitions  
• Advertising  
• Direct marketing  
• Public relations  
• After-sale services |
| **Operative Innovation** | • Functional work division  
• Focus on core activities  
• Operative consideration  
• Image consideration  
• Language services  
• Courier services  
• Security services  
• Operative services | • Functional work division  
• Focus on core activities  
• Operative consideration  
• Image consideration  
• Language services  
• Courier services  
• Security services  
• Operative services |
The strategic role of business services in industry is associated with their innovative nature. This function can be better understood by analysing the five types of innovation that promote business services: technological, organisational, strategic, commercial and operational, as shown in Table 2.

Transformative services

Services are defined as transformative when they disrupt traditional channels to market, business processes and models, to enhance customer experiences significantly in a way which impacts upon the value chain as a whole.

Furthermore, potential service activities that may possess this transformative power can be listed as:

1. Networking, connecting and brokerage services linking consumers, firms and supply chains aiming at improving the allocation and distribution of goods and information in society;

2. Utility and infrastructure services (e.g. telecom, energy, waste disposal) offering high value added to their customers;

3. Knowledge-Intensive Business Services (KIBS) supporting their customers’ innovation processes. Typical for these activities is that they adapt technologies to the customers’ needs. Thus, acting successfully in this business requires understanding the technologies, structure, functioning and features of the specific businesses in which their customers may operate. The effects and impacts of these services are seen in the client industries for example as new service offerings, new business models, new customer interfaces, entry into new markets, changes in delivery and payment systems and finally as increases in efficiency and productivity. These changes won’t, however, remain within the enterprise, but will very likely spill-over to benefit the economy and society at large.

The changed perception of the services sector over the last years is mainly due to the acknowledged and growing importance of KIS as a significant source of growth. The recent growth of KIS is partly due to the outsourcing of business support processes. KIBS are defined as “services that involve economic activities which are intended to result in the creation, accumulation or dissemination of knowledge”. Furthermore, these are activities which enable and maintain various business processes, involve high professional skills and knowledge, rely on advanced technology and strategic inputs, use their knowledge to produce intermediary services for their client industries, and supply their output mainly to other businesses. In addition, KIBS are seen as a parallel knowledge infrastructure in the national innovation system contributing to the national competitive advantage.

This transformation is kicked off and supported by service innovations as their production calls for cooperation and bundling of intermediate inputs from various industries. The traditional industries begin the transformation into emerging industries starting from the design and engineering phases of production. Services which apply or are based on Key Enabling Technologies (KETs) play an instrumental role in shifting production processes towards a more output-oriented (and therefore service-oriented) approach.


While the transformation of manufacturing processes is an important and tangible component of service innovation, the significance of companies relying less on new manufacturing processes should not be disregarded. *ICT, financial, business and engineering services* companies are embedded within all industry sectors and have demonstrated their ability to raise large amounts of funds and to be visible targets for potential acquirers. Over the last 5 years, they have widely contributed to profound market transformations and are considered to be essential contributors to the growth of emerging industries in Europe11.

### 2.2. General characteristics of service innovation

Services currently account for approximately 70% of employment and GDP in Europe. The specific features of the services sector call for a specific policy mix by fully comprehending its specific characteristics as summarised below.

#### 2.2.1. Intangibility

In the world of services, there is greater *intangibility*. Often, customers need to explain more about what they need in the way of services, and their needs often vary from one organisation to the other. Suppliers in turn can no longer follow a “one size fits all” approach to serve these customers. They need to figure out not only how to meet customer needs, but also how to do this profitably. This introduces a tension between *standardisation* (which makes service provision more cost-effective for the supplier) and *customisation* (which more closely matches the customer’s needs, but may require different solutions for each customer).

Intangible value is based on a variety of elements such as brand, experiences, reputation, trust, and knowledge. Intangibles are becoming increasingly important in services as well as in manufactured products. For example, the recognition of design and creativity as drivers of innovation, renewal, and modernisation is significantly increasing by other industries. The rise in the importance of intangible assets is likely to continue, but not all countries have been able to unleash innovation at the same rate or harness the productivity boost that intangibles can bring12.

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11 European Cluster Observatory (ECO)-Phase III Study (2011-2013). Conducted by PwC for the European Commission, DG-ENTR.

12 EPISIS Conference Proceedings on positive impacts of Service Innovation: From Intangible Investments to Emerging Industries and Ecosystems (4-5 June 2012) Helsinki, Finland.
2.2.2. Interoperability

Interoperability between functionalities common to all applications is a key aspect and covers issues like identity management, trust, security, mobility, service roaming (geographically and over different devices), financial cross-border transactions and intellectual property rights (IPRs). Open innovation is essential for the services industry in order to profit from the economic and social benefits generated by interoperability. It provides several direct benefits to service providers and — consequently — consumers by delivering products and services which are better adjusted to the market, more flexible cost structures, increased creativity, adaptability, easier access to knowledge, and quicker and cheaper innovation cycles. Comprehensive interoperability between functionalities is essential not only on a technical level, but also on a service convergence level.\(^\text{13}\)

2.2.3. IPR management for service innovation

The benefits of patenting include the protection of inventions from copying which enables them to be exploited through licensing, thus preventing the duplication of effort. By definition, patents were created for new technical inventions, and are not necessarily best suited to other areas, such as services. Many innovations in services, such as new business models or technology driven organisational innovation, do not meet patent protection requirements so that existing IPR mechanisms are difficult to apply. For this reason, informal IP protection is more prevalent in the case of services. This lead to the emergence of additional ways of protecting and rewarding IP as illustrated in Figure 2 (www.proinno-europe.eu).

Creative Commons (CC) (www.creativecommons.org), a non-profit organisation, is offering free legal tools in order to enable the sharing and use of creativity and knowledge for the last 10 years. CC licenses are not an alternative to copyright, but work alongside and enable the innovator to modify the copyright terms. It makes it possible to give other people the right to share, use, edit, remix, and even build upon the existing work within the boundaries of copyright law. It offers a big pool of CC-licensed creativity to the ones looking for content (e.g. songs, videos, scientific and academic material) to be used freely and legally while aiming to maximise the interoperability of data.

Meanwhile, during recent years, open (service) innovation concept (see Section 4) has been well recognised as a means of obtaining a competitive advantage on a highly competitive market by the active involvement of different stakeholder groups on the innovation process. However, as a co-creative process among different stakeholder groups that are not totally formal organisations, it requires a challenging legal and policy framework particularly for IPR management. For this reason, effective strategies are needed both for formal and informal IP protection in order to address the following issues on\(^\text{14}\):

- IPR management in open (service) innovation;

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• The role of the user as an innovator on user-driven innovation;
• Interoperability standards. Deeper understanding on the IP and legal issues in open service innovation can be found on the synthesis report15 aiming to open a deeper policy dialogue in order to achieve right legal framework for open service innovation. This work is closely linked to the strategy work of the Open Innovation Strategy and Policy Group (OISPG), which is an industrially led think-tank.

There is still intense debate over the extent to which software patents should be granted, if at all. Important issues concerning software patents include the unclear boundary between patentable and non-patentable software, and uncertainty on the inventive and non-obviousness features of the software. Additionally, most countries treat software patenting differently. The differences on interpretation and implementation between different countries create a barrier since software algorithms are patenting differently. The differences concerning software patents include the unclear boundary between patentable and non-patentable software, and uncertainty on the inventive and non-obviousness features of the software. Additionally, most countries treat software patenting differently. The differences on interpretation and implementation between different countries create a barrier since software algorithms are therefore be the outcome of a common design, in which risks are shared among all participants such as supranational public entities and banks, national and regional bodies, business angels and venture capitalists, private equity funds, high net worth individuals as well as foundations and cooperatives. Risks would be absorbed by the fact that the service innovation value chain could be covered at different points in time by overlapping and diversified financing mechanisms, addressing the various aspects and dimensions of innovation: new ideas and results, new business models, new production processes, new testing needs, new governance models and, last but not least, attracting and fostering new talents.

In this new context, innovation financing would imply a more comprehensive approach, calling on all stakeholders responsible for regional development to contribute with a common strategy for the shaping of tailored framework conditions. Innovation financing would therefore be the outcome of a common design, in which risks are shared among all participants such as supranational public entities and banks, national and regional bodies, business angels and venture capitalists, private equity funds, high net worth individuals as well as foundations and cooperatives. Risks would be absorbed by the fact that the service innovation value chain could be covered at different points in time by overlapping and diversified financing mechanisms, addressing the various aspects and dimensions of innovation: new ideas and results, new business models, new production processes, new testing needs, new governance models and, last but not least, attracting and fostering new talents.

In addition to consider the value chain as a whole, which relies both on technological products and services in the innovation life-cycle, one should also take into consideration the specific funding needs of the targeted sector. From this point of view, investment readiness and investor awareness training is needed to attract private investment, especially in emerging industries and services innovation. This concept leads to the development of different innovation funding mechanisms specific to each sector.

MOBICAP (Mobilise Capital for Mobile and Mobility Services) and EMMINVEST (European Mobile and Mobility Industries International Investment Programme), are two ongoing projects running under the European Mobile and Mobility Industries Alliance (EMMIA), aiming to tackle the funding gap for early-stage mobile and mobility industries and build seed funding for mobile and mobility services, whereby the European venture capital community and institutional financiers are working hand in hand to better match private and public funds such as the Structural Funds. The expected benefits are to boost growth in mobile and mobility SMEs, especially across borders, by providing access to training, funds and investment networks through a web-based information system on financing possibilities, training seminars and participation in the Investment Network & Clusters. Likewise, investment organisations will gain access to a professional network of promising investments through the webinar programmes, the networking as well as the development of a funding facility and cluster platform. Additionally, the cluster platform will allow innovation agencies to improve not only their capabilities and knowledge in guiding local companies, but also their access to other international investors and innovation agencies.

2.2.4. Innovation Funding

In the context of rapid transformation in the sectors of industry and finance, the reorganisation of innovation financing is perceived to be instrumental. Financing no longer covers product design and conception alone. It should have the power to address not only risks related to new business models, but also a new generation of talents shaping new ideas, and new prototypes and services generated by these new structural changes.

Traditionally, innovation financing involves a public entity investing seed funding into a company or into a research institute project to cover the initial part of the innovation value chain. This would be further continued by the visionary approach of a stand-alone private investor.

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Crowd funding has recently emerged as a revolutionary tool to raise funds in order to meet the funding needs of cultural and creative industries, projects and individual talents with creative ideas, which are considered as the core of service innovation. Crowd funding is the cooperation and trust between people who network and pool their money and other resources together, usually via the Internet, to support efforts initiated by other people or organisations.

In addition to new financing mechanisms for service innovation, financial services are also becoming increasingly innovative in offering unique solutions, such as the development of digital financial services based on existing mobile networks.

The development of mobile banking mechanisms has enabled many people with no or little access to financial services, particularly in Africa, to gain access to financial services. Mobile banking offers an open multi-telecom and multi-bank access to make deposits, withdrawals and financial transactions possible between private users, banks, large public and private investors.

2.3. Main drivers and tools for service innovation

2.3.1. Main Drivers of service innovation

There are two main drivers of service innovation: the consumer (at the centre of innovation) and the creativity.

2.3.1.1. Consumer

The most productive innovation driver is input from the end-user, since the services production chain starts and ends with the end-user. Thus, consumer interaction with producers and service providers during the innovation life-cycle is essential in the generation of socio-economic added value. This concept lead to the emergence of open service innovation with the involvement of all parties, from public and private stakeholders to society as a whole. Nevertheless, collaborative vision and skills in the sharing of ideas, values and processes are still lacking in open service innovation processes due to the immature innovation and R&D cultures in services firms, IP protection gaps in open service innovation, confidentiality issues, etc.

2.3.1.2. Creativity

Creativity is believed to be the core driver of service innovation. For service innovation to take place, the creative core must meet industry and science in a creative atmosphere that can be stimulated regionally.

OECD member countries have been increasingly interested in understanding and measuring the role of creative industries in growth and development. Creative industries such as design, architecture, advertising, visual and performing arts, and software design add value in several ways. They provide cultural goods and services, create new experiences and services for users, and support productivity in traditional sectors by relying heavily on human capital, skills and talent. The search process for novelty is less dependent on large-scale scientific infrastructure, and such creative industries usually include a high share of self-employed and small
The specificities of such industries call for differentiated policy support.

The performance of those industries is poorly captured by traditional business and industrial indicators. Defining and measuring the contribution of creative industries to value added and the innovation process has yet to be developed and generalised. Local and regional administrations tend to be in a better position to identify the specificities of those activities, since the characteristics of creative assets and talents are highly contextual and localised.

2.3.2. Major tools of Service Innovation

Major tools in support of service innovation can be listed as: Information and Communications Technologies (ICT), Software, Cloud Computing, Web 3.0, Global Monitoring Systems, and Social Networks as explained in detail below.

2.3.2.1. ICT

The most recent technological advances in ICT — often used as an extended synonym for information technology (IT) — are transforming our ability to model scenarios, collect and process information in “real time” and act upon changing circumstances. ICT covers unified communications and includes telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to create, access, store, transmit, and manipulate information. It plays an important role across all industries (e.g. IT, telecommunications, entertainment, media, satellite systems, retailing, financial services, life sciences, healthcare services, manufacturing, education, etc.) as a key enabling technology for changing production, work, and business methods, trade and consumption patterns between enterprises and consumers. ICT enables radical changes in organisation structure and in ways of learning, researching, developing, producing, marketing, distributing and servicing digital and traditional goods and services, while enhancing quality of life.

"The innovative society and sustainable economy of Europe 2020 will be based on ICT-empowered citizens and industries" (EFIA Mission)\(^{16}\)

ICT has catalytic impact on the following key areas:

- Productivity and innovation, by facilitating creativity and management;
- Modernisation of public services, such as health, education and transport;
- Science and technology, by supporting cooperation and access to information;
- Societal challenges, such as ageing population, sustainable health, social care, inclusion, education, security, climate change, energy efficiency.

However, the ICT sector faces many challenges in Europe, as illustrated in Figure 3.
ICT has a large spectrum of application areas in different sectors such as:

**ICT-enabled Government e-Services**

Technological advances in ICT enable governments to offer a large spectrum of public services electronically, such as:

- **Location-based e-services** to help people in their day-to-day commutes or routines such as information on weather conditions, road construction, traffic, walk-in health clinics, public transit, passport services and post offices;
- **Online renewal of IDs** (e.g. driver’s licence, health insurance card, passport, etc.) via computers or smart phones using electronic signatures;
- **Receiving automatic e-notifications** on available government services that are most relevant to citizens at certain points of life, such as after giving birth (birth registration, obtaining a health card, passport, etc.)

The three key themes identified as Canadians’ expectations from government e-service delivery, which may also be common to other countries, are listed below and illustrated in Figure 4:

- **Convenience of service delivery services**: Ease of access channels (e.g. via telephone, in-person, mail, smart phones, tablets, etc.) and usability;
- **Cost**: Fees by service type and channel;
- **Control**: Personal security and privacy.

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17 European Commission COM (2010)245 Final/2

18 Next Generation of Services: Citizen Compass: Enhancing service delivery in the Canadian Public Sector (2012) PwC Canada Public Sector Publication
ICT for Health, Healthy Ageing, Inclusion and Governance

Specific applications of ICT for the healthcare sector include:

- **Personal Health Systems (PHS)** for remote management of diseases, treatment and rehabilitation outside hospitals and care centres;
- **Virtual Physiological Human (VPH)** research focused on more elaborate and reusable multi-scale models and a VPH information infrastructure of larger repositories for the development of “Digital Patient” for better prediction and treatment of diseases;
- **Patient Guidance Services (PGS)** to enable patients’ active participation in care processes;
- **Healthy Ageing** focusing on the development of services, social robotics and highly intelligent environments in support of the ageing population in conjunction with Ambient Assisted Living (AAL);
- ICT for smart and personalised inclusion addressing advanced solutions to improve social and economic inclusion by designing inclusive, accessible and customisable human-ICT interfaces;
- Advanced solutions for learning and skills acquisition;
- Trusted governance and policy impact analysis.

ICT for the low carbon economy

ICT provides various sustainability solutions, including:

- Energy efficiency through the use of “Smart Energy Grids”; 
- Energy efficient design and decision support tools for the optimisation of energy during systems development and operation;
- Efficient water resources management;
- Energy-efficient buildings and spaces;
- Low-carbon multi-modal freight and logistics technologies and services;
- Improved energy efficiency and reduced CO2 emissions in all modes of transport for passengers and goods for energy-positive neighbourhoods;
- Fully electric vehicles to lower CO2 emissions.

ICT for Enterprises and Manufacturing

- **Smart factories** composed of control and sensor-based systems, laser systems and industrial robots;
- **Manufacturing solutions** for new ICT products;
- **Virtual factories** and enterprises addressing end-to-end integrated ICT allowing for innovation and higher management efficiency in networked operations and supporting the emergence of ‘smarter’ virtual factories and enterprises;
- **Digital Factories** capable of performing life cycle management, modeling, design and optimisation.
ICT for Learning (Technology-enhanced learning) and Access to Cultural Resources

ICT-based services are used to foster e-Science, allowing instant access to data and remote instruments, “in silico” experimentation, setting up virtual research communities enabling trans-national, multi institutional and multidisciplinary research collaboration. Existing e-Infrastructures provide a variety of services, such as:

- **GÉANT Platform** (high-capacity and high-performance communication research network): the world’s largest multi-gigabit communication network dedicated to research and education, serving around 4,000 universities and research centres to connect 34 National Research and Education networks to form a global research network;
- **E-Science Grids**: meeting the requirements of the most demanding scientific disciplines (high-energy physics, bioinformatics) by sharing and combining the power of computers and sophisticated scientific instruments, e.g.: Enabling Grids for E-sciencE\(^{19}\), European Grid Infrastructure\(^20\), which will work in cooperation with the Life-Science Grid Community\(^21\) to serve the life science community in scientific domains;
- **The scientific data domain** (data infrastructure), aiming to enable research communities to better manage, use, share and preserve data relevant to scientific reports, research articles, experimental or observational data, rich media etc. through user-friendly e-Infrastructure services;
- **Supercomputing e-Infrastructure addresses the data-intensive and complex challenges of modern science by providing new computing and simulation capabilities (PRACE);**
- **Global Virtual Research Communities** to reap the high innovation potential of multi-disciplinary research by sharing best practices, software and data and to help researchers exploit the benefits that requires enhanced training efforts to ensure optimal benefit.

2.3.2.2. Software

Companies in all industries, including software-based industries, need to accept that a software revolution is coming. Software is observed to disrupt much of the value chains in industries that are widely considered as existing primarily in the physical world:

- **The automotive industry** uses software to run engines, control safety features, entertain passengers, guide drivers to destinations and connect cars to mobile, satellite and GPS networks. The trend toward hybrid and electric vehicles will only accelerate the software shift since electric cars are completely computer controlled. In addition, the creation of software-powered driverless cars is already under way;
- **Software allows designers and engineers to simulate products in 3D as digital prototypes long before they are actually built.** Such software can also be used by other departments in the same company (e.g. marketing);
- **Leading brick-and-mortar retailers** are now using software to strengthen their logistics and distribution capabilities to increase competitiveness;
- **Delivery companies** use software networks to monitor distribution vehicles within the distribution hubs;
- **Airline companies** use software to price tickets, optimise routes and yields correctly;
- **Agriculture** is increasingly powered by software with the involvement of satellite based soil analysis linked to seed selection algorithms for each square meter;
- **The financial services industry** has been visibly transformed by software over the last 30 years;
- **Fundamental software-based transformations are commonly used in healthcare and education;**
- **National defence** is becoming increasingly software-based. The modern combat soldier is embedded in a web of software that provides intelligence, communications, logistics and weapons guidance;
- **Transformation in the music and publishing industries** was caused by the software revolution;
- **Development of e-tailors** through the use of software for the production of glasses, customised shoes and outfits (among other applications);
- **Smartphone-based software applications.**

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\(^{19}\) EGEE, [http://www.eu-egee.org/](http://www.eu-egee.org/)
\(^{20}\) EGI, [http://www.egi.eu/](http://www.egi.eu/)
2.3.2.3. Cloud Computing

Cloud computing is a shared services model providing flexible network-based delivery of IT services on a pay-as-you-go basis. The five essential attributes of cloud computing as defined by the National Institute of Standards and Technology are:

- **Measured service**: Usage metering, with charges based on the amount of resources used, such as usage/minute, gigabytes (GB) of storage, and number of transactions;
- **On-demand self-service**: Services are ready to use and serve specific consumer needs, and capabilities can be rapidly provisioned by the end user, often through a self-serve portal;
- **Resource pooling**: Shared underlying infrastructure, software or platforms, allowing available resources to concurrently serve multiple needs for multiple consumers;
- **Rapid elasticity**: Quickly scalable up or down based on user demands;
- **Broad network access**: Accessible through the Internet on thin or thick client platforms.

Cloud computing offers different deployment and service models, as shown in Figure 5.

Cloud computing has the potential to:

- **Accelerate innovation** by increasing the experimentation cycle and improving time-to-market. Cloud computing reduces reliance on the time, expertise and expense traditionally required to build dedicated technology to facilitate innovation;
- **Focus on customer engagement** by offering inexpensive and flexible options to handle the immense data storage and analytical resources required to meet changing customer demands;
- **Improve connections** by choosing the right cloud-based systems that integrate seamlessly and rapidly to better orchestrate across networks of suppliers, time zones and cultures;
- **Generate revenue and opportunities** by avoiding duplication and redundancies across multiple departments and ministries by aligning them under one government strategy. Along with this, sourcing certain commodity services for the cloud can help to optimise the total cost of technology for the enterprise;
- **Help shift custom development** to standardised cloud utility services;
- **Enhance employee productivity** by providing access to services and data anytime and anywhere;
- **Increase efficiency during peak times** by reducing reliance on systems and resources often dedicated strictly to specific programs, such as tax time, census and elections;
- **Decrease IT capital investment costs** by moving traditional capital expenditure costs to operating expenditure costs. The cloud creates the opportunity to address and smooth the “lumpy” IT capital investment cycle by focusing on operational expenditures.

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22 Why CIOs need to be ahead of the game: Developing a cloud strategy (2011). PwC Canada Public Sector Publication.
2.3.2.4. Web 3.0 (Semantic Web)

Future Internet services are characterised by much richer content accompanied by many interaction mechanisms, such as social networking sites, blogs, wikis, video sharing sites, hosted services, web applications, tagging, mashups and folksonomies already existing under Web 2.0. It is a concept that takes the network as a platform for information-sharing, interoperability, user-centred design, and collaboration on the World Wide Web. By adding semantics to the interactivity of Web 2.0, Web 3.0 will enable active consumer participation and will add high context sensitivity and personalisation of services. The Semantic Web provides a common framework that allows data to be shared and reused across applications, enterprises, and community boundaries. The main purpose is driving the evolution of the current web by enabling users to find, share, and combine information more easily. Humans are capable of using the web to carry out tasks, like reserving a library book; however, machines cannot accomplish such tasks without human direction, because web pages are only designed to be read by people, not machines. The semantic web is a vision of information that can be readily interpreted by machines, so machines can perform more of the tedious work involved in finding, combining, and acting upon information on the web.

2.3.2.5. Global Monitoring Systems

Technological advances in the development of global monitoring systems made it possible to collect crucial environmental information in order to better understand how our planet and its climate are changing, the role of human activities in these changes, and how these will influence our daily lives. A wide range of services related to the environmental protection, management of urban areas, regional and local planning, agriculture, forestry, fisheries, health, transport, climate change, sustainable development, civil protection, tourism etc. have emerged thanks to the implementation of global monitoring systems.

The European system for monitoring the Earth - Global Monitoring for Environment and Security (GMES)\(^\text{23}\), has been established and managed by the European Commission. In practice, GMES consists of a complex set of systems which collect data from multiple sources, including:

- **Earth observation satellites**, which led to the development of Satellite-Based Service Applications
- **In situ sensors** such as ground stations, airborne and sea-borne sensors commonly known as Wireless Sensor Networks (WSN)

Satellite navigation relies on a system of satellites providing autonomous geo-spatial positioning with global coverage. Also known as a Global Navigation Satellite System (GNSS), satellite navigation is used in many domains, such as the mobility industry for navigation, surveying and mapping, marketing, photographic geocoding, GPS tracking, social networking, road pricing and emergency purposes, among many others.

GMES services provide systematic monitoring and forecasting of the state of the Earth’s subsystems, which can be divided into six thematic areas: marine, land, atmosphere, emergency,
security and climate change. The land, marine and atmosphere monitoring services will contribute directly to the monitoring of climate change and to the assessment of mitigation and adaptation policies. Two additional GMES services were set up to address emergency response (e.g. floods, fires, technological accidents, humanitarian aid) and security (e.g. maritime surveillance, border control). Many other value-added services tailored to more specific public or commercial needs (i.e. forecasting services with a local scope, services including socio-economic data, etc.) are being developed based on GMES services and will contribute significantly to the EU2020 strategy.

A **wireless sensor network (WSN)** consists of spatially distributed autonomous sensors used to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. These sensors transfer data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. When the sensors detect the event being monitored (heat, pressure), the event is reported to one of the base stations, which then takes appropriate action (e.g. sending a message via the Internet or to a satellite). WSNs are commonly used in industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, military applications, etc. Advances in WSNs have led to the emergence of **Environmental Sensor Networks** covering many applications of WSNs in earth science research, such as monitoring volcanoes, oceans, glaciers, forests (to detect forest fires, landslides, etc.), monitoring air pollution and water/wastewater, controlling temperature and humidity levels inside commercial greenhouses, etc.

Currently, the main users of GMES services are policymakers and public authorities who need the information to develop environmental legislation and policies or to take critical decisions in the event of an emergency, such as a natural disaster or a humanitarian crisis. Many other value-added services are expected to generate in order to tackle more specific public or commercial needs.

**2.3.2.6. Social Networks**

**Social networks** are developing rapidly and are beginning to influence business networks, resulting in blurred boundaries between scientific, business, and social networks. Social networks were formerly considered as an irritant to the mainstream media, but lately they have either overtaken the mainstream media or are becoming the mainstream media. For instance, 96% of under 30-year-olds have a social networking account. New companies in specific e-commerce verticals, which have led to the emergence of a **second generation of e-tailors**, are providing quite different **customer experience** that turns shopping into an exciting experience and a source of entertainment.

For instance, a designer company demonstrated astonishing growth by raising $8m just a month after launching with 1.2 million members. Half of its business came through social media, as explained by the founder: “We’re growing like a weed because people like to share their latest design finds through Facebook, Twitter, Google + and Pinterest. Part of our core DNA is social interaction and sharing. It’s baked into the site”.

Another interesting use of social networks can be seen in educational technology:

A start-up company has been established with the aim of improving how universities work, and has already raised $6m to develop “social-learning networks for the classroom” in a short period of time. It customises the rules of a network to meet the specific needs of students to make teaching more interactive, by extending it beyond the classroom, and by stimulating students to learn from each other rather than just from the professor. Teachers can control exactly who is in the network (by issuing a class-membership code) can see how students are using it. They can also distribute course materials, contact students, manage tests and grades, and decide what to make public and what to keep private.

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Global trends
3. Global trends

Presented below are the major trends in the global economy:

- Emergence of user-driven open innovation combining service innovation together with technology and product innovation in order to address global challenges;
- Disruptions on global value chains: shift from product-based to service-oriented business models;
- Shift from mass-production to mass-customisation;
- Consumerism: placing the consumer at the centre of innovation and production value chains, leading to the emergence of the experience economy;
- Increased focus on social networks;
- Emergence of new industries due to cross-sectoral spill-overs (cross-fertilisation);
- Advances in Key Enabling Technologies (KETs — i.e. nanotechnology, micro- and nano-electronics, industrial biotechnology, photonics, advanced materials and manufacturing technologies) and their implementation over other sectors leading to flexible automation and just-in-time manufacturing;
- Changes in business and organisational models, processes, delivery systems, customer processing systems, etc. with a shift towards online.

The first industrial revolution began in the late 18th century with the mechanisation of the textile industry followed by the second industrial revolution where the era of mass production have started by the early 20th century. Currently, the consequences of all these trends are leading towards the emergence of the third industrial revolution.

As manufacturing goes digital, it becomes possible to produce in much smaller quantities more economically, more flexibly and with a much lower input of labour, thanks to new materials, new processes such as 3D printing, easy-to-use robots and new collaborative manufacturing services available online25.

3.1. Open Service Innovation to address global challenges

The nature of innovation has changed and it is no longer seen as purely technological, but as the application of new technologies to develop new channels to market, new business processes, new business models and new organisational structures. Industries are being transformed through the convergence of new technologies, including novel materials, smarter software, new processes, new production methods and a whole range of mobile and web-based services.

With the full digitalisation of the economy, the third industrial revolution is under way. Software can be embedded in any industrial device to optimise and monitor its use. Traditional industries are undergoing a period of intense transformation driven by the birth of new markets and death of long-standing ones.

Businesses are also changing their approaches to sustainability, not merely because of ethical concerns about the environment, but due to the rising cost of raw materials, energy and water and on account of new regulatory constraints. Environmental as well as societal impact considerations are thus being integrated in traditional corporate objectives, as they provide a competitive advant. The European Union has developed its 2020 Strategy with the aim of achieving smart, sustainable and inclusive economic growth.

The role of service innovation is critical in the European economy as one of the key factors in all sectors that is contributing positively to employment, the renewal of industries, clusters and regions and tackling societal challenges and thus also contributing to future growth and well-being.

Service innovation and service firms are expected to contribute to the EU 2020 strategy in order to address global societal, environmental and economic challenges such as climate change; mitigation on natural resources that makes it hard to meet the food, water and energy demands of an increasing world population; environmental pollution; ensuring public health; as well as changes in demographics such as aging population; in addition to economic crises.

Smart growth involves improved acquisition and management of information about customer needs and behaviour, and business processes to create high added value goods and services. Business services, particularly business-to-business services, will drive smart growth by upgrading processes. The combination of knowledge-intensive services delivered through mobile Internet, cloud computing, advanced ICT services, growing sensor networks, and satellite-based services are expected to support smart growth by speeding up R&D and productivity.

Sustainable growth requires transition on systems to transform existing carbon-based markets, technology, institutions and products. Services are believed to play a catalytic role in this transformation towards new forms of sustainable and energy-efficient transport, food production, manufacturing, and housing through the implementation of service-based business models. For instance, energy companies are switching from business models where they manufacture energy to models where they provide value-added energy services. This will ultimately help make the production and consumption of goods and services more sustainable and reduce environmental impacts.

28 EPISIS Conference Proceedings on positive impacts of Service Innovation: From Intangible Investments to Emerging Industries and Ecosystems (4-5 June 2012) Helsinki, Finland.
risks and pollution through value-added environmental services enabled by the use of advanced ICT.

User-driven open service innovation is also expected to strengthen social inclusiveness, with users interconnected through the use of services accessed by high-speed Internet. Once the right innovation infrastructure has been provided, users will be able to connect bi-directionally to receive personalised services. The services provided will also make it possible to reach out and support marginalised groups via smart infrastructures and support the active involvement of such groups in modern society, so that inclusive growth can be attained.

For this reason, the EU 2020 Strategy, particularly through its Flagship Initiatives on “Innovation Union” and “Digital Agenda”, supports innovation as a whole, including service innovation, by aiming to remove obstacles to the digital economy and by providing advanced ICT infrastructures.

Additionally, through the Cohesion (Regional) Policy, particularly during the new programming period of 2014-2020, it became a necessity for national and regional authorities across EU to define their research and innovation strategies to be in line with the Smart Specialisation Strategy (S3). By doing so, it is aimed to use EU’s Structural Funds more efficiently while creating synergies between different EU, national and regional policies as well as stimulating private investments. Regional Innovation Strategies (RIS) are expected to meet the requirements of Smart Specialisation Strategies (S3), so called RIS3, in order to satisfy regional economic development while addressing global challenges. For this reason, for the next programming period, RIS3 is seen as an important policy rationale and concept for the Regional Innovation Policy by the European Commission. It aims to promote efficient, effective, and synergetic use of public RDI investments while attracting private investment; support countries and regions in strengthening their innovation capacity; diversify and modernise existing industries while focusing scarce human and financial resources in a few globally competitive areas in order to boost economic growth and prosperity as outlined in the EU 2020 Strategy.

Additionally expected advantage is to harness regional diversity by avoiding uniformity and duplication. It combines goal-setting with a dynamic and entrepreneurial discovery process involving key stakeholders from government, industry, academia and other knowledge-creating institutions. For this reason, during the new funding period, European regions will be asked to draw up national and/or regional innovation strategies for smart specialisation in which services and service innovation should play an important role.

3.2. Disruption of global value chains: from a product-based to a service-oriented model

The different stages of the value chain, from R&D to market, are becoming more globalised and more localised at the same time. Service innovation is playing a critical role in these changes by binding the customer to the solution provider on one hand, while connecting local R&D facilities and companies to the global R&D networks and global markets on the other hand.

Services are playing an increasingly important role in the business models of technology-based companies by provoking an organisational shift from a product-based model to one that is more service-oriented. Product businesses generally place the customers as consumers at the end of the value chain and design their products based on what their consumers want and are willing to pay for. The service comes at the very end of the value chain before the product gets to the customer, as explained in Michael Porter’s value chain.


As oppose to Porter’s model, in the new *Services Value Chain* (Figure 6), customers are involved in every step of innovation in an ecosystem where the creative core, science and industry can meet to collaborate, not only within the same sector but also across sectors. A service-oriented mindset can revive failing businesses, open new markets and provide a far more meaningful customer experience, as demonstrated by the music industry.

In the traditional music industry, the fundamental mindset is product-based: the end result is the production of an album or CD. Generally, the company finds the artist or band, invests time and money to record the songs, promote the album, etc. In this model, consumers are the passive recipients of the music product. But this model has become service-based, and digital consumers have become the co-creators of their musical experiences.

For instance, one music company helps listeners find new music that is similar to the type they enjoy in the genre they currently favour. Once listeners have shared their preferences with this company, the company’s service will “push” new songs composed by other artists, perhaps unknown, matching the taste of the listeners. The feedback provided by the user makes the company better and better at finding music that is more closely tailored to the listener’s interests.

Another music company lets truly committed fans support their chosen bands to a far greater degree than was previously possible in the traditional model. Patrons can receive specialty merchandise from the band; get special liner notes, or photos of the recording sessions; for the right price, some patrons can even get invited to attend the recording sessions, or the release party. Thus, the business models that will succeed in the future music business will be those that help artists connect to their audiences, that empower audiences to find artists they enjoy, that capitalise on the enthusiasm of fans for certain artists, and that spark co-creation between both groups.

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Manufacturers are increasingly providing through-life and other complex services leading to the servitisation of manufacturing differentiating themselves by offering additional services such as customisation, flexibility and just-in-time production\textsuperscript{32}. The boundaries between manufacturing and service processes are becoming blurred as goods, services and products are becoming more integrated. The transformation from product-based to service-based mindset can also be seen in the automotive industry.

In the product-based mindset, the car company procures steel, glass, electronics, and other items and its operations turn these inputs into a vehicle. That vehicle must be painted, accessorised, and shipped to a dealer. The customer purchases the vehicle from the dealer, who readies the car for the customer to drive off the lot. And the customer comes back periodically to the dealer for maintenance, to keep the car running.

On the other hand, in the service-based approach, the car would not be conceived as a transaction highlighted by the purchase, but instead as a delivery method for providing transportation services over a period of time. There is no single purchase activity but rather a series of ongoing interactions with the customer over time, such as offering transportation services, mobility services, or even transportation experiences. New areas of value-added services might be offering different payment mechanisms, vehicle selection, delivery, maintenance, protection, information, etc. If the customer is freed from owning a vehicle, different vehicles can be provided whenever different functions are desired. There are a growing number of automotive service business models, such as car hire services for as little as one hour and in different cities, urban mobility services and personal public transport.

Business offerings are changing as traditional models of investment in assets along with service contracts are being replaced by outright service models. Hybrid products are being offered as an integrated combination of products and services in order to deliver a solution rather than sell a product or product-based service, so that outcomes are replacing outputs, as this model offers value-in-use.

3.3. Mass Production to Mass Customisation

Customers are playing an increasingly central role in the development of goods and services in a number of ways since the market is no longer satisfied with standardised, mass-produced products and services. The cost of producing much smaller batches of products has been falling for customising service experiences. The factories of the future will be able to deliver mass customisation (MC) by designing and manufacturing customised products tailored to the needs of customers at mass-production cost and speed, as illustrated in Figure 7\textsuperscript{33}.

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\textsuperscript{33} Technology Review of mass customisation, PRECISE, Purdue University: https://engineering.purdue.edu/PRECISE/Publications/TrendsandgapsinMassCustomization/PETO32_Ramani.pdf
Mass customisation was made possible by major industrial shifts, including:

- **Modularisation of products and processes** enabling management of product variety;
- The ability of **knowledge-based software** to configure products;
- Improved low-cost technologies enabling the implementation of **flexible automation** in manufacturing.

Still, there are some issues facing mass customisation, depending on the complexity of the product, manufacturing and supply chain. Therefore, at the moment, different manufacturing sectors have different business drivers and are at varying degrees of readiness to adopt MC methodologies.

The **enablers** in the progress of MC are the advanced capabilities in **ICT** together with **Key Enabling Technologies**. The interactions between these technologies, coupled with the use of new materials, lead to: **robots** that are capable of working together with people; **smarter software** allowing highly complex designs when used together with completely new and highly flexible manufacturing technologies (i.e. **additive manufacturing** where products are constructed layer by layer, without using tools, also known as **3D printing**); online and novel collaborative **manufacturing services** which made possible the use of **flexible automation, electronic product design** and **just-in-time production** in mass customisation at costs comparable to mass production. This transition from mass manufacturing towards more individualised production is expected to bring some of the manufacturing jobs back to rich countries which outsourced jobs to emerging countries long ago.

Highly knowledge-intensive services will play a crucial role in this new circuit of technological innovation. Time-to-market and lead times have been shrinking thanks to increased service innovation. Adoption curves are shortening and **new innovative products are invading the market** with the potential to quickly erode the competitiveness of existing products.

Consequently, traditional manufacturing companies are differentiating themselves by offering additional services such as **customisation, flexibility and just-in-time production**. The boundaries between manufacturing and service processes are becoming blurred as **goods and services products become more integrated**. This trend has lead to the emergence of **new manufacturing services**, namely **social manufacturing**.

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**For instance, one company has been offering the social enterprise resource planning (ERP) software through another company’s cloud platform for providing social, mobile, open, scalable and secure applications. It blends social tools with manufacturing software and aims to turn manufacturing itself into social manufacturing. It is radically different software which puts a different spin on cloud computing, ERP software, and manufacturing.**

It has the potential to fundamentally change the way manufacturers manage their supply chains and produce their products. For instance, an engineer in an aerospace job shop could notify shop labour that the engineering department has finished designing the wing component of an aircraft. The job shop could then begin building the wing while the engineer finishes designing the other required components. This has great implications for **just-in-time (JIT)** manufacturing, as it frees up labour to work on more value-added activities rather than waiting for the completion of another phase of production.

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34 A third industrial revolution: Manufacturing and Innovation Special Report (21 April 2012), The Economist.

3.4. Emergence of new industries, business and organisational models, processes, delivery systems, customer processing systems, etc.

The need for innovation or ideas stems from changes in consumer needs, new technologies replacing existing ones and from the emergence of new socio-economic and environmental challenges. Newly developing economic activities are based on the combination and cross-fertilisation of different types of activities and sectors, leading to the emergence of new industries. *Emerging Industries* are typically based on new products, services, technologies or ideas which are in early-stage development and are characterised by high growth rates and market potential. Based on our PwC methodology based on mergers and acquisitions and equity investment, we have identified seven newly emerging industries (i.e. creative industries, mobile services, the experience industry, eco industries, personalised medicine, maritime and the mobility industries) that are growing rapidly, shaping new trends and structural changes in the market. Some of these new industries are completely new, whereas others emerged from cross-sectoral spill-overs between existing industries facing a need to reinvent themselves. Additionally, we found that *ICT, financial, business and engineering services* to be key service activities which facilitate the emergence of these new industries.

**One example of increased integration of cross-sectoral production functions into service concepts is that a major transport and logistics company is offering seamless car door assembly and delivery services to a major car manufacturer.**

Among those newly emerging industries, mobile services, creative industries and the experience industries are the ones placing consumer and creativity at the centre of innovation and aiming to produce customised products with an experience included in it.

In parallel, the next-generation Internet and its services as a computing and connectivity platform are expected to boost user-based innovation and new business models. The activities of networked citizens, businesses, governments and NGOs give rise to new forms of business and create unprecedented ecosystems of innovation. Citizens are given better opportunities to become micro entrepreneurs in their various simultaneous professional and private roles in digital society, creating a new entrepreneurship. Many of small business owners are expected to start running their businesses through smart phones hooked to powerful networks supported by cloud computing. In three to five years, a majority of people in the world are expected to own a smart phone.

Some companies are able to provide task services through smart phones, such as mobile workforce available on demand.

There is a completely new generation of local e-commerce platforms bringing together vast numbers of local businesses in the world that are currently not online.

**Some companies provide inventory services in local retail stores as part of the e-commerce experience. This allows retail chains to compete online by unlocking the local inventory.**

The new generation of e-tailors are much more appealing to those who enjoy going to shopping centres and purchasing in brick-and-mortar shops. Many new start-ups are not only very viable, but are also growing fast because they provide a distinctive experience. According to Marc Andreessen, co-founder of Netscape and venture capitalist for the powerful Silicon Valley venture firm Andreessen Horowitz, 2012 is the year that retail stores will start to feel huge economic pressure as e-commerce and e-tailors get more and more viable. He thinks electronics and clothes are going to be under real pressure, followed by home furnishing.

**For instance, one company has made it possible for a number of local businesses that are not expected to be on the Web for the next 15 years (e.g. local restaurants, hair dressers, day-care centres, lawn care firms) being accessed online. It has allowed small businesses that cannot afford to be online to be reached by customers on demand.**

36 European Cluster Observatory (ECO)-Phase III Study (2011–2013). Conducted by PwC for the European Commission, DG-ENTR.
It is a major challenge for retailers to stay competitive against their electronic counterparts. To the question “How can retailers win in today’s tough markets?”, the Chief Executive of one of the world’s major retailers responded:

First, we have to create a personalised/customised offer that can anticipate how customers’ tastes and needs are changing. And secondly we have to innovate in order to create that offer in partnership with our suppliers, investing not only money, but also more time and commitment in our relationships, since the digital revolution has transformed how people shop and what they expect of retailers and brands. Retailer brands need to be tailored not just to meet individual customer needs today: retailers need to anticipate what customers want in the future. We need to be one step ahead and to guide customers, making their lives easier, more enjoyable and better.

According to Marc Andreessen, software is believed to transform the world by disrupting traditional value chains in many industries. Software companies are poised to take over large swathes of the economy as more and more major businesses and industries are being run on software and delivered as online services—from movies to agriculture to national defence; over the next 10 years, many more industries are expected to be disrupted by software.

Another commonly observed trend on business models is the common use of pay-as-you-go, advertisement and subscription-based business models. Business-to-business (B2B) services are believed to play a key role in driving smart growth by building “intelligence” into the design and modelling of the processes, networks, and customers they serve.

Companies have increased visibility and more accurate information by collaborating in the cloud. For example, a manufacturer can share real-time inventory availability with its customers and distributors, while suppliers can automatically replenish customer inventories as needed.

Finally, traditional careers are expected to differ in a way where lifelong employment with a corporate firm will be replaced by lifelong employment in a network.
Key concepts and instruments in support of service innovation
Innovation today is forced towards a more service-oriented approach, which relies on binding problem-solving skills and technological improvement\textsuperscript{37,38}. Problems inspire innovators to look for answers. They often surface as tensions, such as loss of market share, decline in profitability, dissatisfied customers, etc. Natural innovators are good at defining the problems; they often see problems that the rest of the industry does not see. For example, they can have a knack for spotting issues in user interfaces or in business models\textsuperscript{39}.

New concepts for boosting service innovation have recently emerged, as explained below:

4. Key concepts and instruments in support of service innovation

4.1. Open Service Innovation

“Open innovation” is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology.\textsuperscript{40}

Demola, as an open innovation initiative in Finland connecting academia and R&D together with talented students and industry, has been awarded the Baltic Sea Region Innovation Award 2012 as the best cross-border and cross-sector innovator within sustainable growth and global development. In Demola, university students develop demo concepts for products and services together with companies within four months and create new solutions to real-life problems. During the first three years of activity, over 200 services and product prototypes were co-created by more than a thousand talented students, and 93\% of the results were claimed for business use.

“Open Service Innovation”

The service delivered is the key concept in the Open Service Innovation model, as illustrated in Figure 8. It is delivered by a firm or organisation, in the context of a network of organisations and society. Harnessing the available input into a productive interaction process must eventually lead to service innovation that benefits both society and the economy. Society encompasses the user or customer perspective; the impact of open innovation can be beyond the scope of the individual, but high focus is also placed on user participation. The innovation process is the final top-level subject, as this is also strongly influenced by open innovation. Each of the top-level subjects as well as their relationships can be operationalised in a number of relevant issues, characterising the subject or the relation. From the firm perspective, for example, this includes the reasons for innovation (productivity growth, cost savings, market growth, knowledge exploitation) as well as the reasons for opening up (skills shortage, skills development). Many of the relations are twofold: although the catalytic nature of a service can have a vast impact on society, society can also introduce barriers to adoption or inclusiveness, such as limited access to the Internet.

40 http://demola.fi
“Crowdsourcing” is defined as “the act of outsourcing tasks traditionally performed by an employee or contractor to an undefined, large group of people or community (a crowd) through an open call.” Social media has been defined as “a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, which allow the creation and exchange of user-generated content.” In other words, we can say that, **crowdsourcing is a social media activity used as a channel to bring people together to innovate and develop ideas.**

**4.2. PPPP (Quadruple Helix Model)**

Service innovation is the outcome of an **ecosystem** which has been nourished with appropriate tools and instruments, and endorsed by tailored policies. Those above-mentioned instruments can comprise specific infrastructures headed by joint public and private governance bodies designed to cover a specific part of the value chain and functioning as a ‘glue’ binding the different steps together while filling the gaps and reducing risks.
The open service innovation concept, including high participation of people/society throughout the innovation process, has given birth to a new partnership concept known as the Quadruple Helix Model or Public-Private-People Partnership. In this model, the private dimension of entrepreneurship is another key driver of service innovation.

Future Internet PPP

The Future Internet Public Private Partnership (FI-PPP)\(^\text{43}\), launched in 2011, aims to advance Europe’s competitiveness in Future Internet technologies and systems and to support the emergence of Future Internet-enhanced applications of public and social relevance. It addresses the need to make public service infrastructures and business processes significantly smarter (i.e. more intelligent, more efficient, more sustainable) through tighter integration with Internet networking and computing capabilities. The aims of the FI-PPP are to increase the effectiveness of business process and of the operation of infrastructures supporting applications in sectors such as transport, health, or energy and to derive possible innovative business models in these sectors, strengthening the competitive position of European industry in domains like telecommunication, mobile devices, software and service industries, content providers and media.

4.3. Living Labs

In recent years, much effort has been placed in developing Living Lab methodologies and in converting Living Labs into an innovation practice. The methodologies of Living Lab Organisations are differentiated on the basis of three main characteristics: involving users on equal grounds with other stakeholders in a co-creative process across the whole innovation value-chain; experimentation in real-life contexts; and being Public-Private Partnerships. Four case studies have indicated that all of them share these three common characteristics, although each one has its distinctive flavour, as shown in Table 3\(^\text{44}\).

In parallel to this Living Labs concept, user-centred Design Centres are also being developed to provide virtual prototyping rooms to foster synergies between innovative and conventional services. It provides access to methodologies and technologies, particularly for the SMEs, to test their innovative designs while keeping the IPRs always within the company. For instance, furniture manufacturers can test the ergonomics of the furniture that is being developed on these design centres.

In addition to Design Centres, Design Innovation Clinics also provide support mechanisms at the company level that can be offered either by a public innovation agency or by a private KIS provider such as consultancy companies. It typically provides innovation-related analysis and advice to an organisation, business or individual entrepreneur in a short period of time. They have the objective to make business models, products and services more user-friendly and outline new routes to market in relation to design-led innovation. Another company level innovation support can be seen in the form of Innovation Assistants. They are the employees (e.g. graduates, young researchers etc.) hired and paid through external funds such as Structural Funds to conduct in-house R&D and implement innovative projects in order to boost innovation capacity and capability of the SMEs\(^\text{45}\).

\(^{43}\) Future Internet PPP: http://www.fi-ppp.eu


Table 3: Implementation of the main Living Lab characteristics in the 4 case studies

<table>
<thead>
<tr>
<th>User Involvement</th>
<th>Real-Life Contexts</th>
<th>Public-Private Partnership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living Lab Botnia</td>
<td>• Capture of user needs</td>
<td>• Locus for appreciation of opportunities</td>
</tr>
<tr>
<td></td>
<td>• Co-Design &amp; Participatory Design</td>
<td>• Evaluation and validation of prototypes</td>
</tr>
<tr>
<td></td>
<td>• Gathering Domain- and Market-based Knowledge</td>
<td></td>
</tr>
<tr>
<td>iLabo IBBT</td>
<td>• Contextualisation of prototypes for new products and services</td>
<td>• Focus on data gathering</td>
</tr>
<tr>
<td></td>
<td>• Selection of the “right” users as a key element</td>
<td>• Attempts to capture insights from a large group of users</td>
</tr>
<tr>
<td>Helsinki &amp; Finnish Living Labs</td>
<td>• Identification of Needs</td>
<td>• Use of geographical context for selecting users (citizens, students, etc.)</td>
</tr>
<tr>
<td></td>
<td>• Co-design and participatory Design</td>
<td>• Public, open trials</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Validation of prototypes</td>
</tr>
<tr>
<td>Catalan Living Labs</td>
<td>• Selection of “relevant users”</td>
<td>• Specialised contexts: hospitals, opera theaters, etc.</td>
</tr>
<tr>
<td></td>
<td>• Gathering domain and context-based knowledge</td>
<td>• Emergence of new solutions and Meanings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Large public trials together with small specialised ones</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Unexpected opportunities stemming from real-life contexts</td>
</tr>
</tbody>
</table>

4.4. Large-Scale Demonstrators

Another key instrument that was generated by the EU Expert Panel on Service Innovation in 2011 is the Large-Scale Demonstrator (LSD) concept. The Panel highly recommended considering LSDs as a means of analysing the impact of service innovation in a macro-economic context rather than firm level. With service systems there is substantial emphasis on articulating emerging consumer demands, defining standards and working back from user needs to potential technical solutions.

Demonstrators provide a way of de-risking innovation by providing a staged process in which a range of solutions are initially developed, tested and then selected for further rounds of support. Demonstrators bring industry, service providers, research institutions, regulators, and users together to share knowledge, contribute practical experience to articulate demands and define possible options. Demonstrators move from small-scale prototypes to a smaller number of larger-scale near-market projects that provides intelligent ecosystems allowing interoperability. They can include new health care systems, smart grids, intelligent transport systems and smart cities. Such systems will provide individuals with more choice and better options by linking activities together in a more logical manner. Large-scale demonstrators combine the three vital elements of infrastructure, market framework, people and skills. The R&D factor is also present, but more in a supportive role. It needs a systemic approach that requires regional leadership and priority setting as described with the scope of Smart Specialisation concept.

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Some LSD priorities identified at EU level are in the fields of:

- **Healthcare and active ageing** to challenge the needs of aging population and to reduce healthcare costs;
- **Sustainable Communities** to promote the greening of industry and the protection of natural resources, through resource efficiency, water and waste management, recycling and life-cycle concepts;
- **Industrial Areas in Transition** to enhance the competitiveness of heavily industrialised regions, while transforming their environment;
- **Smart Cities** for providing citizens, visitors, companies, utilities and municipal authorities with the information they need, when they need it to address urban challenges such as congestion, sustainable energy and employment opportunities, as well as information on access to local amenities and services;
- **Creating Dynamic Regions** to improve the standard of living of the poorer, remote regions in Europe, with particular reference to smarter, sustainable tourism;
- **Sustainable Coordinated Transport** to promote more sustainable mobility and reduce the cost of congestion.

Currently there are 3 ongoing LSDs under the European Mobile and Mobility Industries Alliance, namely **CULTWays**, **LIMES** and **Grow Mobile**. These support **sustainable tourism in rural areas** to address the information, location, access and safety needs of tourists in Europe who wish to visit cultural heritage sites and routes that are off the beaten tourist track.

- **CULTWays**\(^\text{47}\) (Cultural Tourism Ways through Mobile Applications and Services) aiming to highlight the potential of mobile technologies as a key driver of service innovation in mobility industries and in cultural tourism. This approach will enhance the attractiveness, economic and social development of remote rural areas which are not typical tourism hotspots, but which have valuable cultural and natural heritage. The key objectives are to demonstrate the potential for mobile technologies in the tourism sector, develop the potential of the demonstrator for scalability and adaptation to any region in Europe and to address the key societal challenges of preserving and exploiting cultural heritage, addressing environmental impacts of tourism in remote areas as well as safety issues related to travel in remote areas. The project will develop a mobile application for tourists travelling along the European Cultural Routes of the Via Claudia Augusta, running from northern Italy through to Bavaria in Germany, and the Way of St James in the north of Spain. The mobile application will provide: cultural heritage services, including a digital passport with certification of completed routes and location-specific cultural information; safety services with location monitoring and travel and weather information and advice; environmental services with information on local green initiatives such as bicycle and electric car hire and eco-accommodation booking. The challenge will be to develop a system combining databases, locations and communications which is capable of updating and integrating new data from different sources which can be accessed both online and offline in order for tourists to avoid roaming charges and to overcome the lack of information due to scarce connectivity. After a market analysis of existing mobile applications and a study of innovative mobile and location-enhanced services, the project will define the data gathering template, design the mobile application requirements and define the interface between the data platform and mobile devices, including interoperability testing. A wide range of stakeholders (e.g. local government administrations, public tourism agencies, professional associations, companies and local organisations) from the participating regions in Italy, Germany and Spain will be involved throughout the project lifetime and will be supported in the development of the mobile application by the European Telecommunications Standards Institute that will supervise the interoperability testing.

\(^{47}\) CULTWays: http://www.mobilise-europe.mobi/cultways/
The European Commission through its DG ENTR has just established the European Service Innovation Centre (ESIC) in order to support regions in the design of better policies to transform existing traditional industries while boosting emerging industries by unlocking the transformative power of service innovation. ESIC will provide technical expert assistance for conducting peer review analysis on six selected EU Regions as model demonstrator regions (i.e. Basque region, the Canary Islands Region, Emilia-Romagna, Luxembourg, Northern Ireland and Upper Austria) for design and implementation of strategies in order to address a particular regional problem or challenge by making better use of service innovation.

However, there are several barriers to the adoption of this new approach, as illustrated in Figure 9, which need to be addressed through a holistic approach where different policies and support measures at activity, company, sectoral and market levels should be assessed together as part of a common strategy in order to support this concept to function properly at all levels (e.g. regional, national, supra-national).

**Figure 9: Existing Barriers to the Adoption of the Large-Scale Demonstrators Approach**

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48 EPISIS Conference Proceedings on positive impacts of Service Innovation: From Intangible Investments to Emerging Industries and Ecosystems (4-5 June 2012) Helsinki, Finland.

49 LIMES: http://www.mobilise-europe.mobi/limes/

49 LSD project will also contribute to the development of sustainable and cultural tourism in all European countries along the Roman Limes (the only European cultural heritage which binds together 10 European countries, from the North-West in the UK to the South-East in Bulgaria, covering many regions) and support mobility in rural areas through the development of innovative mobile services. The project will focus on developing mobile services and creating new, innovative value chains with the involvement of 10 countries.

These demonstrators aim to develop and test scalable and transferable concepts for providing mobile services for tourists in close collaboration with local tourism agencies, authorities and businesses in rural areas with valuable but under-exploited cultural heritage. To ensure user-friendliness, plugtests and interoperability workshops for developers and users of mobile services will be organised with support from ETSI, the European Telecommunications Standards Institute, to help guarantee interoperability across national borders and, possibly, contribute to the development of new standards.

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4.5. Innovation-Based Incubators and Accelerators

Innovation-based Incubators (IBI)

An Innovation-based Incubator (IBI)\(^{52}\) is a business development centre for new entrepreneurs and SMEs that intend to develop innovative ideas. There is a subset where the domains of entrepreneurship and of innovation including service innovation find common ground, where ideas are both innovative and profitable, and can be translated into sound businesses addressing specific markets. IBIs support innovative business projects which could be either technologically oriented or non-technologically oriented. Innovation can be found in technology as well as in downstream applications (of a generic technology), in advanced and in knowledge-intensive services, in business models, in marketing and customer-led processes, in design, in standards, in organisation and management, etc. This can take the form of general-purpose or sector-specific IBIs. Incubation is a process which tends to be activated whenever there is a need to support entrepreneurs in developing their business at various stages, as shown in Figure 10.

Examples of tailored instruments include upcoming joint ventures, such as the ‘Spinnovator’ of Munich, merging the knowledge and interest of a TTO (Ascenion, Munich) and of a private fund (Vesalius, Luxembourg). The aim of this entity is to the accelerate market access for innovation in personalised medicine through an accurate market screening of customer needs done by entrepreneurial leaders.

Accelerators

Company accelerators are a fairly new instrument in boosting service innovation. They are already well known in the US, but have not yet gained wide recognition in Europe. Their role is unique in accompanying companies which have moved out of the incubation phase and into the next phase, which often requires access to global markets. High-growth companies (gazelles) often have a strong ICT base and in most instances offer services based on innovative business models.

Raising funds, finding the right talent, performing administrative work, negotiating with lawyers and dealing with governments can be extremely time-consuming for companies, and can be a source of inefficiencies in a critical phase of the company life cycle. In this context, the value of the company accelerator is to provide logistic support, fundraising competencies, operational management via skilled professionals and invaluable networks of people and investors at a very competitive price.

A PwC market analysis conducted on accelerators located in the Silicon Valley, New York and London shows that most accelerators help in the early stage of a company’s development and provide seed funding, whereas only a few
organisations intervene when companies are beyond the seed-funding stage and have already generated revenue and started acquiring customers. Accelerators in the Silicon Valley are more specialised in certain technology areas than those in the region of New York. Most accelerators focus on cloud, Internet and mobile technology, while only a few specialise in Bio/Health. The market positioning of the top accelerator programmes is shown in the Figure 11 below.

The common traits between PwC’s Accelerator\(^53\) and these entities are: the talents running the entities and designing the service offering, their innovative governance and the availability of interested and innovative investors. Policies on service innovation should focus on setting up the right governance and funding schemes for these entities.

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**Figure 11: Stages of Incubation with types of services involved (Source: PwC)**

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53 PwC Accelerator: http://www.pwcaccelerator.com/
4.6. Clusters, Social and Business Networks and Alliances

Networking with others can create a critical mass and facilitate the communication and dissemination of project/programme results to outside stakeholders. Key Alliances and Business Networks have been established at European level to provide a platform for the exchange of best practices on policy making and stimulating international collaborations. Such alliances include the European Cluster Alliance (ECA)\(^{54}\), the European Mobile and Mobility Industries Alliance (EMMIA)\(^{55}\), the European Creative Industries Alliance (ECIA)\(^{56}\), the European Future Internet Alliance (EFIA)\(^{57}\) and the Enterprise Europe Network\(^{58}\), along with other sectoral business networks.

Two initiatives launched under the ECIA — namely the **European Creative Cluster Lab (ECCL)**\(^{59}\) and **Cluster 2020**\(^{60}\) — are intended to foster Creative Industries through the development of cluster excellence and collaboration. Clusters have long been supported by various means and policies, but it is less so the case with Creative Industries clusters. Traditionally clusters have been supported at sectoral level, often with support received to carry out research activities or to foster linkages with research institutes or universities. Much less is done to foster linkages with other and broader stakeholders, such as knowledge institutions, design centres or technology clusters from outside their sector. Cluster 2020’s vision is to support the creative industries, enabling them to overcome barriers and seize opportunities for growth. This partnership will work with business clusters in England, Germany and France, and will run trials and test ways to optimise working spaces, services and cross-sectoral linkages. The ECCL is the think-tank and beta site for the development of new approaches and processes for creative cluster management through the analysis of creative industries and new collaboration approaches between creative clusters and traditional industries.

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54 ECA: http://www.proinno-europe.eu/eca
55 EMMIA: http://www.mobilise-europe.mobi/
56 ECIA: https://www.howtогrow.eu/ecia/
57 EFIA: http://initiative.future-internet.eu/home.html
59 ECCL: https://www.howtогrow.eu/ecia/project/eccl/
60 Cluster2020: https://www.howtогrow.eu/ecia/project/cluster2020/
Key challenges & barriers linked to service innovation
5. **Key challenges & barriers linked to service innovation**

5.1. **Key global challenges and barriers**

The world is currently facing a number of substantial societal and environmental challenges, such as climate change, environmental pollution, mitigation of natural resources, food and energy security, public health and population ageing, which can only be dealt with on a multilateral or global level, since both the originating factors of the challenges and their consequences are global in nature. Thus, institutional coordination and collective action among countries is needed at global level in order to merge the limited financial resources due to the economic crisis in the most effective way for advancing RDI to tackle these grand challenges while avoiding duplication and fragmentation.

In order to meet all these challenges, the importance of service innovation has been commonly recognised and supported by the European Commission through the recognition of the fact that these challenges cannot be solved within national borders, since the national research programmes designed and implemented within national borders do not have the required scale and scope to generate the necessary breakthroughs and are not aligned in mainstream research agendas, meaning that Member States tend to fund the same type of research, which leads to unnecessary duplication and insufficient scale and scope in Europe. Thus, removing existing barriers to compatibility and interoperability of national research systems and promoting common transnational synchronised research agendas can only be achieved by identifying existing gaps and their importance in the economy.

The current barriers hampering service innovation stem from a lack of:

- public demand, due to the lack of awareness on the transformative power of service innovation;
- service innovation supply capacity;
- service innovation absorption capacity;
- entrepreneurship;
- funding for service innovation, due to the lack of investor awareness;
- education and skilled workforce;
- ICT standards, which are particularly required for interoperability;
- data security, privacy and availability;
- awareness regarding the importance of “Large-Scale Demonstrators”;  
- knowledge transfer and IP management issues in open service innovation;
- supportive policies (e.g. public procurement policy) in favour of service innovation across industries, even within service sub-sectors.

Additional barriers regarding the Single Market also apply in the EU:

- Single Euro Payment Area (SEPA) for efficient cross-border electronic payments and invoices;
- Gaps in the Service Directive implemented to create a strong market;
- Lack of Public e-Procurement infrastructures;
- Weaknesses in e-Signature (e-IDs) Directive to enable secure and seamless electronic interactions between businesses, citizens and public authorities at pan-European level that will increase the effectiveness of public and private online services, e-Business and e-Commerce in the EU.

Another common challenge specific to Europe is the lack of entrepreneurship as an engine for economic growth and innovativeness, as highlighted in the Memo of the European Commission61. Boosting entrepreneurship can be achieved in various ways, including entrepreneurship education; improving the second-chance law for failed entrepreneurs; and boosting demand, design, and workplace innovation as a concrete way of enhancing non-technological innovation.

5.2. Key challenges faced by Public Authorities

The following top barriers were identified in a PwC survey62 of public-sector chief information officers (CIOs) regarding the outsourcing of business services, infrastructure and applications via cloud computing:

• **Finance**: Cloud computing is challenging the treatment of IT as a capital expense because of the ability to procure IT infrastructure and software as a service;

• **Security**: Data security and privacy rank among the top concerns with cloud solutions, since the private cloud industry currently doesn’t offer service-level agreements (SLA) and privacy protection assurances to meet all government regulatory requirements;

• **Compliance**: Public sector and government industries have specific governance and compliance requirements. There are country-specific protections and export laws surrounding the movement of data, and many of these regulations are based on the ability to identify the physical location of data and technology. Since cloud services are not yet standardised, businesses must assert their needs about data ownership and control while negotiating SLAs with cloud vendors;

• **Political sensitivity to services not delivered by internal IT organisations**: Some governments are sensitive to doing business with a vendor that is not delivered and managed by internal IT organisations. The underlying reasons might be the offshore delivery aspect and difficulty in controlling personal information and data;

• **Repatriation**: Some cloud services are not offered by vendors for internal use even if the customer is willing to license the offering.

According to the previous global survey conducted by PwC, the main challenges identified for government leaders were building the brands of their localities, engaging and providing leadership for their communities, working collaboratively with an ever-growing network of partners across sectors and territories at national and international level, and funding. The follow-up survey focused more closely on the service delivery cycle to understand the key challenges faced by local governments. According to survey respondents, outcome assessment along with performance monitoring and needs assessment were found to pose the greatest challenges, as illustrated in Figure 12. The parties involved in the design of service delivery were mainly city officials, followed by residents, businesses and NGOs. Commissioning/buying external service provision was seen as an important factor especially for transport and infrastructure, economic development and investment, tourism and cultural promotion, sanitation and water treatment, security and safety, e-government services, housing and social care. The key success factors on strategy implementations were identified as Leadership, followed by Project and Programme Management (PPM) and Partnerships as distant secondary factors. On the other hand, the main barriers in implementing the strategies were mainly finance and prioritisation. In order to implement their strategies successfully, the local governments are advised to have strong leadership and to: redesign their organisations for more effective collaboration with their primary stakeholders; assess the impact of their size and scale and seek out opportunities to standardise, simplify and streamline their operations; develop well-documented implementation plans assigning clear roles, responsibilities and timetables to each stakeholder; prioritise and manage projects and programmes more effectively by putting in place outcome measuring systems and value for money.

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Another key challenge for local governments is to develop strong and future-proof policies to make optimum use of society’s resilience in dealing with demographic change as a major global challenge. This will result in altered demands with regard to the flexibility and availability of government products, services and information. PwC global initiative on “Cities of the Future” has identified “demographic development” as one of the key elements for the municipalities to make optimum use of society’s resilience in dealing with demographic change. This assessment identifies five roles for local governments (director, administrative partner, service provider, enforcer and employer) and describes their significance for each of the seven core elements (economy, culture, knowledge, infrastructure, environment, democracy, society and people) and the ways in which they are affected by demographic changes like ageing and diminishing population. In order to address this challenge, strengthening policies, collaboration and smarter service concepts should be developed and implemented by governments to meet the needs of an evolving population. The public sector will be hit comparatively hard by the adverse effects of population ageing since government employees tend to retire at an earlier age than their private sector counterparts."}

63 Making it happen: A roadmap for cities and local public services to achieve outcomes (2011) PwC Public Sector Research Centre.

64 Aging tomorrow, innovation today: local governments point of view (2010) PwC Public Sector Research Centre.
Conclusion
Creativity and consumer involvement throughout the whole innovation lifecycle are the core elements of service innovation that should be supported by favourable framework conditions providing right innovation ecosystem with supportive policy measures to boost active collaboration between public and private entities, investors, entrepreneurs, and civil society. Service innovation should also be integrated into innovation policies at national and regional level. To achieve this, awareness on the transformative power of service innovation must be raised at all levels among public authorities, policymakers, entrepreneurs in traditional and emerging industries, investors and citizens in order to ensure smart, sustainable and inclusive growth while making efficient use of limited financial sources to achieve goals that are common and crucial at all levels.

PwC aims to raise awareness and provide recommendations particularly to the policy-makers for developing a new policy framework in support of service innovation. Our second publication in this series will feature case studies highlighting the transformative power of service innovation at sectoral and regional levels that will be followed by policy recommendations for achieving this transformation on the third one.

**PwC Global Service Offering: “Regional Innovation Ecosystems”**

This global PwC initiative mainly aims to support the regions, enterprises, universities, and clusters in accomplishing smart and sustainable economic development by: identifying and implementing regional smart specialisation strategies as well as conducting evaluations for the regions to determine their current position for present funding period and eligibility for the next period; increasing research valorisation, education and training for boosting innovation capacity and capability; developing financial engineering tools for innovative companies; boosting internationalisation; stimulating the conduct of large scale demonstration and transformational projects; supporting the implementation of ICT and Key Enabling Technologies for the modernisation of traditional industries as well as boosting the development of newly emerging industries; accelerating the development of high-growth companies (more information can be obtained via Gateway).

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