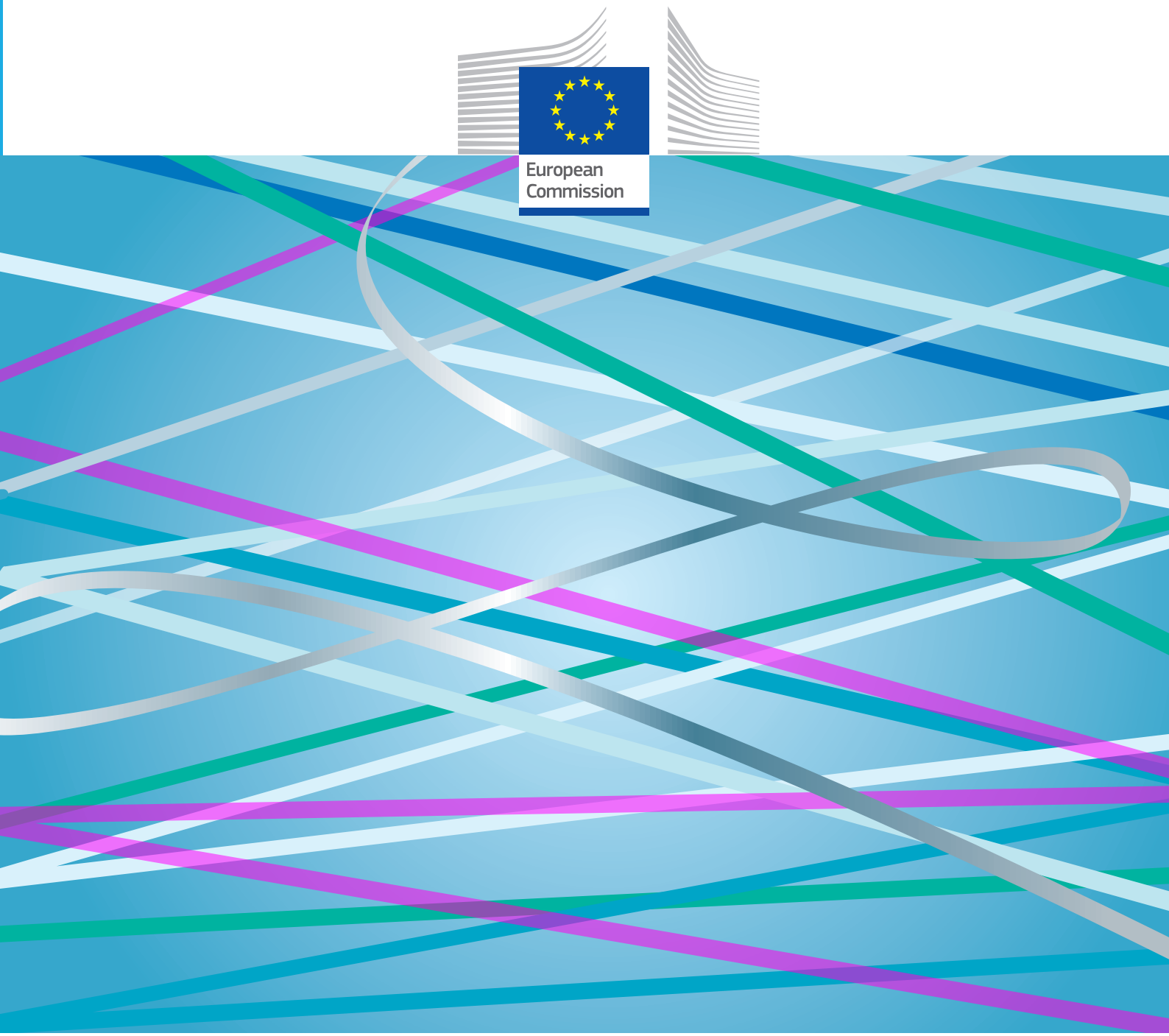

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Contents

Foreword

Dear colleagues and partners in service innovation!

It is a great pleasure for me to introduce you the third edition of Open Innovation 2012. The yearbooks have gained a good reputation describing new developments and emerging ideas of open innovation in services domain.

The first articles illustrate the most recent policy developments and highlight some emerging trends. Moving forward in the yearbook, you can find a good collection of insights to service innovation based on studies, real-world cases and practical experience ranging from the national to regional and company level.

The term 'open innovation' is used in many strategy documents in relation to the contribution of openness to growth and jobs, and for sustainable societal development. The experience leads to a reflection on how new entrepreneurial forms of open innovation ecosystems can be fostered as well as user engagement as creators giving value to open community-based innovation and user-centric service development.

The new entrepreneurship ranging from micro-multinationals, new knowledge-intense local service providers and, for example, social enterprises, all taking advantage of next generation Internet and the societal transformation, are examples on how new service innovation can contribute to the growth, jobs and well-being. It is about creating a favourable environment for letting ideas turn into products and services in real-world settings.

Experimentation (EAR, Experimental and Application-oriented Research) has increasing importance for achieving scalable results more rapidly, as faster innovation cycles are key success factors on which Europe needs to build its future competitiveness.

Co-creativity and user involvement are ingredients in professional services development in the new Internet era. We need to move from PPP (Public-Private Partnership) to PPPP (Public-Private-People partnership) where scalability, reuse and functional and semantic standardisation of the solutions are essential. The open data concept is emerging with its natural progress towards open standardised information, enabling mash-up of the data to meaningful applications and new services. Standardisation of information will be as important for the creation of the new web-based services industry in Europe as was the standardisation of communications for the creation of a strong European mobile communications industry some 20 years ago.

Welcome to the community of service innovation!

I wish you an interesting and inspiring read!

Bror Salmelin
Adviser to the Directorate H
European Commission
Directorate-General for the Information Society and Media

Introduction

Welcome to a very exciting issue of the OISPG Open Innovation Yearbook 2012. Globally, we are seeing increasingly more frequent and deeper levels of networking and interaction between different organisations and new virtual innovation ecosystems being established. Open Innovation 2.0 could be defined as the fusion of Henry Chesbrough's open innovation concept and Henry Etzkowitz's triple helix innovation concept. Triple helix innovation is about achieving structural innovation improvements through proactive collaborations between industry, academia and government. We are seeing more and more open innovation increasingly based on a 'triple helix' arrangement of industry, government and university interaction. The impact of this collaborative innovation goes well beyond the scope of what any organisation could achieve on their own. Intel's announcement of collaboration with Imperial College London and University College London to create a sustainable and connected cities research institute in London will go beyond this to include broader society in a quadruple helix innovation arrangement. Collaborating with citizens to understand what they might want in a future sustainable and connected city maps very well to the idea of user-centric and driven innovation which we discussed in previous OISPG reports.

In a generative knowledge economy, industry is seen as the locus of production (product or services), governments provide a stable and defined regulatory environment, often as well as investments and investment incentives, whilst the role of universities is changing from primarily providing a supply of trained people and education to also providing primary knowledge for the innovation process. One example of triple helix innovation is Intel's network of Exascale Computing labs which have been established in Belgium, Germany, Spain and France in conjunction with various European universities and national agencies to jointly perform the research which will inform the design of the Exascale computer of the future as well as understanding how best to take advantage of Exascale capabilities.

As the information or knowledge intensity of products and services increases, the creation, diffusion and utilisation of knowledge in industry and governments has become more and more important. In the 21st century, mastery of and improving productivity of knowledge assets will be at least as important as mastery and improvement of physical assets and resources. EU Digital Agenda Commissioner Neelie Kroes recently said that 'Data is the new gold,' as she spoke about the EU open data strategy meaning that public data, generated by many administrations can become the feedstock for many new services and applications. Similarly, EU Research Commissioner Maire Geoghegan Quinn said at her EU hearing prior to her appointment that 'knowledge is the crude oil of the 21st century,' and thus our ability in Europe to leverage the collective intelligence of the entire community can create great opportunities in our future knowledge society.

Two of the flagship initiatives of Europe 2020, Digital Agenda and Innovation Union, have gained increasing traction and are accelerating in progress. In parallel, there is a growing case for specific focus on, and enablement of, open innovation. The existing seventh framework programmes and the future Horizon 2020 programme are key supporting mechanisms for open innovation but we need more research and education around open innovation. The numerous research publications of the OISPG in the past year have made important contributions to this area. Bruno Hoyer's report, 'Unlocking the Digital Future through Open Innovation — An Intellectual Capital Approach', provides a critical analysis of open innovation as structural capital. In addition, the report *OSI: Socio-Economic Impact of Open Service Innovation*, led by Logica in the Netherlands is an important contribution to defining the value from open service innovation.

In Europe, we need to emphasise high expectation entrepreneurship as a mechanism for stimulating jobs and sustainable growth. High expectation entrepreneurship occurs when an emerging disruptive technology collides with high ambition and is especially important as, according to the Global Entrepreneurship Monitor, high expectation entrepreneurs contribute up to 80 % of all jobs. Knowledge-based service industries are especially suitable as candidates for high expectation entrepreneurship. We should consider what we need to do to help the next Google or Facebook emerge from Europe.

We should consider how Europe can be a leader in harnessing and creating value from the three mega trends I discussed in last year's foreword (i.e. digital transformations, sustainability and mass collaboration). With the accelerating confluence of these three trends, I think, for Europe, opportunity knocks. Happy innovating!

Prof. Martin Curley,
Director, Intel Labs Europe
Chair, EU Open Innovation Strategy and Policy Group

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Executive summary

The Open Innovation 2012 follows the Service Innovation Yearbook 2009–10 and the Service Innovation Yearbook 2010–11. All these yearbooks have three complementary parts: the first on policy development, the second on trends and weak signals in service innovation, and the third on cases and open innovation development in countries and regions.

In the first part, new societal drives for service innovation merging from Maslow's hierarchies of needs and from Schwarz's universal values are highlighted. The first part also covers the creation of innovation-friendly environments and the links between the Digital Agenda and open innovation creating societal and structural capital for competitiveness and sustainable development. In addition, discussions on the need for embedding open innovation into policy measures, including new openings in the legislation to foster fair sharing as a basis for wealth creation, have arisen.

The first part reflects also the findings of the study *OSI: Socio-Economic Impact of Open Service Innovation*. This study was published earlier in the OISPG publication series, but its key findings are also available in this yearbook.

The second part interlinks regional innovation with the overall concept of open innovation ecosystems leading to new policy measures for the regions. To have a holistic range of actions supporting the emerging innovation processes and ecosystems, discussion on the governance models of the future Internet and its implementation to service society has arisen. Issues like privacy and trust are very important in the open development processes. They ensure the business potential and, at the same time, the fair share of the developed value spills over back to the initiators. This, together with increased societal capital, enables better value propositions for all stakeholders.

In the third part, the case descriptions and country reports follow the recent development of open innovation practices through cases, for example, in the context of Dutch or Danube region or in the cases presented by, for example, Nokia. Collaboration partnerships between public and private sectors are illustrated as well. In this context, it is important to analyse the different roles of the stakeholders. Cloud computing seems to be one important tool which enables new types of interactions needed for co-creativity and innovation. This is illustrated in the articles by IBM and SAP. Articles about interesting approaches to semantic keyword analysis and open innovation models in practise show both the problematics and the power of Open Innovation 2.0.

The third part of the yearbook contains also interesting follow-up to the last year's edition: Intellectual and structural capital trends in several countries are analysed, with an interesting new approach focusing on service innovation potential.

From this very rich content of the innovation yearbook, one can clearly see that open innovation is knowledge society's approach to well-being and sustainable development, both societally and economically. Open innovation can be very relevant when seeking and verifying the applicability of disruptive innovation outcomes in the society. These insights from a variety of views to service innovation are hopefully very stimulating to the reader who wishes to enter the new mainstream.

CHAPTER I

Policy development

1.1 Services innovation: complexity, openness, modularity, and structure

As is evidenced by volume, it is now well known that most leading economies in the world are increasingly dominated by services businesses. Yet we know surprisingly little about how such businesses advance and improve over time. Most of what we know about innovation comes from decades of research into the creation of new products and technologies. But services are not the same thing as products and technologies. They are not physically tangible, they are usually consumed when delivered, they cannot be inventoried, and they often require close interaction between the provider of the service and the consumer. If we are to continue to advance innovation in the 21st century, we must learn how to advance innovation in services businesses [1].

Understanding services innovation requires us to rethink business in fundamental ways. Product-based businesses utilise artefacts to convey customer requirements to suppliers and those same artefacts help customers determine whether or not the supplier has met their needs. In services businesses without those artefacts, the relationship with customers and suppliers changes. The company cannot fully specify its needs in advance to the supplier, while the company cannot describe fully its capabilities to meet the needs of its customers.

A services perspective also changes the competitive landscape. Customers can become partners, as can suppliers. Competitors become collaborators. Strangers become important, even vital, to competitive success. Integrating these disparate inputs into new, coherent systems and architectures becomes a key source of value in a world dominated by services.

Adopting a services innovation perspective requires making significant changes, and such drastic changes are costly, and time-consuming for companies. Yet many companies have profited from making the change. Consider IBM in enterprise computing. Or Rolls-Royce and GE in aircraft engines. Or Xerox in copiers and printers. Or Philips in electronics and (now) healthcare. Each of these companies used to treat services as peripheral to their core business. Now services are at the core of a new, larger, faster growing business for each of them.

Services can also strengthen a company's competitive position, making it harder to attack. Consider the iPod, iPhone and iPad. Companies like Dell, Microsoft, and Google have tried valiantly to unseat Apple in the cell phone and personal music player markets. To date, though, their efforts have been unavailing, and services are the reason why. For the Apple iPod and iPhone are no longer merely products. Instead, they are platforms for the distribution and delivery of a range of services that make Apple's devices far more valuable for their customers. So a competitor cannot succeed in an attack against Apple on the basis of a better product alone. Instead, that competitor must orchestrate an alternative array of services on the competitor's device (a capability we explore below in Modularity and systems integration) that collectively deliver a superior experience for users.

Here are four considerations that are vital to successful services innovation:

1. Complexity
2. Openness
3. Modularity and Systems Structure
4. Organisational Structure.

Complexity

The lack of a tangible product means that each party in a transaction needs the other's knowledge in negotiating the exchange. On the one hand, the provider lacks the contextual knowledge of the customer's business and how the customer is going to leverage the offering to compete more effectively in the market. At the same time, the customer does not know the full capabilities of the provider's technologies or its experience from other transactions in assessing what will work best.

This contextual difficulty should not be carried too far. The prevalence of services in advanced industrial economies shows that suppliers and customers usually are able to exchange enough information

to accomplish the exchange. When the service provided is modest in complexity and repeatedly provided over time (think of a haircut in a salon, for example), the provider and customer need to exchange only limited amounts of information, and can do so over many repeated attempts, so that errors at one exchange can be corrected in the next.

When the complexity of the exchange becomes very large, and when the exchange is repeated only seldom or not at all (think of installing and operating an enterprise resource planning system for your company), the technical complexity and the lack of repeated experiences between the parties makes the full exchange of information vitally important to achieve, yet daunting to accomplish.

As technical complexity rises, the services customer becomes a co-producer of a service innovation, intimately involved in defining, shaping and integrating the service into his organisation. The supplier of the service can extend an offer of what is to be provided but, as we shall see below, it cannot entirely specify the requirements of the service. Instead, the supplier designs its processes to elicit this information from its customers, and modifies the offering in response to customers' needs before sale. In turn, customers select their service provider on the basis of the capabilities they offer, and the extent to which the customer is able to shape those capabilities to serve their particular needs.

Openness

In an open model of innovation [2], firms use internal and external sources of knowledge to turn new ideas into commercial products and services that can have internal and external routes to market. For example, traditional broadcasting companies like the BBC face the challenge of successfully responding to the proliferation of new digital media technologies and markets [3]. The BBC set up a kind of open source community to engage with numerous external individuals and firms through a process of open innovation experiments called 'BBC Backstage'. External developers were encouraged to use its website established in May 2005 — offering live news feeds, weather and TV listings — to create innovative applications.

Openness allows organisations like the BBC to focus on combining its internally generated content with externally sourced content, to simultaneously create greater economies of scope for its audience, and economies of scale for its content producers. A related benefit comes from the participation of many more firms in the market. With the diffusion of more knowledge to more participants in the industry, more companies can experiment in parallel with possible ways of utilising and combining knowledge [4]. No single company can hope to compete with this external explosion of potential offerings by relying entirely on its own internal knowledge. While internal knowledge and resources may be deep, they are necessarily limited in scope. Combination and experimentation proceeds in series within the firm, rather than in parallel in the market. The only way forward is for firms to become integrators of both internal and external knowledge.

Performing the integration function effectively requires a high degree of systems knowledge, of how the various elements of a system work, and how they might be combined together in useful ways. Firms that focus only on particular parts of the system without regard to the overarching system (and its further development), are at risk of falling into a 'modularity trap' [5]. In this trap, the design rules and interfaces that connect the specific part of the system to the overall system evolve over time in ways that disadvantage firms who have lost essential knowledge of the system's architectural evolution.

Modularity and systems integration

By developing a standardised product design based on modular components that can easily be configured and reconfigured for a variety of customers needs, firms can combine the cost advantages of high-volume production (components) with high flexibility or customisation of final product. The interfaces linking components into a system can be made compatible so that multiple components can be specified, adjusted and integrated in various predetermined ways to the varying customer or market demand. Modularity provides a resolution to the trade-off between price and customisation: offering the cost advantages of economies of scale and scope in standardised component production, while providing a higher degree customisation of the final product.

Although the literature on modularity and platforms is almost exclusively concerned with manufactured products, the industrial marketing literature suggests that such approaches can be applied to combinations of product-service offerings [6]. The hardware or 'product components' are the physical pieces of technology that form a specific function in the overall system; and the software or 'service components' are the knowledge or intangible human efforts to solve customer's problems by performing activities to design, build, operate and maintain a product.

Like product components, services can be developed into standardised, simplified and routinised methods of operation. Rather than being offered on an ad hoc basis at the request of a each customer, services can be developed and 'packaged' into routines and performed as repeatable processes. However, as with products, there are limits to standardisation in highly complex service situations, because services are often individually designed and tailored to a specific customer's needs — such as an airline, telecoms operator or railroad company — and uniquely provided to address phases in life of a specific product, such maintaining and support a fleet of trains.

Given the potential value in identifying, assembling, connecting, integrating and testing complex services, the evolution towards services is ushering in a new kind of value-added activity: systems integration. Those who provide this capability are responsible for the overall system design, selection and coordination of product and service components supplied by a network of external suppliers, the integration of components into a functioning system, and the continuing development of knowledge to keep pace with future generations of technology and system upgrades [7].

In an industry characterised by outsourcing and 'open innovation', systems integrators are uniquely positioned to link or couple upstream developments in technology and products with downstream requirements of customers and rapidly changing markets. The systems integrator model of industrial organisation emphasises the advantages of specialisation at the systems and component levels, based on modular components supplied by many external companies, standardised interfaces, and an ability to integrate multi-vendor sources of technology, products and services [8].

An example of the emergence of a systems integration capability comes from IBM. The IBM System/360 was based on a modular design, but the software components and interfaces were proprietary. Once a customer had purchased an IBM computer, the complex operating system made it difficult to switch to another vendor's system. The customer was locked in to IBM's hardware, software and service support. By the 1980s, a new organisational model challenged the traditional advantages of vertical integration. Many specialised suppliers of modular components began to challenge IBM's dominant position. Rather than mirror the structure of the industry by breaking up IBM to create a number of specialised suppliers, Louis Gerstner, IBM's CEO, executed a strategy to move into services, while reducing its dependence on in-house technology by offering to design, integrate and support a competing vendor's products (e.g. HP, Microsoft and Sun) if this was required to provide integrated solution to customer needs [9].

As noted above, the customer must interact with the supplier at various points in the services process without recourse to tangible artefacts like products. Product-based businesses leave it to the customer to perform the final installation and integration of the item into the customer's process. Service businesses deliver the benefit to the customer by taking over the integration of the item.

Organisational structure

The above elements of services innovation that we have identified, including the role of complexity, the value of openness, and the importance of systems integration, all have powerful implications for organising services innovation. On the one hand, organisations need to provide intimacy with the customer, to enable the customer to co-create solutions to their specific needs. The organisation likely will want to offer a broad services integration capability to its customers, enabling access for the customer to a vast array of offerings through the organisation. In this sense, the organisation will need to generate substantial economies of scope in serving the many and diverse needs of its customers.

New organisational structures are emerging to provide customer-focused services and solutions based on a range of standardised and customised offerings. These new structures are designed to resolve the trade-off between standardisation and customisation. They are responsible for developing standardised 'solutions-ready' components, that can be combined and recombined at much less cost than solutions comprised of entirely customised components [10]. Each solution can be tailored to a customer's unique requirements using standardised, reusable and easy-to-deploy modular products and components.

Some large companies that have developed growing services businesses — such as IBM, Sun Microsystems, ABB, Nokia and Ericsson — have reorganised to form 'front-back' structures designed for efficient and repeatable solutions provision [11]. These businesses have formed 'front-end' customer-facing units to develop, package and deliver customised solutions for individual clients across product and geographic lines. The traditional product-based divisions have been reorganised into 'back-end' providers of standardised solutions-ready components, often developed as common technology and product

platforms that can easily be configured for individual customers. In addition, some companies have set up service divisions — such as IBM Global Services and Ericsson Global Services — as back-end providers of services, capabilities, processes, guarantees for service reliability, pricing and resources. Both types of back-end units provide solutions-ready components that can be mixed and matched in different combinations by the front-end units.

A 'strategic centre' manages the interfaces and flows of knowledge and resources between the two operational units. This 'reconfigurable organisation' can adapt and respond to continuous changes in technology, sources of component supply and customer needs. For example, since 1999 Ericsson (the world's largest supplier of cellular phone networks) has created back-end units — Ericsson Gobal Services and Ericsson Systems — and formed 28 market units and individual front-end units — such as Ericsson Vodafone — dedicated to the requirements of its large cellular network customers [1].

Companies like Amazon now offer their back-end transaction processing services over the Web through the Elastic Cloud computing service. Utilising Amazon's Elastic Cloud service gives companies access to world-class IT processes, and saves them the cost and headaches of developing and maintaining such an infrastructure. Amazon also clearly benefits, both from the additional revenue that comes from opening its infrastructure to others, and also from sharing its infrastructure costs with a larger base of volume. So Amazon's internal costs go down, even as its revenues go up [12].

Conclusion

This volume clearly establishes the growing importance of services — and services innovation — in an advanced economy. We can learn much about innovating services from the product management literature. Yet important departures from the world of products are necessary in order to grasp the challenges and opportunities inherent in innovating services businesses.

Innovative service organisations must be mindful of the underlying systems knowledge required to identify, access, and leverage the wealth of external knowledge surrounding them. They must be open, and strive to avoid the 'not invented here' syndrome that neglects the external as they develop the internal. And they would do well to consider both the customer-facing side of their business and the back-end transactional side of their business, in order to achieve both economies of scale and scope in their markets.

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1.2 The drivers for new societal fabric: why active measures for the new societal dialogue are needed for creativity and growth in the wisdom society

This article represents one perspective of the need to create a new societal fabric for user-centric innovation, especially for the services sector. The knowledge-intense services will be the key for the creation of new growth beyond the economical and partly societal turmoil we are currently in.

The knowledge society is in transformation to the wisdom society, where information and knowledge is not only seen as a raw material for normal activities, but where the structural use (mash-up) of societal and technology innovation is based on new types of connectivity and value aggregation.

In this article, possible new drivers for growth are elaborated, as well as the possible enablers for new types of entrepreneurship and sustainable societal and economic development. We need to see how to build the new societal fabric for innovation and sustainable development both societally and economically.

Background

We are in a bigger societal change than ever before in mankind's history. The information and communication technologies have already affected human behaviour fundamentally, by enabling wide democratic connectivity and easy information availability at our fingertips.

However, when we look at the current eDrivers (eCommerce, eGovernment, eServices, etc.), we still see that there is a strong trend to do things as we did before, just 'better' and 'more effectively', very much based on those paradigms we were familiar with in the industrialised society.

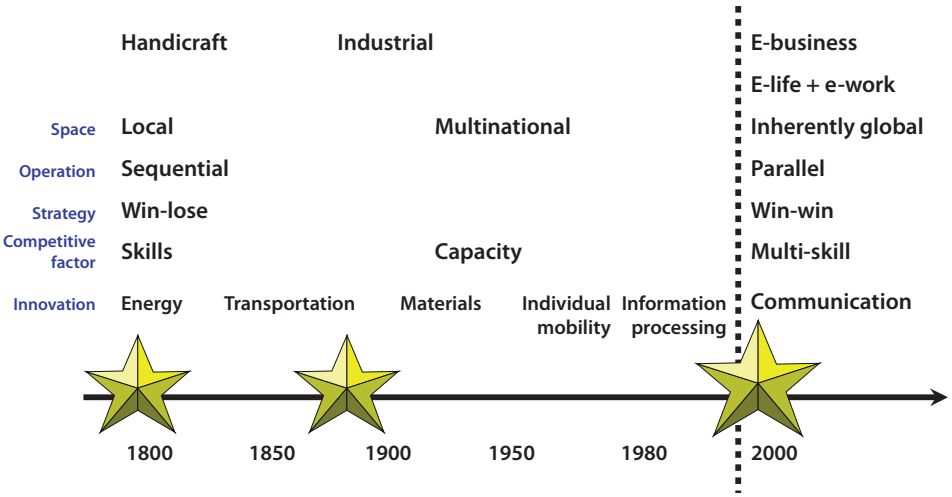
The keywords (Figure 1) are frequently in use, without putting enough thought into the fundamental change we are in. It is not about transforming something into an electronic format. The change is much more profound. Society is moving from a hierarchical and controlled to something where citizen empowerment together with value-based communities will have a profound role. This is already seen around us in people's behaviour, but also in the new innovation processes where connectivity of skills and values are increasingly important.

What has changed? When we look at the technology revolutions and the following industrial and societal revolutions a hundred, two hundred years ago we need to have a focus on the transformative nature and the drivers of the revolutions (Figure 2). The most recent revolution, the ICT revolution, has its transformative power in the fact that, for the first time in mankind's history, our society is moving to less hierarchical one, simultaneously both in time and space.

What does that mean? Now, more than 10 years after the beginning of this revolution we see the power of crowds, and also new business models seriously conquering the old 'dinosaur' models which were valid in the industrialised era. We are now in the hype of the 'knowledge society' where

Figure 1. A lot of keywords — what is behind them — the real world in change!

Figure 2. Fundamental change — a revolution! [1]



information and knowledge is accessible and being a part of the competitiveness of organisations and also individuals. But, the biggest issue is still how to create the societal fabric which will take us to the wisdom society, following the enablers and also drivers ICT is creating, for connectivity, for leadership leading to a both societally and environmentally sustainable society.

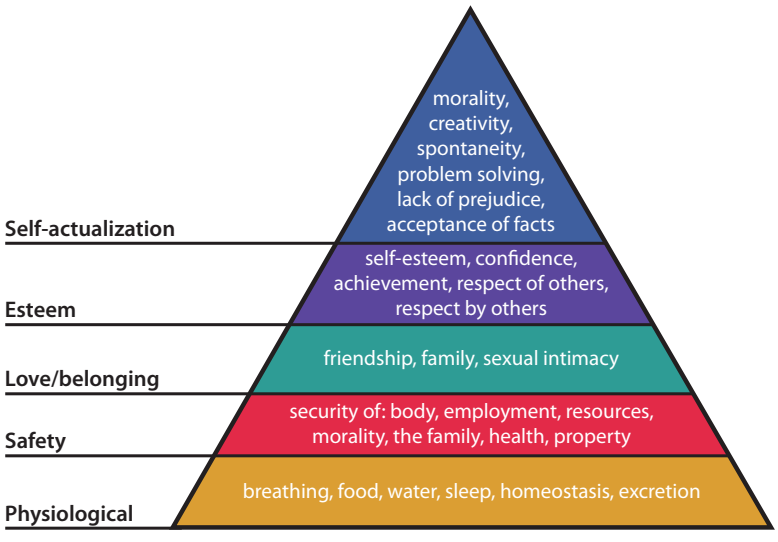
The drivers of individuals and society

The change is inevitable. However, we need to see in this new context some of the time-invariant drivers over the various revolutions. Can we, for example, assume that Maslow's hierarchies of needs are valid for the modern society (Figure 3)?

Largely, in the Western world, the basic physiological and safety needs are in policy focus and, therefore, we also can say that those are not necessary the main issues for new policy actions, enabled by societal connectivity.

When looking at the changes in societal behaviour, we see that the levels of esteem and self-actualisation start to grow both in ICT applications (social media) and the offerings enabled by (modern) ICT.

Figure 3. Upper levels of Maslow's hierarchy drives change enabled by ICT [2]



We need to be much more active in focusing policy measures towards the new societal fabric, which is clearly built on the upper levels of the Maslow hierarchy.

What does that mean for innovation? The focus of successful innovation will be driving towards satisfying the upper-level needs, those factors increasingly being the differentiation factors between successful and non-successful innovation. Hence, user-centricity, and even user-driven innovation paradigms, should be our new (European) approach.

Open innovation environments enable the wide interaction necessary for success. What is even more important is to understand the role of prototyping, because then the various drivers are interacting in a concrete way, not only conceptually. Our research and development actions should build on creating a strong, open innovation culture based on prototyping (not piloting, as innovation is a true mash-up, no longer sequential).

The same change can be seen in enterprises/organisations. In the industrial era, the drivers were cost-oriented, focused on the basic, predictable and calculable value of the company or company clusters.

However, when we see the new operating environment for knowledge-intense companies we see the transformation from tangible products to intangible ones, or products and services with embedded knowledge. The 'Maslow pyramid for enterprises' (Figure 4) can be re-sketched form this perspective. The most critical levels of success are cross-organisational issues, innovation culture (open, experimental, sharing) and the organisational agility to position the competencies of the company in the society, vis-à-vis other organisations, but also among the citizens. Citizens are in the new understanding not 'objects' for innovation, but due to the societal fabric and nature of innovation active players, 'subjects'.

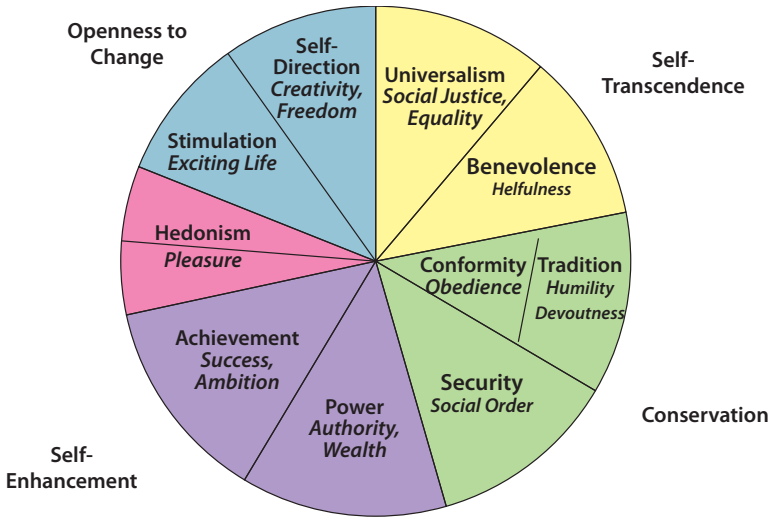
The challenge is to support the move towards higher level in the Maslow hierarchy to satisfy societal needs for sustainable society. It requires an infrastructural change and also experimentation and prototyping to see how we can match the societal drivers, organisational drivers and individual needs in a robust way. To achieve a robust society, a strong leadership is needed. A leadership enabling new societal contract between individuals and the society, the inclusive wisdom society is the critical asset for the future.

Groups, especially value groups are driven by agglomerated values. How to transform the described needs towards values is one of the key questions when we try to see new openings for growth and entrepreneurship in the field of citizen-close services.

The universal value theory of Schwarz creates an interesting approach in the strategic thinking

Figure 4. The innovation culture and agility are the drivers for future enterprises and organisations [3]

Figure 5. The universal values by Schwarz create an interesting framework to look at the values of new types of entrepreneurs and enterprises [4]



Source: http://www.yourmorals.org/schwartz_graph.jpg

of how to transfer the individual needs described by Maslow to a more group and society-oriented perspective (Figure 5).

Based on interesting study results, we see new types of values emerging, supporting the openness to change, self-direction and also self-enhancement. A good in-depth analysis is found, for example, in the discussion papers of the Selusi project [5] funded by the European Commission. The project focuses on social enterprises and entrepreneurs, widening the definition also to profit making companies operating in the societal fabric, creating it, and also with usually large well-established companies. These new enterprise ecosystems seem to be more stable than the traditional ones comprising of old type of businesses and also, remarkably, the innovation capability of these new generation of entrepreneurs is significantly higher than those in traditional sectors.

As shown in the study, the traditional entrepreneurs focus very much on values like power and tradition whilst the new generation of entrepreneurship is much more based on universalism and stimulation (Figure 6). This is seen also in very many companies based on creativity, for example those micro-multinationals in gaming. Micro-multinationals, that is small companies operating on global platforms, should be also in special focus when looking at new entrepreneurship: how to create platforms for global development and experimentation for the ideas to be verified in real-world settings, without too much risk, and providing a fair share of the return to the creators.

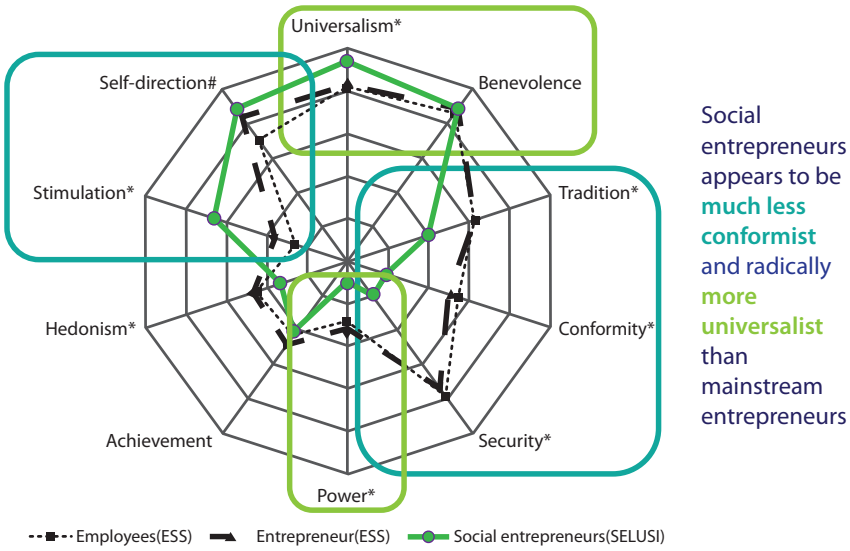
Necessity of new approach

When speaking about the creation of new societal fabric, new entrepreneurial forms and new extrapreneurship, co-creativity of services is important. The need to create knowledge-intense services based on open platforms enabling new service offerings also combining the cyber world with real-world offerings is increasingly important.

The innovation pyramid is reversed (Figure 7). The ICT enabled platforms, the new business models, and the increased personification of services put the end-user in the driver's seat for the new service society. Knowledge per se is no longer seen as an asset, but rather a raw material only, as only increasingly combined with human experience and societal values can we create sustainable development, in the wisdom society, where the new societal fabric for well-being is created.

Growth in well-being can increasingly be achieved by intangible actions and services, provided that the basic needs are fulfilled. Hence, the drivers

Figure 6. What does the average value profile of a social entrepreneur look like? [6]



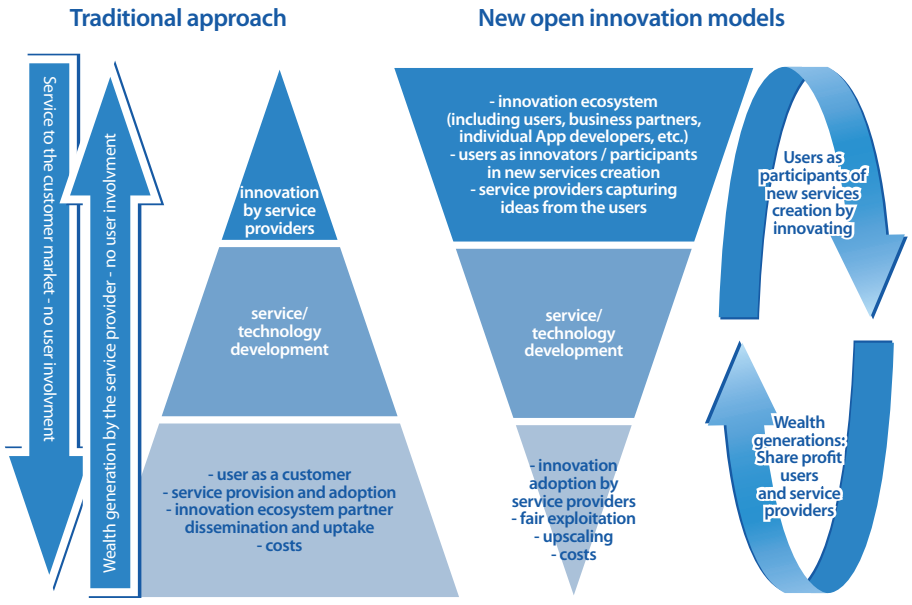
from the Maslow and Schwarz theories are worth being taken into closer consideration when developing new European citizen-centric innovation policies. This should also stimulate new entrepreneurship and new forms of wealth in the economy.

The traditional innovation pyramid is reversed, and there is no return.

Conclusion

The next generation of Internet is emerging, with mobility, true broadband, active interactivity and highly personalised services. However, we are currently relatively weak in driving the applications forward following the paradigm shifts in society, setting the user in the centre (user equals citizens, firms, etc.) We need to have a deeper look at the new societal fabric for innovation, building on the

Figure 7. Reverse innovation pyramid [7]



mash-up of societal drivers, value drivers and technological (mainly ICT) enablers.

Moving to user-centricity and co-creativity enabling the fair and safe trial of new services on open platforms also requires new thinking of the legal and policy approaches for the wisdom society, capturing the societal dimension of the knowledge society. Can we build new practices and principles based on the rights and the roles of the citizens in the society? Can we create a set of fundamental rights in the digital context which cannot be violated in any situation, thus enabling more freedom to make prototypes and trials on new business and service models in the real-world settings?

However, when we look at the real issues, we need to be very active on the political level to create rules, principles and practices on how the new society is shaped. What are the rules of the game regarding privacy, commercial v citizen rights? What do we want the future societal fabric to look like?

Can we move into a development paradigm based on real-world prototypes and trials, encompassing the technology, society and policy frameworks, integrating them in experimental way, developing simultaneously the various components of the future society? It is right time to think about a new approach seriously, and lead the way by courageous pan-European actions.

Now is the time to initialise the debate on the future wisdom society, its values and principles. What is the new contract between citizens and the society, in the new era?

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1.3 Unlocking the digital future through open innovation

Neelie Kroes, Vice-President of the European Commission and EU Commissioner for the Digital Agenda for Europe (DAE), argues, "key to achieving many of our competitiveness and innovation ambitions in the coming years (...) is to embrace open innovation and platforms, so that we avoid wasteful platform competition, and anticompetitive lock-ins, as well as stimulating development and investment in new generations of online services" [1].

The Digital Agenda for Europe was launched on 19 May 2010 as the first of seven flagship initiatives under the ambitious Europe 2020 strategy which sets out the EU growth strategy for the coming decade to a smart, sustainable and inclusive European economy.

In order to challenge the economic crises, slowed down economic and social progress and exposed structural weaknesses in Europe's economy, the overall aim of the Digital Agenda is to deliver sustainable economic and social benefits from a digital single market based on fast and ultra-fast Internet and interoperable applications [2]. To achieve this, the Digital Agenda proposes actions defining the role information and communication technologies (ICTs) will have to play if Europe wants to succeed in maximising the social and economic potential of ICT for the benefit of European businesses and citizens.

In the broader context of the policies and actions outlined by the DAE, it appears as if interoperability and standard-setting both for inclusive digital services and eGovernment services are in need of pan-European platforms to coordinate cross-border service creation in partnership. The remaining question, which has been largely neglected by the Digital Agenda till now, is how these emerging platforms can be aligned under common principles and common architectures to build a genuine single market ecosystem for services development and interaction between public, private sector actors, and people. Henceforth, this article gives an insight into the discussion: Can open innovation give rise to open, interoperable platforms and ecosystems enabling successful implementation of policies and actions outlined in the Digital Agenda for Europe?

It will be argued that, from an intellectual capital perspective, open innovation represents the structural capital, while industry, academia and private users present the human capital. Both structural capital and human capital raise the relational capital which enables the intellectual capital, in this case the actions and policy formulations of the Digital Agenda, to be successfully delivered.

Digital Agenda for Europe — the context

The European Commission, in consultation with different stakeholders, launched the Digital Agenda for Europe to exit the economic crises and to face societal challenges such as demographic change and global competition in all economic sectors.

The Digital Agenda sets out 101 actions clustered in seven pillars; these actions shall ensure the emergence of a European digital single market and society. The seven clusters of action are Vibrant single market, Interoperability and standards, Trust and security, Fast and ultra-fast Internet access, Research and Development (R & D), Digital literacy, Inclusions e-Skills and Societal challenges (public services, health, environment) [2]. The seven fields of action link technological and societal innovation within a strong framework for the future knowledge society, which is based on ICT infrastructures. The use of ICTs in Europe is crucial to address policy objectives in societal and economic key areas such as an ageing society, climate change, reducing energy consumption, improving transportation efficiency and mobility, empowering patients and ensuring the inclusion of persons with disabilities [2]. It is believed that by the right deployment of ICTs in the above mentioned fields, a digital society will be created with benefits for all actors involved.

The deployment of ICT is a critical element in addressing climate change. So far, the EU has committed to cutting its greenhouse gas emissions by at least 20 % by 2020 compared to 1990 levels and to improving energy efficiency by 20 % [2]. ICT for environment has a cutting-edge role setting standards and measurement frameworks for ICT services and products targeted at reducing energy use and greenhouse gas emissions across Europe. With regards to a fast deployment of ICT-based solutions for smart-grid and meters, near-zero energy buildings and intelligent transport systems, cooperation and partnership between industries, public authorities and other sectors is of vital importance to enable citizens and organisations to reduce their own carbon footprint [2]. ICT solutions are needed to further monitor, analyse and visualise energy consumption and emissions of buildings, vehicles, companies, cities and regions. In particular, smart grids are considered to lead towards a low carbon economy. ICT solutions such as open transmission-distribution infrastructures, communication platforms and

control panels therefore ensure cooperation and interoperability between different grids.

The Commission has recognised the importance of healthcare to European citizens as well as the tremendous potential ICT bear for stimulating market growth and innovation in healthcare systems and pharmaceutical and medical devices throughout Europe. Therefore, the DAE subscribes huge importance to accomplishing its eHealth targets in order to create sustainable healthcare and ICT-based support for dignified and independent living. Prerequisite to eHealth creating benefits for all, however is, the removal of legal and organisational barriers, particularly those to pan-European interoperability, and strengthening cooperation among Member States [2]. It appears as if there is no doubt that eHealth has the potential to create benefits for all actors in society. However, eHealth does not by far present the salutary approach to the structural shift in healthcare that seems to be inevitable. As Mars (2010) argues, policymakers face critical challenges as they attempt to develop borderless eHealth policy amid competing demands on funds and resources [3], which as a consequence, might broaden the digital divide between those capable of using and participating in the digital society and those remaining excluded. This not only links to the digital literacy of Europeans, but indeed challenges eHealth and the lack of uniformity in healthcare policies across the 27 EU Member States, as no common responsibility to eHealth exists among the Member States' policymakers. Mars [3] points out how in 13 countries, the main health policymakers differ from those who set eHealth policy. For eHealth policy, multiple ministries and/or national stakeholders are involved in planning policy.

In addition, eHealth policy targets vary across Member States resulting in a lack of adherence to seemingly common goals [3] which leads to very poor universal policy implementation outcomes at the Member State level, lacking any real-life practice. Departing from this, even though there is only little doubt that further R & D on eHealth will stir technologies, applications and services facilitating the emergence of a pan-European eHealth sector. There is a huge danger that eHealth applications and services are implemented without increasing, at the same time, digital literacy among patients as well as medical staff. It is thus of most importance to take citizens on board already in the early development stages of eHealth applications and services to make sure that technology is user-friendly and functional. With regard to research, R & D frameworks need to be adopted with a strong focus on security policies, practices and broadband services. eHealth policymaking, should thus be embedded in the general context of eGovernment services like eBusiness,eLearning, eInclusion, eSecurity and many more to make sure that developments and policymaking is not excluded from other fields of eGovernment services, which may be working on the same issues in different development stages. Therefore, private-public-people partnership and consultation is vital to address the development of eHealth services with a real-life approach.

Broadly speaking, eGovernment which often is referred to as eGov, digital government or online government [4] refers to services enabled by a new ICT environment. eGovernment services offer a cost-effective route to better services, for businesses and citizens and significantly reduce time, cost and administrative burdens for public administrations. In Europe, some eGovernment services are already available in most Member States; however, huge differences exist between the levels of take-up amongst Member States. According to the Commission, in 2009, only 38 % of EU citizens used the Internet for accessing eGovernment services, compared to 72 % of businesses [2]. Hardly any public services are accessible either across borders or across different industrial sectors within Member States. For this reason, European governments are pushing for a swift implementation of user-centric, personalised and multi-platform eGovernment services by 2015.

The main prerequisite for seamless cross-border eGovernment services in a digital single market however is the interoperability of eGovernment services which are accessible by businesses and citizens across borders. The Commission aims at challenging the lack of cross-border public service applications by driving towards pan-European public services solutions. In order to do so, Europe needs better administrative cooperation to develop and deploy cross-border public online services [2].

'The European eGovernment Action Plan 2011–15 — Harnessing ICT to promote smart, sustainable and innovative Government', proposes key priorities to realise the objectives on eGovernment approved unanimously by the fifth Ministerial eGovernment Declaration, also known as the Malmö Declaration. Overall, the Malmö priorities push towards more resource-efficient usage as well as engagement with citizens. The use of ICT with innovative technologies such as service-oriented architectures (SOA), or clouds of services, together with more open specifications which allow for greater sharing, reuse and interoperability reinforce the ability of ICT to play a key role in this quest for efficiency

in the public sector. The eGovernment action plan, thus, complements the Europe 2020 strategy as well as the DAE by aiming at the implementation of cross-border e-Government services for businesses and citizens by 2015, which by then shall be used by 50 % of EU citizens and 80 % of businesses.

The Digital Agenda for Europe aims at bringing Europe back on track towards a digital single market based on ultra-fast Internet. In order to monitor the success of the DAE actions, the Directorate General Information Society and Media at the European Commission has established the Digital Agenda Scoreboard, which will be published on an annual basis at the Digital Agenda Assembly.

Overall, the Digital Agenda has a very strong international approach to complete the actions in the different clusters of action. The key challenge of the DAE, however, is the implementation of its actions across Member States in accordance with the Europe 2020 strategy. For this reason, the Commission will set up an internal coordination mechanism to ensure effective implementation of the proposed actions. The core principle of implementation is cooperation and partnership with Member States, the European Parliament and other stakeholders. In order to establish close cooperation with all actors involved, the Commission aims at establishing a 'High-Level Group' to work together with Member States, foster consultation and dialogue with members of the European Parliament and set up large-scale stakeholder events in the different fields of action to facilitate debate and partnership.

The Digital Agenda Assembly presents the cutting-edge event bringing together actors from Member States, EU institutions, citizens' representatives, and industry to evaluate progress and emerging challenges to the Digital Agenda for Europe. In this vein, the Commission published, in May 2011, the first annual Digital Agenda Scoreboard, which provides a first, however, very early, update on socio-economic developments as well as progress of DAE actions. As improving the EU research and innovation funding and innovation partnership programmes, is one of the key prerequisites in order to stir European ICT innovation, it is worth analysing programmes currently in place to support the targets set out by the Europe 2020 strategy. Thus, the next section examines the nature and organisational developments of the most prevailing EU research and innovation funding programmes.

EU research and innovation funding

Successful implementation of actions and policies of the DAE requires innovation partnerships and collaboration between industries, academia, and small and medium-sized businesses, private and public actors. In this vein, and in the context of the Europe 2020 strategy, EU funding and framework programmes present the EU's strategic approach towards a common strategic framework for research and innovation.

First and foremost, the Innovation Union flagship initiative focuses on advancing Europe's R & D potential. According to the Commission, in Europe: innovation is our best means of successfully tackling major societal challenges, such as climate change, energy and resource scarcity, health and ageing, which are becoming more urgent by the day [5]. The Commission argues that Europe has no shortage of innovation potential, but instead fails to leverage its potential by continuously underinvesting in R & D, in particular in comparison to the US or Japan. Moreover, unsatisfactory framework conditions, ranging from poor access to finance, high costs of IPR (Intellectual Property Rights) to slow standardisation and ineffective use of public procurement [5] create serious disadvantages for companies who want to invest in R & D. Thereby, in Europe, we experience high fragmentation and costly duplication [6] across sectors.

It appears as if the key challenge for the EU and its Member States is to adopt a common strategic framework to innovation, based on common principles and overarching policy objectives, regulated across Member States at the highest political level. In this vein, the Innovation Union sets out such a bold, integrated and strategic approach [5], which, in the next decade, has the potential to create 3.7 million jobs and increase annual GDP by close to EUR 800 billion by 2025, if the Commission, in cooperation with public and private actors, manages to increase funding for R & D to 3 % of GDP by 2020. Policies set out by the Innovation Union aim at strengthening Europe's knowledge base by proposing actions to complete the European Research Area by 2014, bridging the gap between European and national research policies towards a common cross-border policy approach, based on increasing business-academia collaboration. The Commission fosters the creation of a genuine single European market for innovation to attract innovative companies and businesses as well as to stimulate private sector investment in R & D and European venture capital investments.

One of the most central themes of the Innovation Union is to pool innovation efforts by involving everyone in the innovation process. What has been coined European Innovation Partnerships refers to

a new way of bringing together public and private actors at EU, national and regional level to tackle the big challenges we face such as climate change, energy and food security, health and an ageing population [6]. Europe needs to efficiently pool its innovation efforts for cooperation and partnership, not only among Member States and regions, through the use of Structural Funds, but on a global scale in cooperation with third countries as international partners. Open access to EU R & D programmes and agreement on common research infrastructures with third countries are crucial issues towards global scientific cooperation for benefits of all actors involved in the knowledge society. Therefore, The Innovation Union flagship initiative contains more than 30 actions and policies.

The Innovation Union thus makes a clear statement for better linkage of research and innovation activities across Member States. In this vein, funding of R & D should focus more on policy objectives addressing societal challenges, thereby becoming more results-driven and leveraging other public and private sources of funding. Collective innovation efforts across Europe, in the past, presented a rather shattering image of high fragmentation and wasteful duplication of services and product development across Member States. For this reason, EU action is needed, while the Innovation Union has kicked off integrated EU-wide strategies for research and innovation, EU-wide programmes are also critical for closing our gaps with international competitors. According to the Green Paper on a common strategic framework for EU research and innovation funding, now called the Horizon 2020 initiative, EU research and innovation programmes are needed to generate a higher number of world-class scientific breakthroughs as they help generate excellence through European-wide competition. Moreover, an integration of policies and EU funding from research to market (as in the European Innovation Partnerships) will make Europe better at turning knowledge into innovation and the provision of services to support innovation processes beyond technological innovation will help in seizing market opportunities for innovative solutions [6].

EU-wide research and innovation programmes are crucial instruments to close the gap to Europe's global competitors, to leverage private investment as well as to make Europe an attractive investment location.

The Commission is all too aware of the need to adapt to future Internet technologies, increase the cooperation of the public and private sectors as well as standards and openness of innovation processes across geographical and vendor boundaries, to advance Europe's R & D efforts. The EU funding programmes invest huge financial means into the innovation cycle, largely independent of each other. Thereby, the EU programmes potentially increase R & D results within each programme, however, lack a strong cooperation and partnership approach, which would lead to more efficient use of the EU budget as well as efficient R & D results to the benefits of all societal and economic actors in Europe. In order to increase innovation partnership, the Commission has put forward, the Future Internet Public-Private Partnership as well as the Horizon 2020 initiative which both aim at establishing a cooperation and co-creative innovation landscape to maximise R & D benefits to European businesses and citizens. Besides, their isolated nature, EU research and innovation programmes face several shortcomings with regards to their ability to boost European R & D efforts. Usually, EU programmes are considered to be much too complex in their deadlocked structural approach to fund innovation activities in Europe. Most of the time, over-bureaucratic rules and procedures as well as the lack of a transparent whole-chain approach to innovation makes it difficult to simplify and broaden access to EU funding programmes to, for example, SMEs or third-country companies.

Due to the lack of pan-European R & D objectives linked with the current fragmented nature of EU programmes, R & D efforts across the Member States constantly create wasteful duplication and inefficient spending of funding. It can be stated that EU programmes operate in an environment in which most public funding for research and innovation is administered by Member States. Yet, still too often, this fails to take proper account of the transnational nature of research and innovation, leaving synergies with the programmes of other Member States or those of the EU largely unexploited [6]. Consequently, better organisation and structure of EU funding programmes in close cooperation with national and regional funds for research and innovation is needed to avoid wasteful duplication of R & D efforts and spending. Therefore, funding instruments should be pooled under a pan-European strategic agenda, to leverage added value of R & D to citizens, businesses and public actors.

In order to implement a successful research and innovation framework in Europe, the Commission has kicked off both the PPP and Horizon 2020 initiatives, pointing towards pan-European co-creative research and innovation efforts. While these actions move in the right direction of collaborative platform innovation, however, stronger involvement

of citizens and SMEs in the innovation processes is fundamental to Europe's success in implementing a research and innovation landscape which is able to cope with future societal and economic challenges. It is thus fundamental to establish a EU research and innovation funding environment that fosters digital as well as real-world open innovation platforms and innovation ecosystem creation, to enable cooperation and co-creative services development under the common objectives set out by the Europe 2020 strategy. Thereby, as Neelie Kroes, Vice-President of the Commission and Commissioner for the Digital Agenda for Europe put it, 'Unlocking the digital future through Open Innovation'.

Open innovation — unlocking the digital future

There exist various definitions of the open innovation concept itself and when talking about open innovation one can get lost in buzzwords and catch phrases quite easily without secure knowledge of the very foundations of the open innovation model. What do we mean by 'open innovation', or, in the case of services, 'open service innovation'? How does open innovation work in practice and how do we create an innovation ecosystem which is most likely to kick off innovation processes with a user-centric approach? What are the limitations and challenges to the open innovation concept?

First and foremost, it needs to be noted that recently the term 'open innovation' has become a major buzzword in innovation management [7]. Nevertheless, behind the buzz lies a fundamental message which has given ground to a new innovation paradigm based on openness and continuous interaction and collaboration among different actors within innovation ecosystems and platforms.

The term 'open innovation' has various commonly accepted definitions, which are all subject to continuous change. It has been argued that the idea that innovation is a collective process which involves many actors and their interactions is not new, and dates back to the concept of collective invention by Allen introduced in 1983 [8]. Open innovation, usually, can be referred to as the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation, respectively [9]. Thereby, open innovation is opposed to closed innovation, in which companies use only ideas generated within their boundaries (...), open innovation is characterised by cooperation for innovation within wide horizontal and vertical networks of universities, start ups, suppliers and competitors [7]. Koschatzky [10] has argued that especially since the era of open innovation has begun, firms which do not cooperate and which do not exchange knowledge reduce their knowledge base on a long-term basis and loose the ability to enter into exchange relations with other firms and organisations. In fact, Enkel [11] states that the future lies in an appropriate balance of the open innovation approach (...), today's business is not based on pure open innovation but on companies that invest simultaneously in closed as well as open innovation activities. Thereby, the open innovation paradigm presents a valuable model for innovation strategies of businesses and organisations; however, it is by no means a salutary approach to innovation management, since, its practicability is subject to various challenges.

Societal capital and creative commons beyond the cross-licensing model

Besides the above examined cross-licensing model to open innovation by Chesbrough which focuses mainly on collaboration and exchange of ideas between companies, Jacqueline Vallat's report *Intellectual Property and Legal Issues in Open Innovation in Services* co-published by the European Commission and the Open Innovation Strategy and Policy Group (OISPG), for the first time introduced the societal capital and creative commons approach to the open innovation concept. Her report presents a broader perspective to open innovation introducing the societal capital and creative commons dimension to the innovation processes. This means that the focus lies on the involvement of *all* actors in the innovation ecosystem; including end-users and end-user communities, brought together to share experience, information and best practices, and build strategic alliances and cross-disciplinary collaboration [12]. According to Vallat [12] only the societal capital and creative commons approach to open innovation maximises benefits to the full extend, by creating knowledge and experience, companies take on board and further develop.

Departing from this, it is believed that people within their communities and in their different roles in daily live (e.g. professional role, consumer role, community role) contribute to a huge degree to the common pool of knowledge and experience, therefore acting as so-called creative commons generating societal capital (see Figure 1).

Bearing the important role of individuals within their communities in mind, it is of crucial importance to create innovation ecosystems and frameworks between all societal actors involved in the innovation process. What has been coined as 'organisation (...) to reflect the idea of living innovation ecosystem, which develops from its

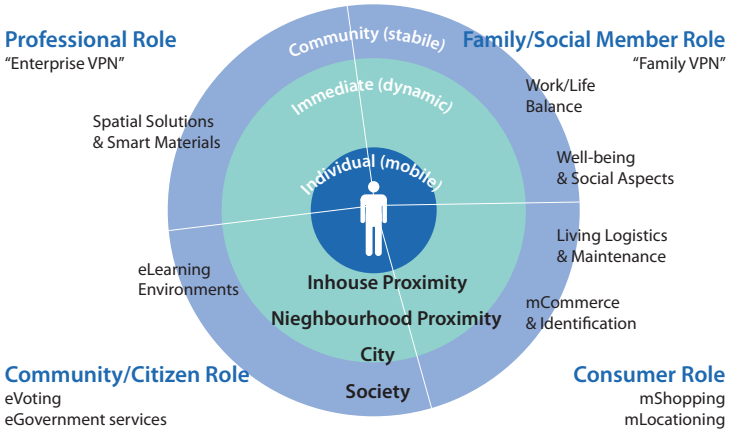
living components' [12], can be identified in particular in Europe with its huge cultural diversity and multiculturalism. According to Vallat [12], Europe presents an ideal environment for 'organisation' to happen, due to its rich cultural and economic diversity which creates highly diverse living innovation ecosystems, which present very valuable qualities, with the potential to yield (...) advantages as the improvement of companies' absorptive capacities and a higher productivity in the knowledge creation process.

In the societal capital, creative commons approach, the user is at the very heart of the innovation process. Generating ideas and input to the innovation processes through crowdsourcing enabled by community-based innovation. In addition, ICTs, in particular Web 2.0, have contributed to strengthen the dialogue between industry and users throughout the innovation process towards a co-creation role subscribed to the user. The user is also the object of a developing service convergence, facilitated by technology convergence; service convergence places the user at the centre of business concern, and makes the provision of highly context-sensitive services the key driver of business models [12]. Hence, open platform architecture is a prerequisite to enable individualised services provision to the user.

Generally speaking, openness lies at the very foundations of any open innovation approach. open source and open access, are fundamental to the creation of creative commons innovation ecosystem architecture. Along these lines the concept of 'organisation' fully relies on an open system enabling users to receive input and generate output in response. The societal capital, creative commons community-driven approach to innovation calls for broader perception and a continuously reviewing process of the open innovation concept, which refers to a service pull model of innovation where the role of the user is critical. Innovation thus becomes a co-creative collaborative procedure between the industry or service provider and the user, for example via crowdsourcing tools to capture valuable ideas produced by communities [12]. In this vein, this new co-creative collaborative procedures to innovation can only be enabled by open access and open functional platform architecture, which allow two-way communication between the user and service provider to take place. These open platforms make it possible to capture ideas from wide communities in a costless and effective way, thereby these platforms are increasingly becoming central to the way service providers view service provision in the future: as a way for the user to orchestrate between the different services he needs and personalise them completely [12].

The open innovation paradigm increasingly relies on digital and real-world ecosystems, which enable communication between the various stakeholders involved in the innovation ecosystem. Even though it might be a tough one to sell to intellectual property lawyers, the trend in innovation strives towards mass collaboration and *coopetition* between users and small and medium-sized companies and large companies. Underlying the discussion on whether innovation ecosystems and platforms need to be opened, partially openness and balanced open access to innovation platforms is the most appropriate and beneficial for all actors involved. We are, however, only in the very early phase of open innovation ecosystems and platform architecture; these processes are still in the very early development

Figure 1. Roles of a mobile individual in a real context [12]



stage. Nevertheless, it can be argued that digital ecosystems point towards the future of global innovation processes.

The openness and collaborative approach of open innovation ecosystems, without a doubt leads in the right direction for industry, governments and users. Open innovation ecosystems thereby create a new approach to organise R & D process within large and small organisations in cooperation with private users. While, in the past, fragmented and closed innovation has been the prevalent concept within R & D, nowadays, cross-border interoperability on a global level creates a new approach to innovation business strategies. Various trends around the concept of open innovation and ecosystem architecture are challenging the state of the art of the open innovation paradigm. As has been pointed out above, the societal capital, creative commons and community approach to defining open innovation presents a highly valuable concept pointing towards an open innovation paradigm which fosters societal innovation by increasing societal capital for all actors involved in the knowledge society. It needs to be added that mobile computing (via smartphones) linked to the increasing adoption of the smart city innovation paradigm, social networks and cloud computing will result in the next big shift to open innovation enabled R & D in the near future.

Intellectual capital management system — open innovation as structural capital

It ought to be noted that, innovation and intellectual capital are strongly connected within the 21st century knowledge economy. As Wu [13] points out, organisations with strong structural capital will create favourable conditions in which to utilise human capital and allow the realisation of its fullest potential to increase the innovation competence and relational capital of organisations. Consequently, the intellectual capital approach together with the open innovation model acting as structural capital presents a highly interesting approach, to boost the collaborative innovativeness of all stakeholders involved in the implementation process of the 101 Digital Agenda actions to unlock the digital future for the benefit of European citizens and markets.

To begin with, the field of Intellectual Capital (IC), also known as intangible assets was introduced in the early 1990s. Coined for the first time by Edvinsson, the term 'intellectual capital' was used, instead of the accounting term 'intangible assets' to describe (hidden) non-financial value in the Swedish financial company Skandia AFS's value scheme report. Ever since then, a debate has been ongoing on how intellectual capital has increased challenges to business leaders and researchers to conceptualise, categorise, measure and manage intellectual capital as key factor, within the emerging knowledge society, to thrive and prosper towards an innovative and sustainable future service economy.

According to Auer [14], by the end of the 20th century, the industrial society was replaced by a knowledge society with a heavy focus on services and organisational knowledge. Since the 19th century, the working sector has dramatically changed from agrarian to manufacturing and then towards a service-oriented business society in the late 20th century, continuously emphasising the advancement of organisations' intellectual assets to create profit and innovation. It is believed that in the present knowledge society, knowledge does not evolve as just another resource alongside the traditional factors of production — labour capital, and land — but in fact that intellectual capital presents the key problem-solving capability of knowledge organisations to increase their innovation competence [15].

Behind the obvious buzz related to the term 'knowledge society', there is a fundamental message. It is believed that within the knowledge society, increasing the intellectual capital of organisations is causally linked to the organisations' economic success. Managing and enhancing intellectual capital has evolved as the key challenge to successful business strategy and innovation competence of organisations.

Within the knowledge society, intellectual capital to enable innovative competence requires human capital to release their individual intellectual capital in cooperation with organisational knowledge acquisition processes. It is thus, individual and organisational working with the *intellectual capital* which adds up to the total of the organisational explicit and tacit knowledge creation [14]. In order to facilitate IC to increase innovation competences of organisations within the knowledge society, organisations rely on information management, which refers to IT solutions for fast communication between project teams and also to quick access to information and data online. While, *information management* is a mandatory tool of the knowledge society that allows data to be converted into information and to store, distribute and re-find information contents (...) *knowledge management* is strictly human-driven [15]; however, largely enabled by effective information management (see Figure 2).

In the context of the Digital Agenda, it has to be noted that the Digital Agenda for Europe actions,

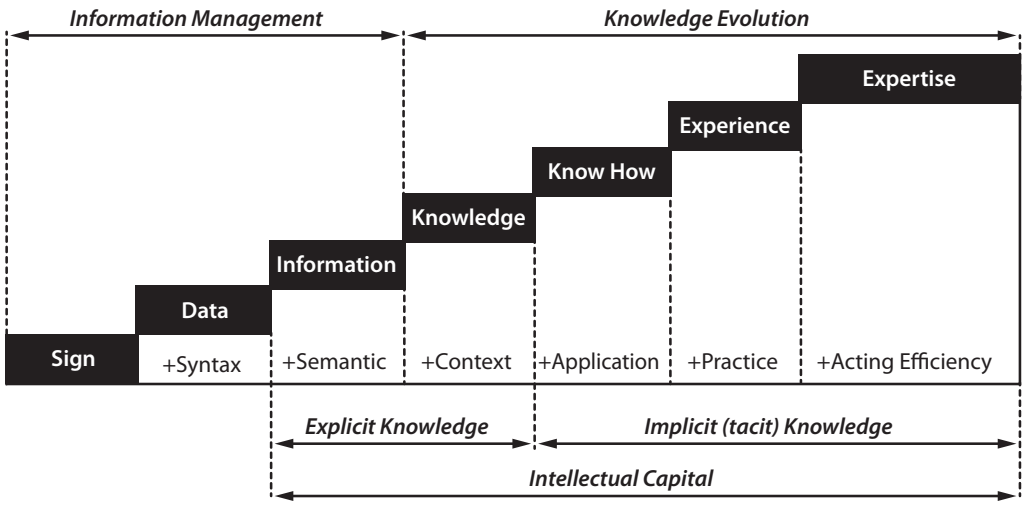
focus very much on addressing challenges and demands created by the transmission-process from a industrial society towards a service-oriented knowledge society and economy in Europe. As it is beyond the scope of this paper to deal with anyone's work on IC, only IC matters relevant to the overall research question will be discussed. It is believed that key to creating European innovation ecosystems and environments is fostering effective information management platforms and architectures and, most importantly, to increase and manage intellectual capital assets of organisations and EU projects to increase their innovation competences and, thereby, enable them to contribute effectively to the problem-solving in the key areas of the actions set out by the DAE.

To start off, while a universally accepted definition of intellectual capital does not exist, there is agreement on what intellectual capital constitutes. Generally speaking, intellectual capital can be thought of as the knowledge-based equity of a company [16]. It therefore represents the most important asset of a knowledge-based organisation [14]. Ever since intellectual capital entered the stage of debate in the early 1990s, there has been a growing awareness and interest in research and conceptualisation of IC. While Stewart [17] and Sveiby [18] argue intellectual capital has been considered by many, defined by some, understood by a selected few, and normally valued by practically no one. It appears as if what constitutes IC is not clearly defined, and what exists is an assortment of terminologies that have basically the same meaning [19]. Throughout the years, there have been many definitions of IC, sometimes referred to as invisible assets [20], intangible assets [21] and intangibles [22]; it seems, however, as if the terminology of intellectual capital has enforced itself.

Departing from this, the OECD, in 1999, presented a definition that categorised the economic value of IC into intangible assets of organisational (structural) capital (SC) and human capital. This definition presents a solid foundation for further categorising components of IC; moreover, it makes an appropriate distinction by locating IC as subset, rather than the overall intangible asset base of a business as has been stated previously [23]. Throughout the years of IC research, many attempts have been made to subcategorise IC. The first categorisation was made by Sveiby [18], who identified three subcategories: employee (individual) competence; internal structure; and external structure. Others added further categories or, as Edvinsson [24] did, termed the three subcategories in human capital, organisational capital and customer capital. Besides the various attempts to categorise IC by the use of different terminology, there is the tendency to harmonisation of the three interactive IC subcategories (see Figure 3); human capital, organisational (or structural capital) and relational capital (Sveiby [18], Bontis [15]).

According to Auer [14], these three categories of IC are highly interactive, as the human capital raises the structural capital: both together create the structural capital. In this categorisation approach to IC, human capital represents the knowledge creation potential of employees. This category refers to the skills, motivation, expertise and competences of individual employees and their willingness to share their knowledge and thereby contribute to

Figure 2. Uncovering the assumed IT dependence for knowledge creation [14]



problem-solving mechanisms inside the organisation. Organisational or so-called structural capital is possibly the most complex component of IC; it includes features such as innovation, culture and processes within an organisation, but also refers to IT platforms, services architectures and innovation, communication infrastructures. The third subcategory represents the relational capital generated by human capital and structural capital, which refers to the external relations of an organisation with, for example, research institutions, industry or other stakeholders.

In addition to the three subcategories of intellectual capital described above, so-called social capital and entrepreneurial orientation of an organisation have major impacts on the intellectual capital performance of an organisation.

Human capital, organisational (structural) capital and relational capital

In the intellectual capital framework, human capital refers to the value of knowledge, skills and experience held by individual employees in a firm [24]. The human capital of employees working in an organisation can be regarded as the main driver of innovation, as it represents the individual tacit knowledge embedded in the mind of employees which hardly can be replaced by IT solutions [25]. Pena [26] points out human capital can be defined as the accumulation of personal attributes (i.e. knowledge, abilities, personality, health, etc.) that allow human beings to function. It is without a doubt that human capital represents a crucial resource for economic value creation in an organisation. Instead, what is subject to discussion is how to increase human capital and how much human capital is needed for an organisation to create a true value to its innovation competence.

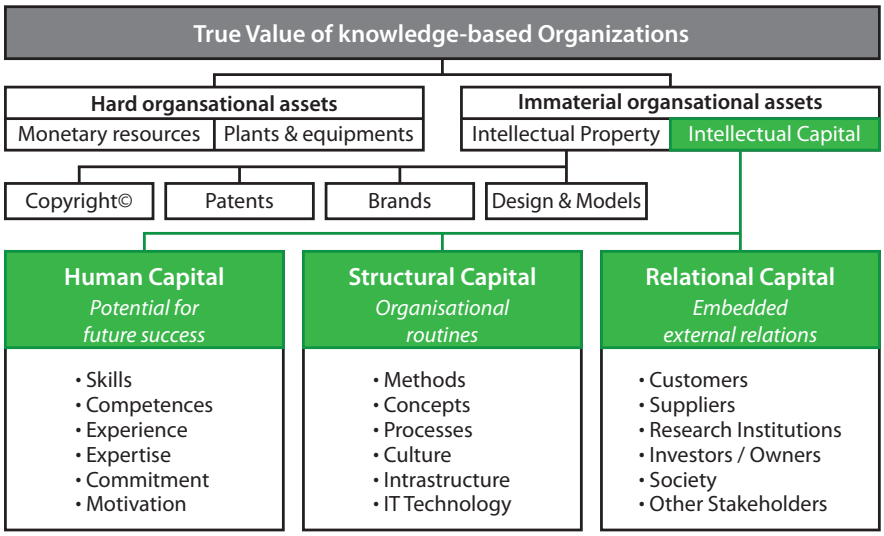
According to Mayo [27], human capital can be divided into three dimensions: capability and potential, motivation and commitment and innovation and learning. Departing from this, capability and potential of employees' human capital refers to the educational level, professional skills and experience, attitudes, personal networks, values and talent, employees are able and willing to evolve within an organisation. Secondly, intangible assets such as the mindset, motivation and commitment to work define an important part of human capital, precisely whether employees align their own interest with those of the firm and different working groups and mentalities within the organisation [25]. The third dimension of human capital can be referred to as the openness to innovation and learning by employees. This means that, new business models and processes in the emergence of the knowledge society, cause organisations to rapidly change the very foundations of working routines and processes. The degree to which employees are open, flexible and willing to adapt to ever-changing competitive business environments, is thus an important prerequisite to increase intellectual capital and thereby advance the innovation competence and business success of an organisation.

In sum, human capital is different from structural capital in managing knowledge; it is the source of innovation as people contribute their creativity while sharing and transporting knowledge [25]. The essence of human capital, therefore, is the sheer intelligence of the individual organisational member.

While human capital's output contributes to a large extend to increasing intellectual capital and innovation competence, an innovative organisation requires an organisational culture that constantly guides its members to strive for innovation and fosters a climate that is conducive to creativity [25]. This organisational capital or so-called structural capital deals with the mechanisms and structures of the organisation that can help support employees in their quest for optimum intellectual performance and therefore overall innovation competence and business performance. The next section will examine the structural capital component of intellectual capital in more detail.

The organisational capital or so-called structural capital of the intellectual capital framework refers to the infrastructure of an organisation to provide a platform for employees to release their human capital. Therefore, a good structural capital will provide a good environment for rapid knowledge-sharing, collective knowledge growth, shortened lead times and more productive people [28]. In this vein, according to WU [13], organisations with strong structural capital will create favourable conditions in which to utilise human capital and allow it to realise its fullest potential and thereby boost the relational capital and overall intellectual capital of an organisation. Thus, it is believed that an organisation requires a high developed structural capital, as, otherwise, the human capital of individuals cannot be released to the full extent, which as a consequence will limit the overall intellectual capital development. According to Evenson and Westphal [28], from an economic sector definition, organisational (structural) capital can be divided into three subcategories; first: *firms' operating capabilities*, such as product design systems, production management and engineering (...), input

Figure 3. Classic diagram of IC as commonly used in literature [14]



outsourcing (supply channels), and market technologies. Secondly, the organisational capital of an organisation can be divided into *investment capabilities*, such as advanced project selection mechanisms [28], personnel training, and financial engineering in fundraising and risk management. Most important, however, in the context of this discussion's approach to intellectual capital, is the third subcategory of structural capital which, according to Evenson and Westphal [28], refers to *innovation capabilities*, such as unique research and development (R & D) procedures (...), adaptive capacity for learning from others, communities of practice to share information among employees, as well as a decision and legal procedures for appropriating maximal benefits from intellectual property.

Thereby, structural capital relates to the methods, concepts, processes, culture and overall IT infrastructure that an organisation adopts to embody, empower and create a supportive infrastructure of human capital [24] in order to create relational capital. Consequently, organisational capital is crucial for an organisation's overall performance in increasing intellectual capital, since without appropriate use or even existence of organisational capital, only human capital remains while relational capital would be absent. Thus, organisational capital is the major (...) resource that affects performance and growth of intellectual capital as well as, in cooperation with human capital, creating the relational capital of an organisation. Which, as has been stated above, is created by linking human capital with structural capital. By doing so, the organisation establishes external relations with, for example, customers, suppliers, research institutions, society or other stakeholders.

As presented above, intellectual capital has evolved as the acknowledged key driver of innovation competences of organisations, while much has been written on how to measure and standardise an Intellectual Capital Management System (ICMS).

Open innovation and intellectual capital — bridging the gap

The analysis has shown that, as indicated by Neelie Kroes [1], Commissioner for the Digital Agenda, who stated that 'by following an open innovation ecosystem and open platform approach to organise the structural capital of the DAE, we can avoid wasteful platform competition, and anticompetitive lock-ins, as well as stimulating development and investment in new generations of online services in line with the DAE actions'.

The European Commission itself has pointed out the importance of embracing open platform architecture as a precondition for the successful implementation of DAE actions, the analysis, however, presented a rather deflating picture of the openness and collaborative nature of innovation processes across EU research and innovation funding programmes, which, at the moment, act largely isolated from each other. While the Future Internet Public-Private Partnership and the Horizon 2020 — the framework programme for research and innovation, drive towards a new

more interoperable co-creative service architecture innovation paradigm.

The key challenge of the Digital Agenda for Europe is the implementation of DAE actions across Member States. Especially in the fields of eGovernment, eHealth and eEnvironment applications, but also for actions heading towards a Digital single market and seamless broadband connections in Europe, interoperability and open platform communication between EU institutions, industry (especially SMEs), academia, and users is needed. Henceforth, particular private end-user communities, who at the moment are largely ignored by eServices R & D processes, must be taken on board to the innovation processes to ensure that future Internet services and applications are user-friendly and functional.

Overall, it appears that the existence or possible emergence of an organisational capital driven by open innovation ecosystem creation does not exist. Rather, we seem to be witnessing the existence of isolated islands of sectors of industry, units in the EU institutions and other stakeholders who all lack a strong structural capital providing the infrastructure to facilitate the creation of relational capital, based on the human capital of the European Commission together with industry, academia and private users to implement the DAE actions and achieve the Europe 2020 targets. Thus, the extent to which the structural capital of the DAE at the moment, is able to increase the DAE's intellectual capital needed to implement the DAE actions is highly limited, due to the fact that the organisational capital of the DAE does not facilitate open access platform architectures to organise human capital of all stakeholders involved in the research and innovation processes to create relational capital, thereby increase the intellectual capital of the DAE actions.

Open innovation ecosystem architectures, which are in common use to increase innovation competence in the private sector, present collaborative innovation environments that strive towards open or partially open platform architectures, enabling communication between stakeholders involved in the innovation process. The mass-collaboration and *coopetition* of digital as well as real-world open innovation ecosystems provides an organisational capital potential that is in favour of interoperable innovation methods, concepts and processes to provide open platforms for stakeholders involved in the DAE actions to collaborate and exchange information. This open innovation attitude is especially needed in the fields of eGovernment, eHealth and eEnvironment applications, where many overlapping spheres of interest, such as privacy and security, digital literacy of staff and users, future Internet service architectures and user involvement in the R & D processes, overlap. Consequently, open platform architectures and innovation ecosystems facilitate digital as well as real-world community-based innovation ecosystems to increase the Intellectual capital of various actions in the fields of ePublic services. In addition, it is certainly worth questioning if Europe suffers from a shortage in ICT human capital in industries, employees or higher education institutions, as usually stated by the EU institutions. Instead, what the European innovation environment is in need of is more entrepreneurial orientation and a slight increase of social capital.

Huge financial means are invested in the innovation cycle; however, lacking a full innovation chain approach, this has resulted in a large amount of investment wasted in deadlocked R & D projects. Consequently, European research and innovation funds, at the moment fail to establish an organisational capital which provides an infrastructure for the human capital of the Commission, industry, SMEs, academia and private users to maximise the value of every euro the EU invests in research and innovation.

Besides the importance of organisational capital in increasing intellectual capital, social capital also entails an important role in enabling necessary communication between different stakeholders in an open innovation ecosystem. Weak and strong social ties between employees increase social capital and contribute to information exchange and problem-solving solutions within an innovation value chain. In the case of the DAE and open innovation acting as structural capital, this means that avoiding so-called structural holes in open innovation ecosystems is fundamental to maximise the innovation competence of all stakeholders involved in the DAE. Again with regard, to DAE actions of eGovernment, eHealth and eEnvironment applications, those employees of the Directorate-General for the Information Society and Media, the Directorate-General for Research and Innovation and the Directorate-General for the Enterprise and Industry and all other stakeholders within the EU institutions and from the private and academic sectors should make use of open innovation ecosystem platforms to avoid wasteful platform competition and instead embrace collaborative, co-creative innovation and partnership to maximise the innovation competence and intellectual capital of the DAE.

The European Commission, along the Directorate-General for the Information Society and Media, is responsible for the implementation of the DAE actions, is all too aware of the need to adopt open

innovation platform architecture as structural capital to advance the innovation competence and implementation of the DAE actions across Member States. Thereby, embracing social innovation and increasing societal capital to the benefit of all actors in the knowledge society.

Future research and policymaking should therefore focus on increasing societal capital by increasingly taking private users, especially digital natives, on board of the innovation value chain of the DAE. It is of crucial importance that the DAE actions are not implemented by detached public bodies and organisations but that instead people in Europe who actually will need to use, for instance, the ePublic service architectures, have a chance to make their contribution to the innovation value chain of services and legislation enforced by the DAE actions. The focus should lie on the involvement of all actors in open innovation ecosystems, including end-users and end-user communities, so-called creative commons, to share experience, information and best practices with those who are in charge of R & D and implementation of the DAE actions. Thereby, embracing open innovation platform architectures and innovation ecosystems as structural capital within the intellectual capital approach to the DAE leads to a more problem-driven instead of science-based innovation approach. Taking the experiences of people in Europe within their communities and roles in daily lives on board, to contribute to a user-centric approach to innovation, which will increase societal capital to the benefits of the all actors involved in the knowledge society.

It is therefore of high importance, especially in the fields of ePublic services actions of the DAE, to foster co-creative open innovation partnerships and open platform ecosystems towards a future Internet public-private-people partnership (PPPP).

Overall, the EU's innovation performance is at a crossroad. The Commission is all too aware of the situation and calls for 'smarter' investments in both public and private research as well as cross-border and cross-sector cooperation in research and innovation to meet the Digital Agenda for Europe timeline and the Europe 2020 targets. This discussion has made an argument for using the open innovation paradigm embracing open platform architecture and open innovation ecosystems to advance the structural capital, within the intellectual capital of the Digital Agenda for Europe's innovation performance, which obviously requires major improvements to meet its targets. For now, the concept is on the table: it is now up to the policymakers to make the right use of it.

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1.4 Reflections on policy, regulation and governance for open innovation: towards a research and policy 'enabling framework'

Introduction

This paper outlines an approach to the analysis of policy, regulation and governance conditions that can facilitate and extend practices of Open Innovation (OI). The approach stems from several streams of research currently underway at the European Institute of Interdisciplinary Research (EIIR) that address trajectories related to the development of the Future Internet. The approach is designed to identity and evaluate key enablers of, and barriers to, OI specifically framing them in ways that make them subjects for policy and regulatory action, along with the modalities of implementation, specifically the identification of the key actors/decision-makers/stakeholders, as well as the institutional vehicles, whose engagement and involvement is deemed critical for the design and implementation of OI initiatives.

Defining OI as a policy, regulation and governance field

Current research demonstrates that whether the Internet is viewed as 'polymorphic networks of networks' or as an 'execution environment for smart applications, services, interaction, experience, and data' [1], defining OI as a technology problem is not at all straightforward. It is less so when it comes to policy, regulation or governance. OI as a policy and regulation field is not obvious, self-evident or a subject of consensus among its key stakeholders, be they researchers, practitioners or policymakers. In fact, the OI 'field', in much the same way as the Future Internet itself, can best be conceptualised as a 'contested terrain' encompassing positions that range from 'minimalism' to 'maximalism' regarding the role of policy, regulation and governance [2] [3]. An important part of the work outlined here is to animate this field as a 'forum' in order to enable the OI community to identify paths that might lead to equitable and consensus-based policy responses that generate optimal benefits.

There are several debate currents on the optimal level of policy, regulation and governance of OI. Most of them focus not so much on 'policy' or 'regulation' as much as on governance. The term 'governance' does not refer exclusively to acts or duties of government. Governments do play an important role in many forms of governance. However, the concept is broader, and extends beyond merely the state apparatus. Governance, apart from traditional policy and law, includes multiple tools and mechanisms. Governance can operate through several other equally important channels such as institutional design, decision-making structures and procedures, social norms, and technology.

In order to operationalise the term in the context of OI, it might be useful to refer to political science and political economy terminology regarding the exercise of power in social and political systems. From this vantage point, the terms 'governance', 'policy' and 'policy implementation' are fundamental to the overall governance process: 'governance' is about 'who' has rights to take decisions, to exercise power in a given domain of concern; 'policy' is about 'what' policies and rules are to be implemented in order to achieve the goals of those who exercise power; 'policy implementation' is about 'how' to put into place and enforce the policy, which opens up the question of democratic participatory regimes, and their alternatives [4].

This broader *problématique* of governance is particularly relevant when it comes to discussions of OI policy and regulation design. One way to conceptualise a fruitful approach that addresses the policy, regulation and governance aspects of OI is with reference to 'layers' of governance. This approach argues that modern communications networks, and specifically the Internet, should be understood as a series of 'layers' rather than as an assorted complex of different technologies. The approach lists at least three such layers: (i) a *physical infrastructure* layer, through which information travels; (ii) a *code* or *logical* layer that controls the infrastructure; (iii) a *content* layer, which contains the information that runs through the network [5].

The approach is by no means exhaustive. It is possible to change the names of the 'layers' or include several additional 'layers'. The point is not which specific layers we choose, but that OI as a policy, regulation and governance field can be broken up into discrete analytical categories. As a consequence, OI governance can be organised on multiple 'layers' that have diverse magnitudes of impact in different domains that individually might affect the development of the whole. One important issue in this respect concerns *synchronisation* or coherence of decisions at different 'layers' that might affect the development of OI as a whole.

Towards a multilevel policy and regulatory analytical framework for OI

In terms of a methodological approach to the analysis and design of OI policy, regulation and governance, it is important to break with traditional conceptualisations of policy as blueprinted 'intervention' or 'guidance'. A more productive way is to think through the concept of 'enabling framework'. Such a framework is focused on removing bottlenecks to OI practices in ways that enhance economic and social dynamism and the innovation capacities of social, economic, and policymaking participants. It is driven by an underlying model of policy, regulation, and governance design that views social networks as 'living systems' evolving over time depending on the composition of the political, social and economic environments in which they exist, and other factors rooted in location and history.

This approach stresses the importance of a key challenge policymakers face: *prioritisation*. Prioritisation and implementation of OI initiatives cannot rely exclusively on government. It is at least arguable that competition under globalisation, along with the growing intensity use of ICT, alters the structural conditions of policy and regulatory intervention. Government is an important factor in shaping OI environments but so are companies, universities and public and private research bodies, and other institutions of government and civil society. Government itself, on the other hand, is not the unitary entity it appeared to be when macro-policies defined government intervention. At the micro- and meso-policy levels, relevant for the implementation of OI, many different types of government agencies at all levels of administration and geography have an impact. And this is fundamentally a question not of government but one of governance among different stakeholding organisations within a spatially dispersed system of competencies geared to achieving potentially conflicting objectives [6].

In other words, OI-related policies should be crafted with the input of civil society, business, government, and technical experts. The participation of all relevant stakeholders is needed to develop and implement OI objectives. An effective and innovative multi-stakeholder approach is needed for government, the private sector, the Internet technical community, civil society and individual, or communities of, users to jointly shape the policy, regulatory and governance environment of OI.

In this context, it is critical to adopt a 'dialectical perspective' that expresses the interdependencies across OI-relevant policy and technology dynamics. More specifically, it might be appropriate to examine OI policy, regulation and governance from two analytically distinct, but in reality interrelated perspectives: (i) OI policy, regulation and governance as seen from a 'technology perspective', and (ii) OI-relevant technology as seen from a 'policy, regulation and governance perspective'.

The merit of this approach is that it opens certain dialogue terrains that cannot be accessed by adopting a single — either 'technology' or 'policy, regulation and governance' — perspective. *The issue is one of interdisciplinarity* [7] — but more importantly one of *inter-epistemological challenges in constructing effective bridges of communication across diverse decision-making communities involved in the OI — be they in the public or private sectors*. In other words, though establishing cross-disciplinary paths of communication is important, an emerging fundamental issue concerns addressing the challenges of how knowledge is built within different disciplines and stakeholding communities and the challenges of establishing knowledge complementarities across them.

One way to construct such bridges is to pursue the formation of a *multilevel governance framework* that would allow us to explore linkages between EU, national, regional and local/urban policies and ways the strengthening of linkages across them might more effectively address OI challenges. A multilevel governance framework calls for the narrowing or closing of the policy 'gaps' between levels of governance through the adoption of mechanisms and tools for vertical and horizontal cooperation.

The *vertical* dimension of multilevel governance recognises that EU institutions and national governments cannot effectively implement OI strategies without working closely with regional and urban/local governments as agents of change. A multilevel governance approach also recognises that urban/local governmental authority required to act in areas related to OI is often 'nested' in legal and institutional frameworks at higher scales. Thus, a two-way — 'top-down' and 'bottom-up' relationship that involves agents of state, government, civil society and individuals — exists between EU, national, regional and urban/local action levels on OI as each can enable or constrain the other.

The *horizontal* dimension of multilevel governance acknowledges the opportunity for learning, information transmission and cooperation across EU, national, regional, and urban/local governance structures. Horizontal governance activities can give government, business, research and

non-governmental organisations influence in the OI policy dialogue process. The horizontal dimension of multilevel governance is also associated with improving coordination across EU, national and regional authorities to implement cross-sectoral OI initiatives. Horizontal relationships at the sub-national level can also exist in the form of national and transnational networks and coalitions involving urban bit also rural regions [8].

Emerging policy, regulation and governance areas in OI

Applying this methodological framework, it is possible to identify key policy, regulation and governance issues that need to be addressed from a dialectical standpoint in order to generate critical capacity mass across different disciplines and stakeholding communities in order to establish knowledge and action complementarities across them. Below, we outline a few such issues.

In terms of a policy, regulation and governance as seen from a 'OI technology perspective', such issues include:

- online identity, including anonymity, digital presence, rights to delete information, etc.;
- security of communications, including legal implications;
- cloud computing, including the risks and benefits of virtual access to information, etc.;
- content regulation, including copyright, licences, open access, etc.;
- eDemocracy, including transparency, open government data, empowered citizenship, services to citizens, etc.;
- digital citizenship, including individual and corporate rights and responsibilities, etc.;
- digital inclusion, including access and use of the Internet by vulnerable populations, etc.;
- trust, including risk drivers, actors at risk, risk management, etc.;
- online communities, including social networks, virtual relationships, etc.;
- the Internet of things, and the connections between people and devices;
- distributed knowledge production, including eScience, eLearning, etc.;
- cybercrime and cyberlaw, including phishing, cracking, cyberterrorism, etc.

In terms of technology as seen from a 'OI policy, regulation and governance perspective', such issues include:

- social and political dynamics of unification and fragmentation of the Internet;
- tendencies of reassertion of national sovereignty in the Internet 'space';
- trends towards the commercial 'digital territorialisation' of the Internet;
- trends towards the protection of, and challenges to, 'net neutrality';
- sets of political, legal, social and security reasons that act as drivers of potential fragmentation;
- the role of cities ('smart' and otherwise);
- scenarios of 'fenced' Internet systems and governance mechanisms across them;
- trends in the regulation of network operators (specifically regulatory variance regarding 'open access');
- the Internet of Things and the Internet of Doing Things;
- Internet-driven social impacts (social networks, fraud, piracy, etc.);
- trust, privacy and security.

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1.5 Rights or limitations: an autopsy of business-model based copyright regulation

ICT is a moving target. A problem with making laws to hit a moving target is that the mindsets of those who make law are very much tied with what they have come to know already: old regimes and established business models. In this article, I shall analyse the copyright Directive 2001/29/EC (the InfoSoc Directive) [1] asking what follows when regulation is based on fixed business models.

The said Directive seems to be outdated, and I claim this is largely due to the legislation being written to suit the old analogue world's rights-based business models. These exclusivity-based models that functioned well in the analogue context were transferred to the digital environment as such, rather than in order to facilitate completely new business models. On the other hand, the Directive had a ground-breaking obligatory copyright exemption regarding interim copies on the Internet, which has proven successful — at least if success is measured by the dissemination of the Internet and the success of the telecommunications industry. The liberalisation of the copyright regime in this respect has enabled the Internet to grow and produce new, innovative business models, whereas the rights-based exclusivity regime was less successful, suffers from broad piracy and may need to be re-evaluated [2].

A word of warning — traditional copyright concerns such as the cultural importance of copyright protection or the artists' income issues are not discussed here. This article concentrates on the relation of copyright and technological development. I understand very well that copyright is an important part of the creators' income, even if it is by nature 'superstar economy' [3]. However, the underlying question in this article is, whether, in conditions of mass use, even the artistic profession might benefit more from compensation-based regulation rather than the present exclusivity-based but largely unenforceable regulation.

Mutual beliefs as the basis of law

In his essay 'Opposite Mirrors' Eerik Lagerspetz built an interesting theory on 'mutual beliefs' [4]. Mutual beliefs form the basis of conventional facts [5]. Our knowledge about the beliefs and actions of others is always subject to substantial uncertainty. The role of conventions in life is to diminish this uncertainty. Mutual beliefs enable the development of cooperative strategies in societal action.

Legislation is based on beliefs of things to come and the best choices for the society. Beliefs are often amplified by those who want to influence in lawmaking — lobbyists of various organisations and stakeholders. More often than not, the act of lobbying requires certain amount of resources and therefore economic power. Lobbying — the amplification of beliefs — is not possible for those who have no voice in the system.

Beliefs are dominated by existing business models

In order to illustrate the difficulties of business model-based legislation, I shall analyse, not the law text itself but the background beliefs of the so-called InfoSoc Directive. It is apparent that the business models that were originally discussed during lawmaking were analogue business models and not those that later developed from the technological possibilities of the Internet. It also seems that there already existed uncertainty on whether to believe in the benefits of exclusive rights or their limitations.

The purpose of the InfoSoc Directive is to promote and support the development of European information society through harmonisation of copyright legislation. As stated in the preamble to the directive itself:

This [purpose] requires, inter alia, the existence of an internal market for new products and services. Important Community legislation to ensure such a regulatory framework is already in place or its adoption is well under way. Copyright and related rights play an important role in this context as they protect and stimulate the development and marketing of new products and services and the creation and exploitation of their creative content.
(Directive 2001/29/EC, preamble, paragraph 2)

What I want to show is that the preamble of the InfoSoc Directive not only embodies a strong belief in a rights-based approach, but at the same time offers broad arguments in favour of limitations to copyright. This contradictory groundwork laid forth in the preamble is not quantified in any manner and thus leaves room for interpretation in both the analysis and the implementation of the document.

This confusion was an indication that the legal instrument had become a battlefield of ageing business models. The discussion was dominated by the representatives of the established industries leaving other possibilities untouched.

InfoSoc Directive: rights or limitations?

Much of the discussion concerning copyright seems to indicate a belief that copyright law is in essence about price regulation or organisation of the market structure — which it clearly is in only rare occasions. In the first place, what copyright law regulates are the negotiation positions of the parties — rights holders, commercial and end-users — which make analysis on the level of economy treacherous. Some have more market power and negotiation skills than others.

Concerning copyright law as a vehicle for policy-making, there are basically three stages: copyright exclusivity, limitations to that exclusivity, and total exemption from liability [6]. These correspond to the essential elements of copyright which can be classified as follows [7]:

- exclusivity (property right);
- economic compensation (liability rule);
- moral rights: paternity, respect (inalienability).

The copyright belief

The InfoSoc Directive's opening statement in its preamble reflects the four freedoms framework of the European Union (free movement of goods, services, labour, and capital). The harmonisation of laws between the Member States on copyright and related rights contributes to the achievement of non-distorted internal market (Directive 2001/29/EC, preamble, paragraph 1). The European Council has stressed the need to create a general and flexible legal framework at community level in order to foster the development of the information society in Europe (ibid., paragraph 2).

Further down in the preamble is a statement of belief regarding the relation between copyright and economic activity:

A harmonised legal framework on copyright and related rights, through increased legal certainty and while providing for a high level of protection of intellectual property, will foster substantial investment in creativity and innovation, including network infrastructure, and lead in turn to growth and increased competitiveness of European industry, both in the area of content provision and information technology and more generally across a wide range of industrial and cultural sectors. This will safeguard employment and encourage new job creation.
(Ibid., paragraph 4.)

The core of this belief can thus be said to be the assumption that *increased legal certainty and a high level of protection of intellectual property will foster investment*. The first part of this should be rather obvious from an economic point of view: clear market conditions enhance market activities. The second point is equally clear, since the stronger the rights holders position is, the more likely the protected property can be used, for example, as collateral to help finance further investment. In other words, the lower the risk, the better the chances to attract investment [8].

The nature of copyright, however, is somewhat more complex. Copyright may well be there to protect property that has no economic value at all, as it may also cover assets of significant financial value. A comparison to other forms of property law may illustrate the point. Consider, for instance, two pieces of real estate property, one in a remote area in Lapland, the other in the centre of Helsinki, of roughly the same size; these may drastically differ in financial value while remaining subject to the exact same real estate registration system and its attendant rights framework. The relation of supply to demand behind the difference, forming the basis of all market behaviour in general, is not controlled by the property rights system. Moreover, as all competitors enjoy the same rights, differentiation cannot be based on the rights system.

What this means is that even though copyright protection serves as a framework for legal protection, it is by no means the maker, let alone the guarantor, of the value of the property. The question remains: Does the end result, the product itself, satisfy the needs or desires of the individual potentially interested in it? Or, to put it differently, is there someone prepared to exchange money for it?

Paragraph 4 of the of the preamble in the InfoSoc Directive addresses both content provision and information technology (IT); yet, these would appear to be at least partly competing areas of investment. Some companies, to be sure, may operate on both markets but, in general, the two remain distinct businesses from one another. There is also a buyer-seller relationship between the businesses, that is content is distributed to customers via telecommunications networks and with the help of necessary IT equipment. Emphasising copyright would make the content providers' negotiation position stronger, and emphasising limitations would enhance the negotiation position of the IT technology companies.

The InfoSoc Directive, rather surprisingly, endorses both theories.

What, then, is considered to be the proper business to protect? To the extent that investment in content is encouraged, the rights holder's position rises to the forefront. Higher copyright protection creates a better negotiation position for the copyright and related rights holders, or *their* business.

The limitations belief

It may, however, appear that temporary or initial low levels of copyright protection provide a boost for certain business areas such as equipment sales and decrease the time-to-market for new products, through decreased transaction time — and may even decrease the transaction costs. If high levels of protection lead to overly difficult transaction mechanisms (in Europe, the '27 issue'), a disincentive for investment is created.

Providers of information technology may very well profit from low levels of copyright protection for the content, whereas high levels of protection may worsen the negotiation position of the equipment manufacturers at the low end of the chain.

Paragraph 5 of the preamble to the InfoSoc Directive pays attention to the role of technology: Technological development has multiplied and diversified the vectors for creation, production and exploitation. Paragraph 9 stresses the need for high levels of copyright protection:

Any harmonisation of copyright and related rights must take as a basis a high level of protection, since such rights are crucial to intellectual creation. Their protection helps to ensure the maintenance and development of creativity in the interests of authors, performers, producers, consumers, culture, industry and the public at large. Intellectual property has therefore been recognised as an integral part of property.
(Ibid., paragraph 9.)

This emphasis on rights is repeated in paragraphs 10 through 12, and again in paragraphs 21 through 25. But the tone is slightly confusing in between:

This Directive should seek to promote learning and culture by protecting works and other subject matter while permitting exceptions or limitations in the public interest for the purpose of education and teaching.
(ibid., paragraph 14).

Reading this very literally would indicate, with a possibility to confusion, that learning and culture require the protection of copyright while the needs of education and teaching seem to call for its opposite?

A major exception, in line with what is stipulated in the eCommerce Directive, is specified in paragraph 27:

The mere provision of physical facilities for enabling or making a communication does not in itself amount to communication within the meaning of this Directive.

Article 5(1) of the Directive accompanied with this statement ensures that the telecommunications industry will not be part of the copyright liability chain. In this regard, at least, we can then recognise a limitation of the main copyright exclusivity rule; moreover, one that almost certainly has and will have broad consequences for the organisation of the telecommunications industry.

Without the exception, the telecommunications operators would have found themselves in a position trying to agree on licensing with regard to devastating amounts of network traffic. We could see this as a clear indication of the legislators' belief that no good follows from subjecting telecommunications networks to copyright obligations. Mass use and exclusivity do not coexist.

Paragraph 31 of the preamble tries to explain the reasons behind the prima facie contradictory approach to regulating the rights versus limitations relationship:

A fair balance of rights and interests between the different categories of rights holders and users of protected subject matter must be safeguarded. The existing exceptions and limitations to the rights as set out by the Member States have to be reassessed in the light of the new electronic environment.

There is a similarity between the structure of the preamble and the articles: definitions of various rights are given in Articles 2 through 4, with a long list of exceptions and limitations following in Article 5. This is surely based on a careful analysis and evaluation of the economic and societal impact of the rights as well as the exceptions and limitations, but at some points it may be difficult to find the logic of the compromise. Furthermore, the chosen legislative technique is not flexible for dynamism — we have no fixed idea what the future businesses will look like and will likely be constantly surprised.

The initial conclusion remains that we still do not know nearly enough about the actual effects that rights, exceptions, and limitations will have among different industries. Given the need to make it acceptable to all the Member States, however, it may be that the Directive text simply had to be designed like this.

Does copyright benefit or hamper business?

Even if paragraph 4 of the preamble to the InfoSoc Directive represents the lawmakers good intentions, one of the major conflicts of interest — exclusive rights and their limitations — in the field remains largely unanalysed in the Directive. However, the history of copyright legislation shows that this is not at all the first time in the history of technological breakthroughs that the rights versus limitations issue is discussed. The early stages of the voice recording industry may serve as an example.

In the early 20th century, the impact of the Second Industrial Revolution was beginning to show its full force as the development of new media forms was rapid. Should new forms of media be arranged on the basis of strict exclusive copyright or should the new media be somehow arranged differently in order to encourage its development?

The arguments in favour of the benefits of new technology emerged as an important factor in the adaptation of compulsory licensing in the early 20th century. The compulsory licensing model applied in the patent system of, for example, German legislation allowed for the use of patented material against equitable compensation under certain circumstances. Adapting this idea to the copyright system meant that it would not be illegal to make a voice recording of someone else's material, but the author of that material had a right to compensation. This required balancing measures within the copyright system [9]. As an overall statement, the technological development gave rise to a new media economy, which in turn required new institutional balancing of interests.

According to Brennan, the new industry was initially able to flourish untroubled by the Berne Convention copyright obligations. Copyright owners perceived this to be doubly unfair: the popularity of the new technology meant that their sales of printed music began to decrease, while they continued to receive no share of the profits generated by the widespread use of copyrighted materials in the applications of new technology. Given the tendency in economic and institutional theory to stress the role of legal framework as 'the rules of the game', seen by many as facilitating the spread of market economy, Brennan claims that the rapid development of the recording industry could take place only because of the lack of legal norms [10].

The well-known Berne Convention specialist Sam Ricketson argues along the same lines, pointing out as one of the factors contributing to the rapid growth of the recording industry *the lack of enforceable rights* by copyright owners. Copyright owners had initiated campaigns at both national and international level to gain recognition for their rights, arguing that phonographic recordings were just another form of reproduction [11].

In response, the argument of the recording industry representatives was that the recognition of these rights would mean financial ruin for their field, which, moreover, had been built in good faith and in the absence of any legal restrictions to begin with.

It may be amusing that a century ago the recording industry lobbied for copyright limitations, but without those limitations, the whole industry might not have developed as quickly to such magnitude as it did.

Ricketson's claims illustrate an interesting shift in the way arguments are advanced regarding the relationship between copyright regulation and economic development. Traditionally, copyright has been seen as a vehicle for encouraging creativity. In a closer examination of Ricketson's argument, it becomes clear that he, like Brennan, attributes the rapid growth of the phonogram industry to the *lack of enforceable rights*. The argument could even be turned upside down, posing the question whether, if the development of a technological phenomenon is to be encouraged, instead of granting copyright it might be better *not* to provide such protection at all, at least in the initial stage of the business.

Stretching Ricketson's argument a little, one might draw the conclusion that had the exclusive right of control over the recording of a work been established early on, the development of the industry might not have been as fast and pervasive as it now turned out to be [12]. Yet, it would be pushing the point too far to claim that, for Ricketson, the development of the recording industry demonstrated a negative trend: rather, his point was to illustrate the position of the industrial entrepreneur who seizes an opportunity knowing that legislation lags behind.

Looking at the InfoSoc Directive from this perspective, in retrospect, the limitation concerning interim copies seems to have worked in favour of the dissemination of the Internet, whereas all other parts of the legislation have proven more or less technology-dependent and thus running the risk of being outdated.

We could also see the evolution of latest technology innovators such as Google and YouTube as examples of the same approach: from early on, the companies adapted an operating mode of realising their mission first and worrying about national copyright regimes later.

Copyright protection may then either benefit or hamper business, with the question being simply

about *whose* business it is that we are talking about. Furthermore, the enforcement of copyright at the present stage faces major challenges from broad piracy, which makes copyright protection in the traditional sense very difficult to manage. Tackling piracy without limiting individuals' freedom to networking is problematic and there is no better instrument for keeping contact with beloved artists than the Internet [13].

Examples of discussions on alternative perspectives to copyright

The issue of limitations was debated to a greater extent when cable television started to spread and developed an economically significant outcome for copyright holders. I shall end this brief article with a look at some of those themes which, in my opinion, may have relevance even today. What is common to these ideas is approaching copyright more as a system of compensation for mass use rather than trying to uphold the idea of exclusivity where it does not work.

1. A right to compensation as a surrogate for the rights to exclude

In the United States, during the enactment of the cable television compulsory licensing provision, key questions arose regarding the juridical grounds for doing so. The main issue was, owing to the constitutional power of the Congress to grant authors the exclusive right to their writings, were it not unconstitutional to create compulsory licences which render the author's copyright less than exclusive, by taking away from authors the right to deny potential users access to their copyrighted works? The issue, however, was never settled in court.

On the other hand, in 1909, when the principle of compulsory licensing was first enacted, the songwriters affected feared that if they successfully challenged the new Copyright Act, they might be left with no protection whatsoever against mechanical reproduction of their songs, in which case the issue would fall under the fair use regime [14]. So, the feasible alternative for compulsory licensing was not exclusivity but fair use.

Brennan has compared the compulsory licensing of retransmissions to the classic example of the lighthouse in economics as presented by R. H. Coase. In Brennan's estimation, the two are comparable in the sense that in both cases actual exclusion of outsiders from the use of the service is difficult or impossible. A right to remuneration therefore serves as a surrogate for the right to actually exclude [15].

2. Impracticality argument

Mass use of copyright-protected works makes the problems of exclusivity-based copyright fairly clear. Consider a cable television system with a capacity for, say, 200 television channels. Each channel provides programming 24 hours a day, seven days a week at the rate of approximately two programmes an hour.

Each of the programmes involves at least 10 to 20 rights holders, and in the case of major productions may even number hundreds or even thousands, including cooperators claiming at least some degree of authorship of the creative elements of the programme. We can assume the average number of such rights holders to be 100 per production. Let us further assume that the licences for cable retransmissions were to be negotiated individually with an average of 100 rights holders per 30-minute programme. A simple calculation then reveals that for only one TV channel, the total licences to be negotiated and agreed on will amount to 24 x 2 x 100 = 4 800 licences per day. In the case of the 200 channel cable operator, this would mean 200 x 4 800 licences per day, that is 960 000 licences. This is clearly not only impractical, but impossible. And it is obvious that the complexity involved in the Internet is very much greater than in cable TV.

The impracticality argument was used in the Congress during the preparation of the United States 1976 Copyright Act, underlining the impracticality and undue burden in the requirement that every cable system operator negotiate separately with every copyright owner whose work was to be retransmitted over the system [16].

3. The need to subsidise an infant industry

The argument focusing on the support needs of a new and innovative industry has been raised several times in copyright history. The perspective was also brought up in the discussions concerning the amendment of the Berne Convention to include the compulsory licensing exemption for phonorecords [17].

In the United States, the 'emerging industry' argument has been widely used especially in relation to cable television. The argument has been put forward that a developing industry needs the protection of a reliable and reasonable compulsory licence to make planned growth possible [18].

Conclusion

The rights limitations dilemma should be approached in a constructive fashion, for example by analysing more closely the complex technology-related issues

now only touched on above. The issue of artists' income is important, but being 'superstar economy', copyright system should be constructed differently to be an effective safety net for the bulk of artists not enjoying major success. No perfect solution can be expected to be attained from such work, but at least the common ground for further discussion may thereby become broadened [19]. Regulating a moving target in a highly innovative environment requires a liberty-based regulation.

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[2] Deloitte, Background Document in support of the Digital Agenda for Europe, final report, Brussels, March 2010, p. 106: 'One of the main challenges for the sector lies in the music industry with its losses on CD sales over the last years. In this respect, the music industry blames the illegal P2P networks for the losses they are experiencing (their estimations of losses are in the order of 300 billion in Europe)'.

[3] 'Superstar economy' refers to an economy where the distribution of income is grossly uneven. This is typical in the copyright economy. See, for example, Towse, R. (2001), *Creativity, Incentive and Reward; An Economic Analysis of Copyright and Culture in the Information Age,* Edvard Elgar, United Kingdom.

[4] Lagerspetz, E. (1995), *The Opposite Mirrors: An Essay on the Conventionalist Theory of Institutions*, Kluwer Academic Publishers, p. 10. The standard definition of mutual belief includes a series of reiterated beliefs ascending to infinity. Lagerspetz's reformulation of the notion goes as follows:

It is mutually believed in a population S that p iff (if and only if):
(i) everyone in S believes that p;
(ii) everyone in S believes that everyone in S believes that p, and so on ad infinitum.

[5] Lagerspetz, p. 13.

[6] Without going into detail as to how the international instruments regulate exclusivity and its limitations, here I simply rely on the definition formulated by Senftleben, M. (2004), *Copyright Limitations and the Three-Step Test*, *Kluwer Law International*, p. 22: limitation of copyright means permission to use a work without payment (fair use) or via a statutory or compulsory licence (against payment). In what follows, I will also not discuss separately statutory (or legal) and compulsory licence but instead use the term 'compulsory licence' when discussing non-voluntary licensing.

[7] With corresponding rights components as suggested by Calabresi and Melamed (1972) indicated in parentheses. Calabresi, G. and Melamed, A. D. (1972), 'Property Rules, Liability Rules, and Inalienability: One View of the Cathedral', *Harvard Law Review,* Vol. 85/6, April 1972, pp. 1089–1128.

[8] We could advance a 'high risk, high profit' argument to support a claim that higher level of opportunity invites more investment, but in general the assumption of money's being conservative seems correct.

[9] For a discussion of the period between Rome to Brussels as an era of important technological impact on copyright, see Ricketson, S. (1987), *The Berne Convention for the Protection of Literary and Artistic Works: 1886–1986*, London. According to Koktvedgaard, Mogens: *Immaterialretspositioner*, Copenhagen 1965, pp. 440–441, the artistic skill of an inventive genius had to give way to modern and more impersonal protection during the 20th century, with the modern immaterial rights tendency resulting in the inventions being protected as products of impersonal rather than personal effort.

[10] Brennan, D. J. (2003), *Retransmission and the US Compliance with TRIPS,* The Hague, p. 11.

[11] Ricketson, p. 94.

[12] While this may represent a not entirely legitimate extension of Ricketson's argument, it helps to illustrate the 'mutual beliefs' that observers have in assessing the effects of rights on an economic activity.

[13] For example, the writer follows the career and news concerning the legendary jazz guitarist Mike Stern via his homepages and also in Facebook.

[14] Cassler, R. (1990), 'Copyright Compulsory Licenses — Are They Coming or Going?', *Journal of the Copyright Society of the USA*, Vol. 37, No 2, January 1990, p. 237.

[15] Brennan, p. 103.

[16] Cate, F. H. (1990), 'Cable Television and the Compulsory Copyright License', *Federal Communications Law Journal*, Vol. 42, No 2, April 1990, pp. 202–203.

[17] Berne Convention for the Protection of Artistic and Literary Works, Paris Act 1971 (Berne Convention), 1986, p. 156.

[18] Cassler, p. 246.

[19] For a broader review of the issues related to mass use of copyrighted material, see Huuskonen, M. (2006), *Copyright, Mass Use and Exclusivity*, Helsinki.

1.6 Socio-economic impact of open service innovation supporting the Digital Agenda

In 2011, the study *OSI: Socio-Economic Impact of Open Service Innovation* supported by the European Commission's Directorate-General for the Information Society and Media delivered the final report to be published [1] [2]. The study assesses the economic and societal potential and impact of an open service innovation approach in Europe. The OSI study was coordinated and led by Logica business consulting, Dr Gohar Sargsyan. The consortium consisted of IBM, Nokia, Intel, Novay and the Innovation Value Institute. The study considers the role of users and citizens in open, user-driven service innovation, as part of the industrial ecosystem, in the context of societal and ICT developments.

The OSI report offers modern models, methods and approaches to open innovation, as well as analyses of the challenges of economic values, wealth generation in socio-economic terms and creation of common values. It also suggests successful business ecosystem approaches for service innovation.

The study's final published report elaborates on open service innovation: then it classifies schemes for open innovation for a better comparison of different forms of open innovation and different types of underlying Intellectual Property Rights (IPR) constructs. Our methodology gives an overview of the literature, leading to an open service innovation model with society's participation in innovation processes, which is new to the research community. The model forms the basis of the case analysis. Furthermore, the report gives an overview of innovation policies in EU Member States in relation to open service innovation.

After a more detailed justification of the research approach, the report describes the case study approach: 15 detailed case analyses from different EU Member States on open service innovation on innovation process, firm, network, service, society level questions are described. After detailed analysis of the case questions, we show the cross-case analysis and summarise the key barriers and lessons learnt. The relation to Europe's Digital Agenda has been identified. We also identified several issues beyond the Digital Agenda's current actions, as we believe that not all the identified barriers and the lessons learnt in our study are fully covered in the actions of the Digital Agenda.

The case study analysis led us to a new open innovation model by reversing the innovation pyramid where the user is one of the key drivers and wealth generators in the new open innovation ecosystem. This model is also new to the research and industrial community.

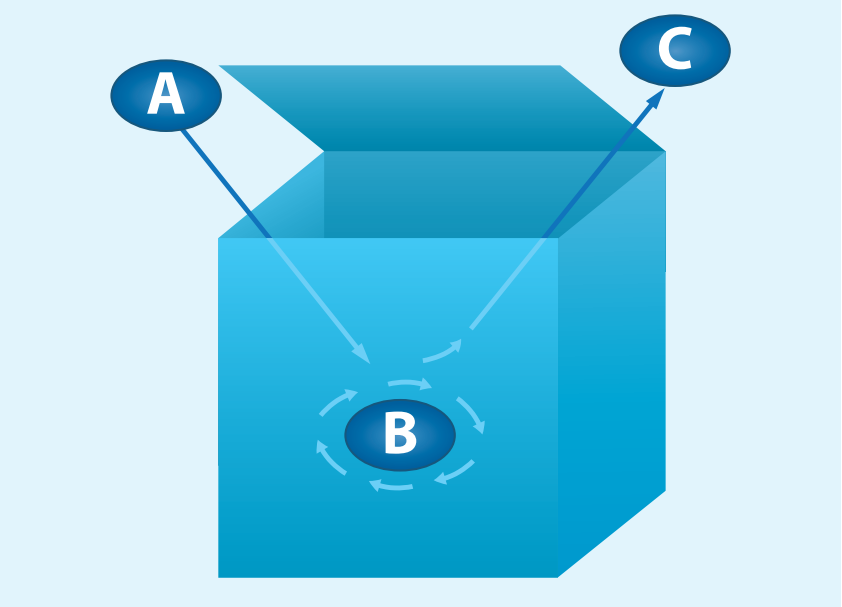
Policy should be used to remove barriers that would not be removed by normal market mechanisms. Market failures or systemic failures can prevent the uptake of innovations or new innovation mechanisms, such as open innovation in services.

As an industry-led study, this study's findings and recommendations on open service innovation policy are grouped from the perspective of the market: namely, from the perspective sharing ideas (*input*), the interaction *process* of open service innovation, and *wealth generation* in socio-economic terms. This three-perspective grouping is new to the market on open service innovation approach and we call it the 'Open-Box' model. Here are the three perspectives.

1. Given that open services innovation is about sharing ideas, (half-)fabricates and results of intellectual creativity, what, then, are the barriers for people and organisations to make this *input* available? Are there policies that enable novel sharing principles and accelerate the availability of this *input*?
2. The *process*es of open services innovation as described in the model section of this study indicate that the most productive driver for innovation is end-user and their interaction with producers and service providers. The case studies indicate likewise. What, then, are the barriers that we seek to remove to improve this *interaction process*?
3. Open service innovation seeks to create value for our society and our economy. Harnessing the available *input* into a productive *interaction process* must lead eventually to services that benefit our European society and economy. What, then, are the barriers that keep us from exploiting the creativity of our organisations and people and how can be stimulate *wealth generation* in socio-economic terms?

The above mentioned approach is illustrated in the 'Open-Box' model (Figure 1).

Figure 1. Open service innovation 'Open-Box' Model



Findings and recommendations on sharing creativity

Creative society

The rise of a class that takes open services innovation as the baseline has an impact on society. We see the growing impact of information, communication and media on social interaction [3]. Each person is connected to several communities at the same time, both in the real world as well as in virtual worlds. These are the communities in which you work, do sport, absorb culture, live, recreate, share emotions and experiences. *Creation of virtual communities will allow new groups to form, defined by their media interests.*

A large number of the old barriers entering the creating sector have been removed by digitalisation. Entry costs are no longer determined by the costs of hardware and distribution networks. Using and rebuilding information leads to new prominent companies. The user will live in a cloud of information. Simpler and cheaper access to public information is needed for governments to be heard. Open design, open access, open architecture are in order. Creative commons and open sources are searching for their way next to protected creative or intellectual property. New rules may be implemented as new laws or as new habits. *Old barriers will go. We better participate to make that happen.*

Recommendations

- Open data of public bodies: a proactive attitude is required by public and semi-public bodies. *What is the new 'industrial open', the new 'industrial trust'*?
- Open data is a must, but conflicts will arise with the protection of personal integrity. Open data of one's own body is strictly private. Here, deeper insight into ethical issues is required. *What is the new security, the new individual openness*?

Findings and recommendations on a productive interaction process

The services chain

From conception to execution, the services production chain differs profoundly from the earlier waterfall model in that it starts and ends with the end-user. This forms a loop in which experimentation and creation follow each other iteratively. Living Labs have been introduced as a means to measure and optimise the usability. Therefore, the innovative aspect of the creative technology chain is that it runs from *science* via *valorisation* into *education, impact and social innovation.*

The services creation partners

Services innovation happens where the creative core plus research and development plus industry

meet. The challenge is in the scaling up from an idea to production. The problems in scaling up are primarily due to broken links in the technology chains. At the heart of services innovation are small organisations, ad hoc cooperative ventures, freelancers and one-person businesses. At the other end are big industries with production experience and capacity. At yet another end is the research world in universities and institutes with its own average world-class reputation, practically inaccessible to small organisations. *The creative core, science and industry need to meet.* The essence of creation is to be at the same place, the same time and in the same mood. Nothing can replace that. Therefore, the creative climate has proven to be an important attractor. *The creative climate is to be stimulated regionally.*

Collaborative skills are often lacking. Shared ideas, values, and processes are lacking. *There is a lack of joint vision on open service innovation processes, due to an immature innovation and R & D culture in services firms.*

The parallel (versus the sequential waterfall approach): the classical sequential model of innovation does not always work but different open innovation mechanisms are applied in parallel and in a networked organisation.

Recommendations

- Take the end-user of a service (the one who applies a service) as the co-creator. The implication is that no matter if people are inside or outside of an organisation, the right triggers must be applied. This is not financial reward only, although a sustainable living must be possible when one is adding 'value' to someone else's business.
- Create and experiment with new forms of open laboratories (digital design labs and virtual laboratories) where institutionalised R & D personnel work together with non-institutionalised researchers from the creative core of SMEs. Include the informal R & D professionals in the established R & D networks including the flagship initiatives. Open up the labs, create workplaces and invest in digital infrastructure to share data, models, half-fabricates and knowledge.
- Create new forms of PPPs (Public-Private Partnerships) or PPPPs (Public-Private-People Partnerships) to stimulate the creation of new services.
- Stimulate the role of corporate industries as upscaling partners for the creative core. Find or create new fiscal and financial instruments and their legal frameworks that bring the creative core and corporate players to a level playing field. *Production vouchers or production performance contracts* are promising directions.
- Implement the approach IPR protection with openness requirements, for example, Creative commons, open licensing. A shared process in which knowledge is made available openly and transparently for all to develop Internet-based products and services on the new platforms. In *Intellectual Property and Legal Issues in Open Innovation in Services* [4], specific issues concerning IPR and networking, user involvement of open platforms are identified and recommendations are provided.

Education

Despite all development, end-users often lack the innovation, entrepreneurship and ICT skills to actually participate in open innovation and creative society. Think of hospitals, where both nurses as well as practitioners lack ICT awareness to be sufficiently open to new services and participation in service development. Think of users' motivations on participation in open innovation. There is a tremendous gap between potential and current state of affairs. This also holds for public authorities and civil servants that lack the skills to play a role as lead customer in service innovation.

Services are all about experience. To stimulate the end-users to participate in services' creation or usage, gaming methods are often applied. *Games are highly stimulating and improve the end-user's motivation.* Highly motivational games, exploration of information and media sources, and direct feedback through wearables are the best assets for lifelong learning, where the player needs to know in an instance whether the answer is right or wrong. *The distinction between learning at school and learning in life will fade. Learning for personal development will be supplemented by learning for sustainability and society.*

Recommendations

- Vitalise education: teach a new generation how to operate in a networked society where firms, the network and people are all actors in the same ecosystem.
- Traditional careers will differ. A lifelong employment with a corporate firm will be replaced by a lifelong employment in a network.
- *What is the new lifelong employment*?
- Educate service professionals: raise awareness of ICT potential, clearly distinguishing between hype and truth. Additional ICT in the classroom can significantly improve learning

experiences and access to education (especially in *disadvantaged regions* in Europe and globally), empowering and training teachers to use technology to change lives.
- Invest in ICT knowledge of civil servant/public authorities that often lack the knowledge and skills to play a reinforcing role in service innovation.
- Support and participate in *education transformation* — increase student competitiveness, build job skills and competencies, support economic development and provide social cohesion. This includes assessment, the ability to assess 21st century skills.
- Encouraging student participant and interest in STEM (Science, Technology, Engineering, and Maths) will fuel technical advancement and opportunities.

Findings and recommendations on wealth generation

The definition of wealth generation is undergoing a revision. In the corporate thinking of many of the case study participants, it is no longer shareholders profit only, but a mix of client satisfaction, employee satisfaction and shareholder satisfaction.

Finding: wealth generation relates to client, employee and shareholder satisfaction in equal terms. In fact, this means a further rise in the role of the individual because, in the end, client, employee and shareholder all refer to the same individual, albeit in different roles. Our society is becoming aware of the role the individual is playing in the well-being of everything around us. The consequence of this trend is that we also have to reverse think about the innovation cycle. We have to start at the individual and focus on what is adding the most value to that individual. This thinking is described as reversing the innovation pyramid (Figure 2).

In the reversed innovation pyramid, we have to find a new understanding of 'share of profit'.

- What makes people contribute? Why would they do that?
- How is added value capitalised into wealth and the benefits shared over all contributors?

Wealth generation for the market

The innovation (in product, service, or delivery) must raise and create value for the market, while simultaneously reducing or eliminating features or services that are less valued by the current or future market (Figure 3). The 'buyer' is in opportunities for services never offered to customers before, so called simultaneous pursuit of differentiation and low cost and the combination tries to highlight the sweet spot in the middle. We extend that to stay that 'buyers' or 'users' can be both consumers and innovators/participants, given all of the supporting conditions.

Figure 2. Innovation ecosystem: traditional and new open innovation model

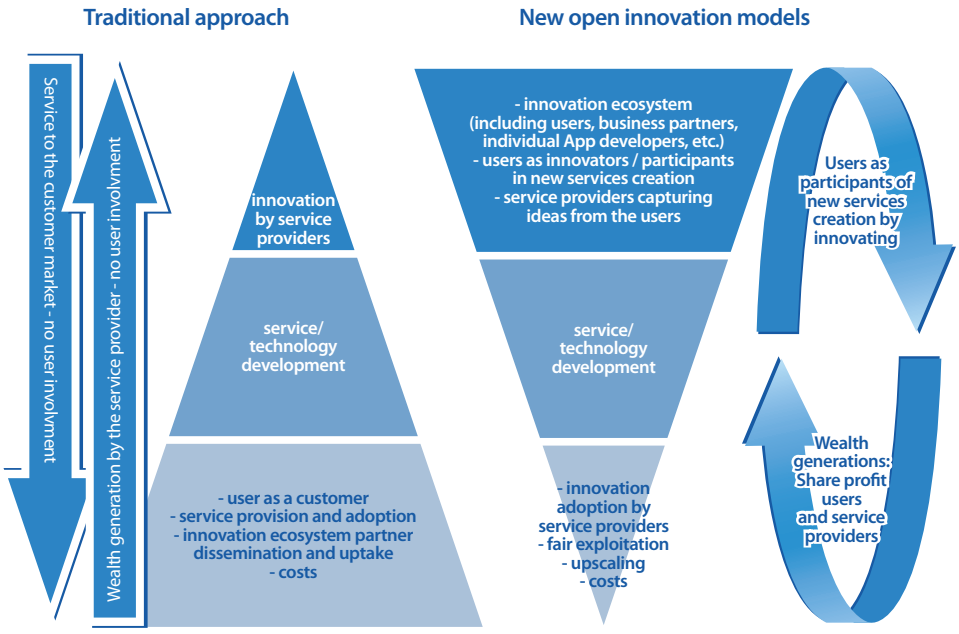
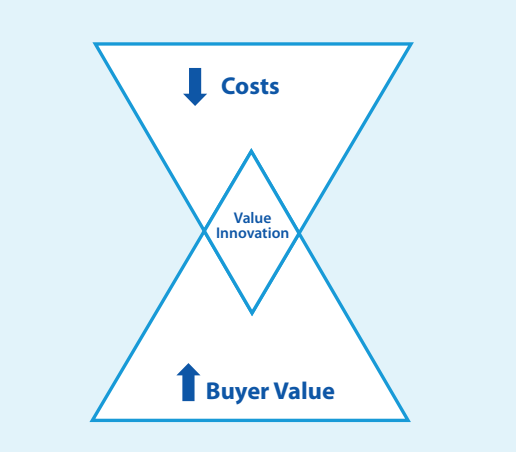


Figure 3. Value Innovation [5]



Wealth generation in an inclusive society

The right combination of creativity, content and technology will generate services that close the digital divide. New devices will bring inclusion to the elderly and the handicapped by story tables, monitoring wearables, devices and individualised memory access from public broadcast archives. Closing the digital divide pays off in social values. Social coherence needs specific attention in response to the fragmentation of society by television and passive Internet use. Reintroducing storytelling in computer settings almost without interfaces will serve societal coherence.

Wealth generation for well-being

There are many opportunities once the worlds of information, monitoring and communication have been brought together. Sharing content and creativity by the Internet will create new well-working lifestyles: wherever and whenever. Wearable technology supported by Internet coaching will create well-being lifestyles for young people and the elderly. Hence, it will control healthcare costs by communication as needed. Sustainable energy, sustainable water and sustainable material use will require a complete turnaround in our daily practices: for companies, for individuals, for the government.

Recommendations

- Adopt a policy to stimulate *social innovation sciences* in the recognition that wealth generation is driven by the right balance between citizens, clients, employees and shareholders' interest.
- In the Netherlands alone, a high percentage of freshmen from higher education start their own enterprise. Their ambition, at the start at least, is not to enter a big corporate, but to exploit one's own intellectual capital at the stage of innovating. If we manage well as a society, we can exploit a vast resource of creative and entrepreneurial minds.
- Push a new service mindset versus a new product mindset: this new mindset will place the client experience at the centre of a business's purpose. It will unlock greater value for customers in their dealings with providers. It will redesign business processes and business models leading to renewed growth for the business, and for an economy of such businesses, see also [6].
- Encourage users to participate in the innovation process and creation of new services by studying the innovation ecosystem and users' motivations [7].
- Stimulate heterogeneous cluster forming and create financial and fiscal constructs to help them. Focus on new combinations of technology, societal issues, users/creator groups and artistic forms.
- Initiate an EU-wide *creative council* where employers, unions, public agencies, politics and SMEs are represented. Promote *creative thinking* as a foundation for open services innovation.
- Build a single market for services in Europe with the active participation of its users.

The key driver to 'the individual-corporate' is ICT. As we have seen from our case studies, individual-corporates cover different sectors; however, all are driven by ICT. So, what new industries are coming up that incorporate this openness approach already? ICT-led Creative Industries.

The information motor

Several new ways are open ahead of us. A different style of working has entered the stage with less emphasis on control and more on initiative and self-reliance. The lifestyle is more conscious in society, better informed about energy, body and security to ensure longer living at home when we grow old. Art is more important than ever to many as the meaning of life in a society with less religion. And there is an effect on the habitats we live in, from the anonymous world of the Internet to the social media.

The creative lifestyle, the individual-corporate

The key driver to 'the individual-corporate' is ICT. Many people are beginning to work and to live the creative way. They work in a high degree of autonomy and, as the other side of the same coin, with a high degree of purpose and result. They create something individually and, at the same time,

operate in a network of relationships. This is a lifestyle where responsibility and accountability are important assets. Leading the shift are the people in many diverse fields who create for a living, not only products, software or designs but also education, strategic advice and science. This new economic class is generally known as the 'creative class'. Artists and designers are only a small subset of the class we have in mind. What makes the creative sector unique is the integrated way of living and working and regulating with an emphasis on self-motivation and flexibly networked. At the core of the creating class are information, communication and media.

Considering the urgency to turn our study recommendations into an action today, the partners and the contributors of the OSI study are progressing well on turning it into an action plan. The results of our study attracted industry representatives, policymakers, educational institutes, students, artists, and researchers. The study results have already been addressed and discussed in number of papers and scientific works [8] [9]. We are also working at a national level within the participating EU countries for the follow-up action plan.

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1.7 Pioneering regions and societal innovations as enablers for the Europe 2020 strategy

Abstract

This article is about the need for transformation and societal innovation in Europe. In order to achieve the objectives of the Europe 2020 strategy, policymakers at all levels must make clear decisions, and back them up with actions enabling countries, regions, organisations and citizens to contribute actively to creating an innovation society in Europe. The road ahead has been described and now the real challenge for Europe is implementation. There is a need to bridge the gap between existing research results and actual practice. Societal innovations — broader than technological and social innovations — are required. Pioneering regions and regional innovation ecosystems will play a central role in this. Entrepreneurial initiatives that translate grand challenges into local priorities and address pressing needs are important. They should employ the best experts and change agents from diverse fields to pioneer innovative solutions. Prototyping promising solutions and the rapid implementation of the best are important ways of providing value for citizens and fostering a European innovation culture that works.

This article cites relevant European sources on the nature of the radical changes required, providing an overview of policy and practice. It explores several examples of initiatives already under way, focusing on recent work in Finland, and suggests what people can learn from these programmes and how to move further.

The key ideas of various experts and experiences seem to converge on a simple message: move quickly from words to deeds, demonstrate the courage to creatively address the challenges agreed on, work together, across borders of all kinds, at the level where change impacts the system directly, there where government is closest to the people — at the level of innovative cities and regions.

The challenge for Europe

The EU political leadership has called for the renewal of societal and industrial structures and processes. To accomplish this, Europe needs radical transformation and societal innovations. Europe cannot recover from the financial crisis with short-term measures alone. The situation has been succinctly summarised by the flagship initiative Digital Agenda for Europe [1]: The crisis has wiped out years of economic and social progress and exposed structural weaknesses in Europe's economy. Europe's primary goal today must be to get Europe back on track. The track, however, is not the same as it used to be. Old practices and structures are not enough to achieve the goals Europe has in mind for welfare and quality of life. It is time to invent the future of Europe.

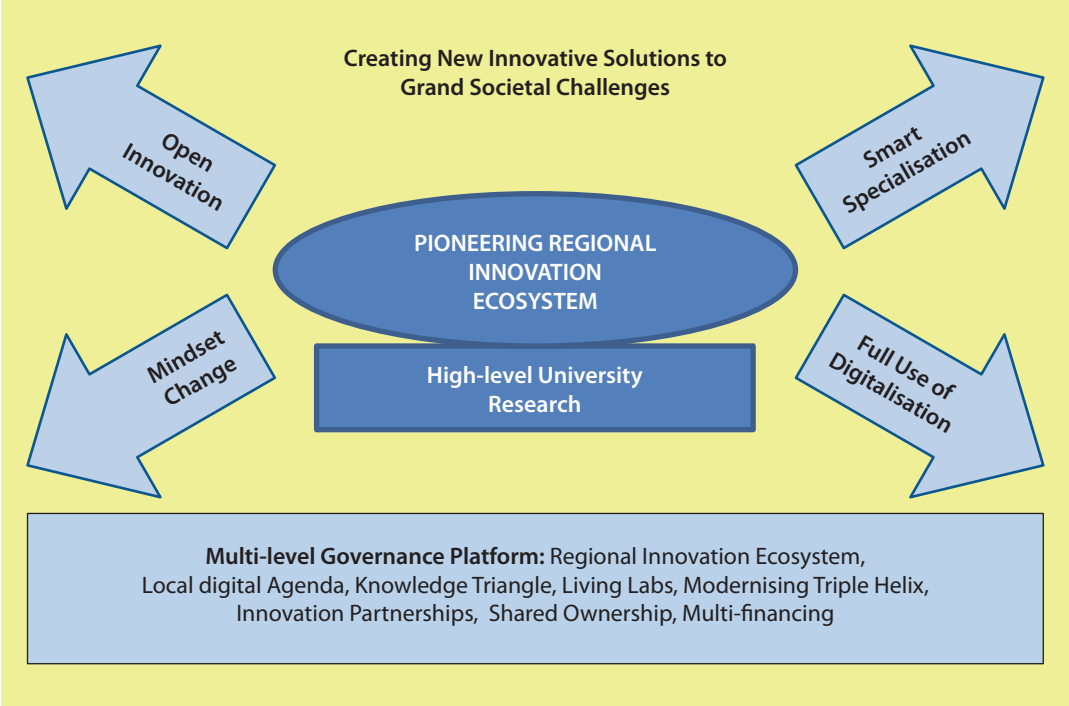
The focus is defined by the Europe 2020 strategy and the seven flagships. The implementation at practical level by the policymakers in Member States and regions requires new kinds of collaboration between public, private and third-sector parties. The measures concern all aspects of governance in the public and private sectors, and much more collaboration is needed than before. Europe needs powerful initiatives to concentrate our energy and focus on clear priorities, to connect the critical actors and motivate them to engage with each other, and cooperate across borders of all kinds. This calls for creativity to overcome the obstacles we see and the courage to meet the challenges we have chosen to address.

Transformation based on research and innovation

The Europe 2020 strategy calls for transformation. European actors already have much of the high-level research results required, and the European Research Area has good systems in place to produce more. However, these are not consistently used in political and business processes and governance. There is a huge gap between the latest research knowledge and real-life practice here, while Asian businesses and political decision-makers are actively using European knowledge as the engine for their global business development. In China and several other countries, the potential of globalisation is being realised in practice. Economies of scale and rapid innovation have been combined with the determination to succeed. Are Europeans incapable of reacting quickly? Has too much success in the past bred a culture of complacency in which radical transformation looks like too much to ask?

Europe must inspire and leverage its entrepreneurial, pioneering spirit in order to unlock its enormous existing resources and focus on fast improvement. As the failure of the Lisbon strategy indicates, good intentions, correct analyses and even good planning are not sufficient. Brave leaps to the future must be taken at a practical level [2]. Fine words and short-term responses will not provide what is required. There is a deepening malaise, which must

Figure 1. Europe's Blue Ocean strategy focusing on societal challenges



be addressed forcefully: with respect for the fear of change, but recognising that only those who *do* change will prosper and survive. Cities and regions must become real implementation fields for the Europe 2020 strategy.

Regions should be turned into innovation platforms for strategic change. They need to be enabled and empowered to become the new 'republics of tomorrow' — knowledge-fuelled, future-centred drivers of innovation, providing processes and tools for government and business, products, services and new jobs for citizens, with an impact felt from the boardroom to the living room. For this, the key is a new dynamic understanding of regional innovation ecosystems, where public, private and the third sector learn to operate together, instilling a new and creative mood in society.

All across Europe good experience has been gained in the new open research, development and innovation platforms and methodologies which mobilise public-private partnerships and encourage the participation of people. The ongoing changes are already taking hold: in the future, they will have an enormous impact on everything. As Figure 1 shows, the key elements for the full implementation of Europe 2020 already exist: the directions for addressing societal challenges through multilevel governance — including open innovation, smart specialisation, full digitalisation and mindset change — have been defined. Europe can and should create something unique for global welfare and sustainability. This can be achieved by integrating Europe's strong cultural diversity and research excellence with relevant public and private business opportunities through the digital single market. This powerful capacity to tackle societal challenges does not exist elsewhere. That is why we call this the European Blue Ocean strategy. The focus should now be on commitment to concerted action.

Territorial pacts to implement the Europe 2020 strategy

The Committee of the Regions (CoR) has defined territorial pacts as instruments that enable regions to take an active role in the implementation of the Europe 2020 strategy. Analysing the ongoing preparation and implementation of the flagship initiatives from the CoR perspective, the main concerns are that they remain too much at a blueprint level and their impact reaches the member states — not to mention the regional level — too slowly. Too often, the flagships are considered to concern only the European Commission. There is no active resistance to change but, in the current economic situation, passive waiting is just as harmful.

The territorial pacts should focus on a few tailor-made priorities which have a special value

for the region concerned. They should not become a new bureaucratic instrument, but work to strengthen the natural components of the National Reform Programmes (NRPs) in order to ensure compliance with the multilevel governance and partnership principles. They could take the form of political commitments, possibly complemented by contracts established on a voluntary basis between public bodies, while focusing on governance and the implementation of the Europe 2020 strategy. Territorial pacts could especially target policy areas where regional and local authorities are key actors in relation to the design and implementation of the Europe 2020 headline targets and flagship initiatives [3].

This initiative is officially endorsed by the Committee of the Regions and by the European Parliament: so far, it has received political support from the European Commission, the European Council and the Belgian, Hungarian and Polish Presidencies of the EU.

In his letter to the CoR President Bresso, President Barroso stated: "I am pleased that the European Council confirmed its intention to maintain close cooperation with the Committee of the Regions and to fully involve regions in the implementation of policy reforms, so as to ensure ownership. In addition, the Commission is encouraging Member States to set up territorial pacts on a voluntary, basis. These pacts will enable close involvement of regional and local authorities in the implementation of the Europe 2020 strategy. (...) Regional and local governments can make a substantial contribution to the preparation and implementation of the national reform programmes" [4].

So what does Europe need now? The target has to be bridging the gap between existing research results and actual practice. Structures and processes in cities and regions must be developed, even radically changed, in accordance with the latest research results. We have defined the following as the guidelines for immediate actions.

- The focus must be on creating and implementing innovations at a practical level, based on values and mentality, in order to achieve concrete results for the well-being of citizens.
- Political decision-makers should consistently demonstrate the courage needed to aim for the highest ambitions and bring forth something radically new.
- Regions and cities should create pioneer initiatives that are genuinely European by nature: multicultural, human-centred, focused in societal innovations and capabilities for creating better structures for the welfare society and laying the groundwork for the digital single market development.

The EU must have the courage to make quick decisions to fund a few new types of wide-scale R & D initiatives that transfer the newest global research knowledge into practical real-life applications in a creative, multidisciplinary way. These must be pioneering initiatives that employ the best experts and change agents of several fields. It is clear that prototyping promising solutions and the rapid implementation of the best ones are strategically important both for providing value for citizens and for fostering a European innovation culture that works.

The critical governance level of Europe 2020 actions needed is local and regional: municipalities, together with regional decision-makers, are the ones to make the Europe 2020 to come true — or not. The territorial pacts need to apply a multi-strategy approach, keeping in mind the different historical and cultural backgrounds of the regions and their diverse opportunities to utilise the various flagship initiatives. This means local differentiation and emphasis on different EU targets, so that each region only concentrates on a few focus areas which have a special value for that region.

Implementation of the Europe 2020 strategy is the real challenge

To challenge you to think more creatively about the broader context, we quote the foreword of the Lisbon Council report, *An Action Plan for Europe 2020* [5], written by Wim Kok, former Prime Minister of the Netherlands: 'Comparing the situation today to 2004, when I was in charge of producing a report on the midterm review of the Lisbon agenda, the situation is much more serious. ... There appears to be a structural lack of connectivity between what is said in Brussels and what is perceived as being urgent in the Member States. ... Until now, all European agendas have been seen as too abstract and isolated to be in the national interest. ... We have always known that implementation was Europe's weak spot, so the question of enforcement is key. ... the best way to deal with difficult, interconnected issues is to be as forward-looking and open-minded as possible. ... This can mean shifting budget priorities around, so that leaders have the financial resources to invest in areas where tremendous benefits can be reaped from a first-mover advantage, for instance in eco-innovation.'

Different articles in the same action plan for Europe 2020 frame various aspects of the European challenges.

- Andreas Schleicher: "Never before have skills been as central to the prosperity of nations and better life chances for individuals as today."
- Martin Schuurmans: "Unless everyone starts to recognise innovation as the encompassing factor for research, education and industry with entrepreneurship in the driver's seat, Europe will continue to stall."
- Alessandro Leipold: "A growth-enhancing structural reform effort has become even more critical in the wake of the crisis and its legacy of high unemployment and depressed potential output."
- Harry Verhaar: "As we tackle the challenges of sustainability and climate change, the direction we need is crystal clear, but the momentum is just too weak."
- Geoff Mulgan: "Systemic innovation matters as much in society as it does in the economy."
- Ziga Turk: "The issue is not "digital economy" versus "industrial economy". It is about figuring out how the digital economy will transform industries and societies, improve productivity and increase added value."
- Mark Spelman: "Conventional wisdom views ageing as a problem. The 'greying' of the population represents a significant untapped growth opportunity."

Much of what is stated in the Europe 2020 strategy could already have been envisioned years ago. As evidence, we quote the outcome of the EU expert group led by former Finnish Prime Minister Esko Aho. The report [6] published in January 2006 presents a strategy to create an Innovative Europe: achieving this requires a combination of a market for innovative goods and services, focused resources, new financial structures and the mobility of people, money and organisations. Together, these constitute a paradigm shift going well beyond the narrow domain of R & D and innovation policy.

The report crystallises some fine insights verifying the need for more in-depth understanding of how markets function: 'More resources for R & D and innovation are a necessity but they are an insufficient means to achieve the goal of an Innovative Europe. A paradigm change is needed in which European values are preserved but in a new social structure.' The report continues: 'Our proposal is to create in Europe a market that stimulates and encourages innovation and in so doing provides firms with the incentive to raise their R & D level and to apply successfully the full range of new technologies.'

The report goes further, clearly recognising that achieving the goal of an innovative Europe 'requires a new paradigm of mobility, flexibility and adaptability … [one which] cannot be confined to the narrow domain of R & D and innovation policy, important though that is. Simultaneous and synchronous efforts are needed at different levels'. Cutting across all levels is 'the necessity for more positive European attitudes and culture towards entrepreneurship and risk-taking'.

What do these messages coming from top experts mean for the changing role of regions in European policy? We want to review these, and integrate them with some of the main conclusions coming from the CoR's sixth Territorial Dialogue [7] on territorial pacts to implement Europe 2020 (organised on 22 February 2011).

The dialogue focused on the CoR's proposal for territorial pacts at the country level, as a tool for national, regional and local authorities to design and implement the national reform programmes in partnership, working together — through contractual agreements, where relevant — in an integrated and coordinated manner. The point was made that cities and regions need to perform better as spearheads for innovation — which should be understood as more than just research.

There was a unanimous view that the strategy would deliver *only* if built on each region's existing assets. The closer to the regional and local levels, the more policy choices would reflect underlying needs and be effective. Coordination of efforts will only bring results if policymakers focus on fewer actions: territorial pacts could serve this purpose. In his statement during the dialogue, MEP Lambert van Nistelrooij expressed a strong conviction that Europe needs a new kind of governance to enhance joint responsibility and ownership of policies. He pointed out three important concepts which must serve as a platform for specific government measures: *concentration*, *connection* and *cooperation*.

The key ideas of various experts and authorities seem to converge on a simple message: move quickly from words to deeds, working together at the level where change impacts the system directly, there where government is closest to the people — at the level of innovative cities and regions.

Increasing competitiveness and social cohesion through intellectual capital

Throughout history, cultural richness and enriching collaboration between cultures have been the strengths of Europe. Due to the globalisation and the network society business practices, the competitiveness of Europe must now be seen in a new light. Competitiveness must be strengthened in diverse ways, on the one hand putting emphasis on critical success factors and focus themes and, on the other hand, on the skills, abilities and well-being of all regions and their inhabitants, thus improving the probability of development and success. Competition is a positive thing when it aims at improving the quality of life and skills of all participants. It is not a question of some parties being oppressed and some successful, but of increasing the common good.

Competition is indeed an excellent motivator. And, to be sure, Europe is facing strong competitors. Looking at the global players, we see the BRIC countries with their boundless energy, determined focus and positive images of what the future can bring. These positive images alone can be major drivers for change, and these countries are working incredibly hard to make them come true. In order to be able to compete effectively, Europe must create its own stories of positive futures, and back them up with the same dedication and focus.

The successful implementation of the Europe 2020 strategy depends on systemic change. This calls for strong purposefulness and goal-setting based on a deep understanding of the interconnection and mutual dependencies of various factors and phenomena, as well as targeted collaborated actions by different decision-making bodies operating on diverse activity levels. Old ways of working do not function effectively anymore. Europe needs courage and the skills for open renewal. All actors need to resonate with the confidence — this, especially, at all levels of society — that Europe is serious about open renewal. The manifesto of the European Year of Creativity and Innovation 2009 [8] provides a solid cultural basis for the renewal needed during the next few years.

1. Nurture creativity in a lifelong learning process where theory and practice go hand in hand.
2. Make schools and universities places where students and teachers engage in creative thinking and learning by doing.
3. Transform workplaces into learning sites.
4. Promote a strong, independent and diverse cultural sector that can sustain intercultural dialogue.
5. Promote scientific research to understand the world, improve people's lives and stimulate innovation.
6. Promote design processes, thinking and tools, understanding the needs, emotions, aspirations and abilities of users.
7. Support business innovation that contributes to prosperity and sustainability.

This manifesto is very ambitious, and we know from experience that it won't happen simply because experts say it. Regions and cities need plans, equally ambitious, which can be followed with persistence. And people — throughout the communities and at all levels of society — need to be engaged. Social cohesion is one of the main responsibilities of regional and local governments in the EU. It is often their legal obligation to design, fund and carry out policies aimed at integrating people who are excluded from the labour market. The objective is to use legal competencies and tailor various programmes to meet local needs, with a special focus on young people and children. Effective integration is needed in the areas of education, housing, urban planning, social sector, security, and cultural activities. Most of all, citizens should come to understand, accept and actively contribute to pursuing shared European goals; they should resonate with the confidence that they are part of a positive and important enterprise: ensuring future welfare and quality of life for themselves and their children.

What does this mean on a regional level? Too often, people still remain the objects — or even the victims — of ad hoc actions, rather than becoming active players and initiators themselves. For this reason, the main target for the renewal measures is not changing the structures, but changing the working culture and thus mobilising various stakeholders. Of course, some structural changes are necessary in order to improve the preconditions for developing this working culture, and to enable citizens to flourish and realise their potential. This requires strengthening the role of cities, but not, however, in their old role as service providers. The new role of cities is to enable proactive collaboration and business activities. Europe's cities should create a regional culture of collaboration, characterised by responsiveness to the motives, aims and resources of people, communities, and local business, including social cohesion as part of their core businesses. They must be aware of the challenges, capable of translating them into the language that motivates people and business, consistent in engaging people at different levels of society and

supporting them, where needed, to co-create their own futures.

Creating synergy through flagships — the model for Smart Regions

Cohesion policy is one of the key policy areas through which regional and local authorities can carry out many of the flagship initiatives. The 'Territorial pact on Europe 2020', as a distinctive part of the strategy's governance, should be used as a practical instrument in line with the inter-institutional partnership principle as officially recognised in the strategy. Territorial pacts could be conceived as natural components inside the national reform programmes. They should not become new bureaucratic instruments, but rather concrete mechanisms inside of the Member States' internal policy structures to ensure the commitment of public authorities at all levels to align national objectives to the Europe 2020 strategy.

To take one example from the Digital Agenda flagship, there is a list of initiatives where regional and local authorities can clearly deliver results, to name a few: eGovernment to improve the supply of public services in education, health, social inclusion and territorial planning; increasing the interoperability between central, regional and local administrations; enhancing ICT literacy; stepping-up awareness about stimulating the upgrade of infrastructure; supporting the development of public-private partnerships involving local and regional authorities; and supporting ICT development for SMEs in the area of public ICT services.

The challenge for Europe 2020 is what happens at the regional and local level: Will the regions wake up and implement the Europe 2020 strategy and the flagships, and through that accelerate their reaction speed in answering the grand societal challenges and changing needs? Integrating some key elements from different flagships, we can define the following critical success factors.

- Strengthen the decision-makers' understanding of the digital economy and the huge opportunities available to enable the renewal through the flagships.
- Promote citizen and customer-centeredness and new practices in leadership, both on a strategic and operational level.
- Create favorable conditions to change people's attitude and mindset towards creativity, innovativeness and entrepreneurship.
- Interconnect small-scale project and pilot activities for supporting the same goal.
- Renew the working culture to break down management silos which prevent efficient service development. Develop customer-centred production and optimise costs, organisations need open-minded working practices that cross organisational boundaries at both member state and local level, addressing third-sector parties and businesses as well.

It is essential that regions are able to translate grand challenges into regional priorities, relating them to pressing local needs. They must be able to downscale the rhetoric while keeping the poetry, facilitating cities, communities and neighbourhoods in addressing the issues that really matter to them. In effect, Europe needs to create and support innovation ecosystems which address issues at all three levels, without losing focus on the importance of enabling people to do the work themselves. This strengthens and supports the entrepreneurial spirit Europe needs to address its grand challenges.

Taking advantage of the coming cloud culture of Internet everywhere, the EU is already opening opportunities for extensive digital collaboration at the regional and local level. Until recently, digital Europe was characterised by ad hoc cooperation between strongly individualistic players taking advantage of possibilities where they could be developed. Now, there are promising possibilities for active collaboration at all levels, and citizens, business interests large and small, local government and universities — professors, researchers *and* entrepreneurial students — are much more easily able to connect and co-create new opportunities to address local issues and generate regional welfare. This is illustrated in Figure 2 [9]. In the future, the expectation is that linked regional ecosystems with complementary change agendas will allow almost unlimited opportunities for entrepreneurial actors on a local level to interconnect, learn from each other, act together to address shared ambitions and achieve mutual goals. A new mindset is required, and one can already see the transformation to this culture of collaboration taking place.

Regional ecosystems — operating as the interface between European level, national level and the level of individual initiative — are ideally suited to translate ambition into action and integrate learning at all levels to improve practice, be it the practice of people-centred policymaking, targeting strategic objectives, and fast and effective implementation on the ground. These ecosystems will be in the business of attracting, connecting, committing and empowering people to work together on their own pressing problems, while recognising

Figure 2. Towards a culture of collaboration: transformation through opening digital opportunities

the need for coordinated action with people working at other levels of the system. Relevant results at the local level are a key energising force for, in this way, people remain engaged and enthusiastic about doing more. Their entrepreneurial spirit soon drives the desire for innovation — and for innovative products and services — and the ecosystem thrives. Once local results have been achieved, joint actions can be organised, focusing on scaling up through mirrored learning processes to link neighbourhood-to-neighbourhood, city-to-city, and ecosystem-to-ecosystem. Finally, regions can be connected to regions in broader, European-wide contexts, creating a truly future-centred innovation society.

Research results achieved through the funding of the seventh framework programme (FP7), the competitiveness and innovation framework programme (CIP), and other similar initiatives should be much more effectively used to increase the performance capabilities of regions. Special focus should be on developing and implementing the concepts and processes needed to take full advantage of digitalisation and new key enabling technologies for modernising regional innovation policy. Policymakers should play the dual role of being both process owners and learners, thus investing a fair amount of their time in deepening their own knowledge and understanding of how complex systems and societal innovations work.

There is a special need to further develop models for public-private partnerships and, in this way, modernise the triple helix concept. High-level knowledge created by FP7 and CIP offer good grounds to build on: initiatives such as Regions of Knowledge, Living Labs and Smart Cities can serve as platforms for increasing the knowledge base of regional decision-makers. This doesn't mean participation in some seminars and meetings: intensive coached and mentored leadership learning programmes are needed. These are programmes which could be compared with the best European Executive MBA programmes; however, in this case focused on creating and orchestrating regional innovation ecosystems to implement the Europe 2020 targets. When organised with a very high professional profile, they could attract high-level decision-makers, top civil servants from the regions and the Commission, as well as the best researchers, business managers, and civil society leaders. This modern executive education programme would require both face-to-face participation and distance-learning. The participants, coming from different regions and backgrounds, would learn collaborative skills through benchlearning, facilitated dialogue, and coached practice. Together, they would further develop their own real-life cases, while creating the networks they need for diverse future activities.

It has often been stated that Europe needs pioneering regions in order to once again become a

global pioneer in creating the human-centric innovation society. This innovation society — characterised by user-centred service provision, fuelled by humanism and a multicultural mindset, open-minded in developing and testing new ideas and converting the best of them into radical innovations — must be manifested first of all at the regional level. This calls for a systemic approach to human-centric innovation, and creating collaboration platforms to enable demonstrations and rapid prototyping. Genuine collaboration at the regional level creates a new culture of knowledge co-creation, and promotes the dissemination of best practices. This is one way for Europe to resume its centuries-old tradition as lead-developer of human-centric society.

Creating local digital agendas in practice

How can local and regional authorities enable the desired radical change? How can the strategies and operational programmes of the EU and its Member States be put into action at local and regional levels? A promising solution can be found in local digital agendas, an inspiring activity that connects essential potential actors from several levels. As stated by the European Parliament [10], digitalisation is the driver of desired change: 'this digital revolution can no longer be thought of as an evolution from the industrial past but rather as a process of radical transformation.' The focus needs to be on action, not more planning and drafting documents. To have the desired societal impact, it needs to be professionally orchestrated. This has been accomplished by conceptualising a mega-endeavour (the Local Digital Agenda, LDA) consisting of diverse projects and wide active participation.

The Dutch Province of Friesland, together with several other regions (including Catalonia, Flanders and Helsinki) has started such a joint collaboration by forming the Vanguard Group to organise pioneering European activities (see Figure 3). This group operates with the CoR to pilot and disseminate the results of implementing CoR opinions. It has worked especially well with the following two statements [2], in which 'the CoR identifies a particular need to:

- create local digital agendas to speed up the optimal use of ICT through orchestrated local, regional and European collaboration; and
- promote the digital single market as a cornerstone of the Digital Agenda for Europe and support large-scale pioneering projects drawing on top European expertise and involving all the various stakeholders.'

LDAs could become important structuring and binding tools for integral regional development. The LDAs are not about pushing ICT: they enable mechanisms for digital pull-strategies and value creation. Likewise, the LDAs are helpful for realising

Figure 3. Europe 2020 needs European pioneers: the Vanguard Group integrates real and virtual realities

goals in different socio-economic sectors such as education, energy, health and social cohesion. This will all take place from a citizen and company point of view, to enhance a 'fabric of local cooperation' and collaborative creation. Generic elements will be enforced and developed in different structures and business models. Local developments can be connected through the LDAs and help create a thriving context. These elements can be technical (open-data platform), organisational (open innovation and collaboration communities), mindset (culture, behaviour) or even legal (one-contract shop).

This could all lead to a new regional design utilising relevant 'common sense' principles. These principles — for example collaboration, user-driven approaches and trans-sectoral innovation — are needed to create a strong European digital single market. The concepts and tools are based on openness and trust rather than command and control.

This development, however, will not take place on its own. Strong commitment to collaborative change, together with the prioritisation of appropriate measures is needed. It is much easier to write broad well-meaning programmes that look good on paper, than actually focus resources to enable the development and implementation of innovative solutions on the ground. Local digital agendas are needed for this, as well as good conceptualisation and orchestration. This includes a definition process to enable decision-makers to recognise grand societal challenges, translate them to regional and local priorities, and commit to the renewal — often radical renewal — that is required.

The desired change calls for the significant development of mental models, working practices and a culture of partnerships, to be worked out in close collaboration between the political decision-makers, private and public sector stakeholders and researchers. In our mega-endeavour this happens especially:

- with the help of testing and implementing demonstration projects related to sustainable development: studying, piloting, demonstrating and verifying new models;
- in collaboration with the significant businesses, universities, and research institutions of the region: partnerships to create working culture, innovative concepts and methods to support them;
- by developing the decision-making processes needed to address societal challenges: using the best international knowledge and collaboration expertise, developing the required competencies and methods to support decision-makers.

The Helsinki Region as a forerunner

The establishment of Aalto University through the merger of three top-level traditional universities (Helsinki University of Technology, Helsinki School of Economics and the University of Arts and Design

Figure 4. Regional innovation ecosystem in the T3 Area

Helsinki) has opened new global avenues for the Finnish knowledge-driven pioneering activities. Helsinki Metropolitan Region and, at its core, the Innovation Triangle Area, is pioneering European digital and innovation development. The process highlights the following actions.

- Creating a concept — the regional innovation ecosystem — that crosses sectoral boundaries and leads knowledge society and digitalisation activities through common practices. It implements Local Digital Agenda (LDA) and Local Innovation Agenda (LIA) goals with sufficient authority and resources.
- This will be interlinked with the research and development activities of the Energising Urban Ecosystems programme (EUE), a four-year industry-driven research programme with a budget of EUR 30 million.
- Collaboration and synergy are on the focus of innovation activities throughout the Region, as societal innovations are of crucial importance in this development. ACSI, the Aalto Camp for Societal Innovation, is instrumental for creating and supporting the new mental mindset needed.

The activities are demonstrated in the Helsinki Metropolitan Region, especially in Espoo's Innovation Triangle Area Otaniemi-Keilaniemi-Tapiola (T3); this area of five square kilometers is already the largest concentration of science, innovation and related businesses in northern Europe. An aerial overview of T3 can be seen in Figure 4.

Through activities like these, Finland provides real-life demonstrations of how to modernise the traditional triple helix model, define relevant critical success factors, and show how to run change processes in practice. Political commitment integrating initiatives such as LDA, EUE and ACSI in general policy guidelines is crucial. On a larger, regional scale, this is planned through the Helsinki-Uusimaa Regional Council.

A special target of these activities is to influence political decision-making at all levels — EU, national, regional, local — by showing how to tackle the huge gap between research knowledge and real-life processes. We want to show how effective conceptualisation and new research based methods can produce the regional measures required to turn research-results into innovations that are created locally and can also be applied throughout Europe. We also want to show how local and regional authorities can mobilise public-private partnerships and encourage grass-roots' participation, the so-called user-driven open innovation for collaborative value creation in open societies. Scalable concepts, work processes, methodologies, tools, and actual innovations will provide the basis for a Europe-wide ecosystem of reusable solutions, which will become part of the core of a European innovation society.

What does this mean in practice for the regional and local decision-making process? Based on our two years of piloting work at ACSI and the one-year intensive planning phase of the EUE, we can suggest the following success factors:

- the need to hold all sectors of management accountable for implementing regionally prioritised activities within their operational field;
- a seamless collaboration between strategy, leadership and the selected spearheads must be ensured;
- a knowledge production format that can be used for demonstrating potential change and indicating where radical change is possible;
- the importance of linking all this directly to regional policy and political decision-making.

The increase of renewal capital by emphasising empowerment and focusing on societal impact is especially important as a part of the steering system and daily practices of the public sector. This can be started by integrating all participants in a learning process that enhances understanding of the digital economy and, especially, by promoting collaborative innovation in decision-making and administration.

The EUE programme will work actively to develop Finland and T3's global role as *icebreaker, pathfinder*, and *prototyper*. These three roles are essential to the entrepreneurial, pioneering spirit needed to spearhead innovation culture in Europe.

Icebreaking means opening new space for energising society and enhancing regional innovation. It is the process of clearing a space for practical action. When the way forward seems blocked, there is a need to break through barriers to create new possibilities for thinking and acting. In sticky situations, when people see more difficulties than opportunities, icebreaking creates space for experimenting, new thinking, and moving forward.

Pathfinding is the process of discovering and exploring new ways forward. Innovation is often unknown territory, and explorers and guides are needed to move people, projects and organisations in useful directions — towards quality-of-life improvements that are attractive, practical, and scalable. There is relevant science, technology, good practice and

knowledge available everywhere in the world: But how to access it quickly and apply it where and when it matters? The complex world knows many difficult places and dead-ends, and pathfinders seeking new ways to stimulate societal innovation impact make the journey easier.

Prototyping is the process of co-creating promising solutions and testing them in practice. It is an iterative process of learning-through-doing, where demonstrations of work-in-progress lead to a deeper insight into what really works and what people really need. New products and services, but also policy and possible futures can be prototyped effectively. It is essential to learn to accept hands-on working with new ideas, sometimes 'failing our way forward' and always focusing on continuous improvement. Prototyping is the key to innovation acceleration.

ACSI, the Aalto University's Camp for Societal Innovation, is the Finnish initiative deeply involved in stimulating global collaboration for societal innovation and using innovation ecosystems. ACSI is a new-generation innovation agenda making use of concepts, operating modes and a network for the development of a global innovation platform that is anchored at Aalto University. The eight-day camp at the core of the ACSI process has been piloted twice: in the summers of 2010 and 2011. More than 250 professors, researchers, students and working professionals from around the world, from a broad range of different disciplines, participated in the two ACSI pilots.

Methodologically, ACSI operates through the Knowledge Triangle, combining research, education and innovation to enhance renewal and efficiency of each of these areas. The goal is to break the boundaries between traditional university practices and to create synergy by integrating students, teachers and researchers from various disciplines to study and work together with field experts and innovation practitioners, focusing on real-life issues and leading to practical results, outcomes and impacts. In this way ACSI acts as:

- a contributor of innovation methodologies: for learning, research and societal impact;
- a content contributor: ACSI produces knowledge and solutions for real-life needs;
- a driver of systemic change: ACSI in operational mode is a driving force for change.

ACSI is itself an innovation ecosystem, providing methodologies and tools to effectively address the cases it focuses on, and to power the Energising Urban Ecosystems programme. At the same time, it connects and activates hundreds of innovative students, researchers and field professionals throughout the world as they tackle the tough issues of icebreaking, pathfinding, and prototyping solutions with the potential to impact society.

Several of these regional ecosystem activities will be linked with the CoR and also serve the LDA. The Helsinki-Uusimaa Region has been awarded to be the European Entrepreneurial Region EER 2012. In the EER action plan, activities will be allocated in accordance with the Europe 2020 strategy and especially the Small Business Act. Maybe the most important focus of EER activities will be on enabling the young digital native generation to play a much stronger and more entrepreneurial role in society. Learning from others, collaborative learning and learning through international networks are crucial. It is difficult for individuals to develop all the skills that globalisation and the rapid development of technology require. The same is true for the skills needed to develop innovative products and services. That is the value of being part of regional innovation ecosystems characterised by the Venture Garage Mindset: entrepreneurial, self-initiating, agile and resilient.

Energising urban ecosystems

Europe needs pioneering large-scale programmes like Finland's Energising Urban Ecosystems (EUE) programme [11]. We referred to it above, and here we highlight a few points based on our experience with the planning of EUE, and in particular being in charge of integrating it with the implementation of the Europe 2020 strategy at the regional level. The EUE is a four-year, EUR 30 million programme integrating the research capacities of 25 industrial and five academic partners in order to meet the challenges and realities of 21st century urbanisation.

EUE's approach promotes a number of interdisciplinary themes: mixed-use urban systems and communities; urban infrastructure asset management and value development; sustainable lifestyles, work-life balance and people flows; and smart, emission-free regional energy and communication systems. Moreover, future urban ecosystems are seen as core platforms for mutually complementary innovation activities and processes, which can develop both regional competitiveness and pioneering competencies in product/service development for global markets.

The EUE programme's scientific collaboration model combines academic and industrial research processes in an integral research framework. It brings together cross-sectoral, interdisciplinary research teams to study, develop, deploy and test hypotheses and, in this way, accumulating knowledge for joint outcomes. In a sense, the EUE programme

model is an example of a functional, scientific co-creation process, utilising participatory research design to create industrial added value, thus addressing EU and global strategic needs.

The EUE programme structure has been systemised into three mutually complementing layers — *Urban Visions, Urban Solutions* and *Urban Innovations* — and a closely interlinked ensemble of six complementing work packages. The Urban Visions layer examines urban ecosystems from a holistic, birds-eye perspective, providing strategic vision, an overall conceptual framework and alternative architectures for the programme. Individual work packages can apply them in their individual research processes. The Urban Solutions layer focuses on identifying the main urban planning components in the given programme context. These intelligent assemblies could be called the 'Smart building blocks' (e.g. for living, working, mobile life, well-being, and security) of the future urban ecosystems. The Urban Innovations layer takes this way of thinking closer to everyday practice, focusing on demonstrations and the testing of emerging hypotheses. Research activities are aimed at modelling, piloting and rapidly prototyping the emerging building blocks (technologies, components, products, solutions, etc.), the innovation processes and the development practices in real-life contexts.

Based on the above description of the programme structure, key programme-level research questions have been defined as follows.

1. What kinds of elements and processes are critical in creating dynamic, sustainable, energetic and evolving urban ecosystems, which are capable of responding to the complexities of urban actors and their ever-changing needs and behavioural patterns?
2. What are the mechanisms required to increase the renewal capital and to maximise the potential value of available and emerging enablers (e.g. advanced technological solutions, gradually converging PPP intelligence, and accumulating design competencies) for modern urban development?

By answering these challenging questions, the EUE programme will also create concepts needed throughout the EU to achieve the targets of the Europe 2020 flagships. This opens new opportunities for EU-funded research projects to support EUE aims and objectives. Of special importance is the synergy with Innovation Union activities such as European partnerships, Smart Specialisation, Regions of Knowledge, Living Labs, and Smart Cities.

The EUE's 'Regional Innovation Ecosystem' (RIE) work package focuses on creating an evidence-based and well-documented concept for globally leading, regional innovation ecosystems. The main research will be conducted in the T3 Area, one of Europe's pioneering innovation ecosystem test beds. It will demonstrate how to effectively implement the key enabling success factors of the Europe 2020 strategy, and how to modernise the triple helix model by enhancing collaboration between the city, universities, research institutes and diverse enterprises through the Knowledge Triangle approach.

In order to move from the machine model of planning to a new 21st century social model, more extensive and deeper collaboration in the region is essential (Figure 5) [12]. A change of mindset *and* of working culture is required. Aalto University, with its entrepreneurial spirit and pioneering activities, is central to driving the transformation through in this RIE work package.

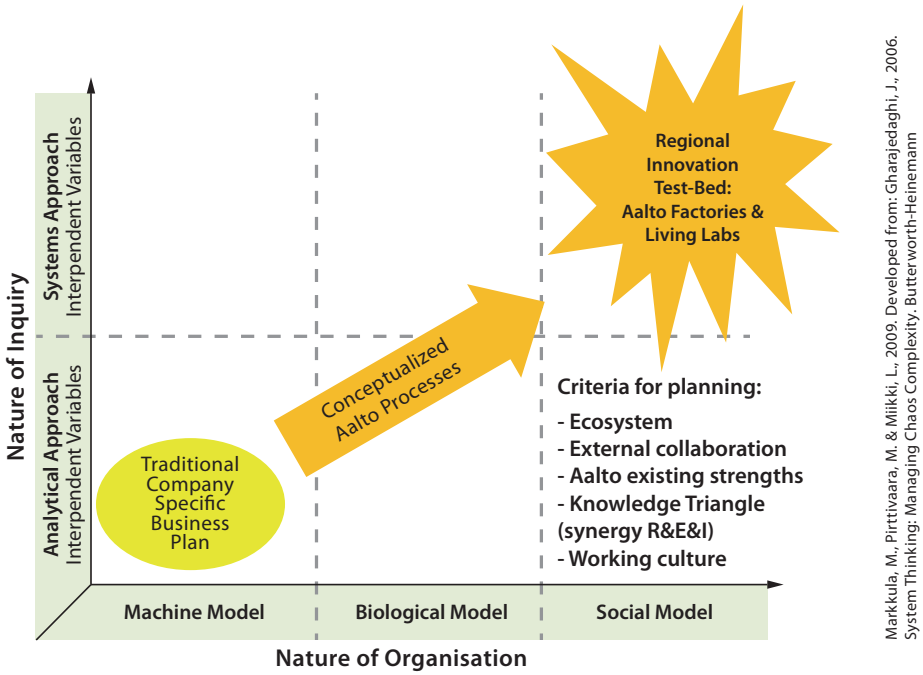
The RIE work package will integrate theory and practice in the creation of energising urban ecosystems to attract talent and business. Its core activities will prototype, demonstrate and implement new urban design strategies and business-driven innovative solutions, as well as service concepts of the future, taking advantage of cutting-edge knowledge and technologies such as digitalisation, regional information modelling, and visualised virtual reality. RIE will mobilise the specific input of collaborating Finnish and international experts to organise the service infrastructure for the entire EUE programme through the orchestrated integration of real and virtual world working environments and innovative working methods. In this way, RIE can be seen also as the methodological engine for the entire EUE programme.

Conclusions: How can regional policymakers become agents of innovation and change?

Effective implementation is the key to achieving the Europe 2020 targets. Collaborative action — especially at the regional level — and the rapid realisation of promising ideas in practice is clearly what Europe needs now. In this article, we have cited a number of high-level experts and relevant sources supporting this argument, and given some examples of pioneering regions and programmes that are already demonstrating some of the ways forward. There is still a long way to go, but — all over Europe — there are people already on the move.

It is impossible to achieve the desired ends by working alone. This is true even for pioneers and entrepreneurs. Throughout the OECD report *Regions and Innovation Policy* [13], many arguments call for a

Figure 5. Aalto T3 regional test bed



networked view of innovation. Such a view takes into account the important role of intra-regional nodes in wider interregional networks, including cross-border innovation spillovers. *Crossing borders* does not just refer to geographic and cultural borders. Just as important are crossing the borders of scientific disciplines, the borders of business sectors and technology clusters, and the borders of generations working together. People need to invent the new future of Europe through the work of pioneering regions and by creating entrepreneurial consortia of different actors. The key question is *how* to do this effectively.

Discovering how to mobilise different actors and resources for collaborative innovation ventures must become a key governance concern for all policymakers focusing on the future and concerned with providing quality of life for the areas for which they are responsible. We want to conclude this article by quoting the summary of the OECD report.

'Finding and building on a region's unique assets for strategic development goals is the task for policy. To this end, regions need to develop a sound, realistic vision of their economic future and formulate a broader, more integrated, more efficient policy mix. It will require combining instruments from various policy areas and levels of government, supporting knowledge generation, diffusion and exploitation, into coherent policy packages. Finally, regional innovation capacity needs to be built in a way that establishes complementarity with innovation strengths in neighbouring regions. Sound innovation policy is not only about creating innovations. It is about creating the conditions that enable innovation and its benefits to materialise in the form of improved economic, social and environmental outcomes for society as a whole.'

'Several key issues frame the role for regions and innovation policy. Among the most prominent are:

- the diversity of innovation strategies;
- the fact that innovation goes beyond R & D;
- the mismatch between functional regions and administrative borders; and
- the generally shared governance for innovation policy across levels of government.'

'Advice for policymakers encourages regions to be agents of change that develop a clear vision and strategic framework for innovation-driven regional development. To do so, regions should design a smart policy mix that builds on regional assets and brings together a portfolio from different policy areas. To implement this vision, more flexible governance mechanisms are required, supported by policy learning, better metrics and evidence-based experimentations.'

A clear view of innovation is essential. Technological breakthroughs may be one-off occurrences, but

societal innovation should be ongoing, sustainable and repeatable. Reusable solutions that can be handed from city to city and sector to sector are required. Innovative regions, resonating throughout Europe, will help create a common innovation culture. There has been much written about the knowledge society, but it is up to Europe to create an innovation society alongside it. This innovation society recognises that knowledge is the raw material for renewal, and that people are essential for converting knowledge into innovation and value.

The Aho report has already told us, in 2006, that for Europe to become an innovation society, its culture has to change. This will require 'a cultural shift which celebrates innovation', a mindset in which citizens are encouraged and eager to embrace innovative goods and services. But more is required. It will require unlocking the great creative potential of people, the risk-taking potential of entrepreneurs, and the pioneering potential of regions. It requires both the imagination to see what is possible, and the courageous choices needed to pursue it. It requires thinking beyond, moving faster, and allowing the passion for improvement to motivate our common practice.

All this is possible. The vision is already there, in Europe 2020 and the seven flagships. All it requires now is the will to do it, and the doing. In this way, Europe's innovation society can unite its diverse pioneering regions and innovation ecosystems to forge the true republics of tomorrow.

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1.8 New governance models towards a open Internet ecosystem for smart connected European cities and regions

Introduction: driving innovation in Europe through bottom-up open Internet ecosystems

The current economic and financial crisis is an opportunity to propose a new model for Europe to create wealth and societal innovation. Innovation is the battleground for global competitiveness in the 21st century and is the means for Europe to successfully tackle major societal challenges, such as climate change, energy and resource scarcity, health, ageing, mobility and employment which are becoming increasingly urgent. This is why the European Union has set itself, in the context of the Europe 2020 strategy, the objective to increase spending on R & D to reach 3 % of GDP by 2020 [1]. Innovative solutions that challenge traditional ways of doing things are required to respond to citizens' present and future needs, such as moving from closed innovation models to open and collaborative innovation models that can unleash the power of social production and collective intelligence. Innovation is no longer seen as a linear step-by-step process in which R & D activities carried out inside the closed boundaries of the firm automatically lead to the commercialisation of new products and services, but as a complex, dynamic, and interdependent process involving organisations and stakeholders [2]. Companies are confronted with rapid change and the challenge is to determine how they will transform their Intellectual Property (IP) policies to engage in open innovation and *crowdsourcing*, thereby innovating their ideas by dynamically exchanging their knowledge and facilitating the active role of external users in the innovation process [3]. Tapscott and Williams in their book *Wikinomics* outline the main principles behind what they name the 'economy of mass collaboration' [4]. They analyse how 'peer production', the participation of people in the innovation process, is shaping the economic and social environment, and becoming the key force driving competitiveness in the 21st century. Companies that don't tap into external knowledge production for the development of new products and services will find it very hard to compete [5]. The Internet today represents at least 2.1 % of the US GDP and the success of Web 2.0 is based on the capacity to attract masses of users who create a world of social relations underpinned by the innovation platforms made available by companies. Web 2.0 is a winning model for investors, since it harnesses, incorporates, and valorises the social and technological activities of users [6]. New digital ecosystems are able to harness developers' and users' creativity by allowing them to create their own applications and contents by building on previous innovations, following the open source development model [7]. However, more and more often, the so-called social models are, on the contrary, based on closed and proprietary standards that tend to exploit the network effects by locking in customers, without giving them the choice to manage their communication devices and link social data across platforms. The most successful business models in the 'freemium economy' are based on *personalisation* [8] that consists on exploiting users' interest graphs through collective filtering algorithms to deliver targeted advertising and recommendations for services and products subsidised by the advertising industry. This model certainly poses threats to the current privacy and data protection legislation in Europe [9]. Moreover, it doesn't seem to be sustainable to harness free information and activities from users at a moment of serious economic and unemployment crises throughout Europe. If we want to bet on innovation as a possible way out of the current crisis, we need to bet on creating jobs for future generations and economic opportunities for European SMEs in the digital economy, thus contributing to solving Europe's current and future societal challenges.

Europe today is facing a great challenge in rebuilding a competitive, sustainable, and smart system based on investments in advanced digital technology, research, and education to maintain material and immaterial infrastructures and improve citizens' lives. In today's knowledge-based and services-led economy, cities have emerged as the nerves of economic development. Cities are increasingly viewed as the catalysts of innovation, enhancing not only their surrounding regions, but their nations as a whole. Due to the impact of the Future Internet on the life of the citizens, cities and regions should be fully involved in the process of governance related to the deployment of future Internet infrastructures and Internet-enabled services, especially public services. They represent a critical mass, able to scale up and reuse new applications and services developed across Europe. Yet, to date, open innovation methodologies have been successfully applied mostly in the private sector. However, betting on open innovation and the use of social networking platforms to improve public services can be a key strategy for the public sector at a moment of budget constraints and financial crisis. Cities can thus become orchestrators of

innovation by engaging and mobilising citizens' creativity and business talents, and thus producing *digital commons for Europe.* The proposed vision is to facilitate the creation of a *bottom-up open innovation ecosystem* that can exploit the European added value in the digital economy. The innovation ecosystems should be 'digital', meaning that any data must exist in binary form and in standardised and open formats so that it can be aggregated and analysed in real time by the public. Digital ecosystem innovation focuses mainly on the data 'mash-up' process, which synthesises new information by connecting, reusing, combining, and semantically aggregating and elaborating disjointed information extracted from a plethora of sources, in particular information generated by users (e.g. through social networks), accessible public data, or captured from sensors (Internet of Things). 'Open' means that interoperable, customised, and modular services and applications can be built in a dynamic and flexible way, plugging into existing and future Internet infrastructures, thus favouring entrepreneurship and civic innovation. An 'Ecosystem' means that there is an interdependent and dynamic constellation of living organisms acting within a global socio-economic environment. The ecosystem metaphor emphasises the need for a holistic and *multi-stakeholder* approach that Europe should have towards innovation. The challenge for Europe is in creating a new framework for collective action and awareness, going beyond tasks that IT is already good at doing such as data aggregation, sensing, measuring to the more complex aspects of social and collective intelligence. The question is how to engage key constituencies of the Future Internet and how to integrate the non-technology elements, such as social relationships, governance models, social and juridical norms into the proposed strategy in order to effect the necessary societal change.

Acting smart is indeed a complex process that needs the engagement of all actors in the innovation chain and that demands the integration of multiple elements: a coordinated economic development strategy at local, regional and national level in order to achieve inclusive, sustainable and smart growth; multidisciplinary research and innovation systems; open internet ecosystems that allow the integration of interoperable customised services; and strategic urban design integrating the know-how of urban planners, designers and architects. Within the European 2020 strategy for smart, sustainable, and inclusive growth cultural diversity, the variety of European political systems, greater cooperation and lifestyle changes of citizens in Europe can be a driver for innovation. Smart Cities and Smart Regions should provide a wide range of opportunities for ICT businesses (in particular SMEs), technology suppliers, user industries, and end-users to compete at the European level and build cross-European partnerships that can emerge globally. The challenge for Europe is thus to determine the particularly European added value that can stimulate actual innovation and fair competition and so, in the long run, overtake monopolistic innovation models, while, at the same time, addressing societal challenges. The European Commission together with local and national governments should put forward a holistic future Internet strategy that addresses together the technical, social, regulatory, and business aspects as well as investigating the impact that cloud computing will have on the management of critical information infrastructure and citizens' data. European distributed innovation should be the basis for a sustainable economic model underpinned by open architectures and open standards for Internet-connected environments that allow interoperability, governed privacy, data portability and social ownership of the digital commons. This will, in turn, foster entrepreneurship, enabling the creation of smart, interoperable services and applications by many potentially unforeseen European actors, including the tremendous potential value in sectors currently ignored by the US model, such as the public sector, SMEs, and civic innovation. This strategy could create jobs and opportunities for the new generation of digital creators and social entrepreneurs. Furthermore, the architecture of the Future Internet, like the architecture of smart services and Smart Cities that will be built on it, carries important political consequences. Following the process of Internet governance carried forward by the UN (WSIS), all Internet stakeholders must be involved in the definition and evolution of a future Internet architecture underpinning Smart Cities and Regions.

THE FRAMEWORK: current and future Internet

The Internet is a critical infrastructure that pervades all aspects of people's lives, a nervous system for society. The Internet is a catalyst for creativity, innovation, and collaboration, enabling people to interact from everywhere and access terabytes of data with a simple click. Soon there will be more than 50 billion devices connected with a diverse set of services and this kind of usage takes the Internet well beyond the design point for the original technical architecture. It is therefore time to undertake a fundamental redesign of this infrastructure and a portfolio of EC-funded projects and activities in FP7 are already doing this. There is a need to re-examine the underlying technical, business, and

regulatory frameworks, since these frameworks could become barriers to innovation. But also there is a need to maintain the Internet as an open, universal, neutral, and interoperable technological platform. I will propose here a synthetic model that can help us understand the evolution of the Internet ecosystem (see Figure 1) and to encourage a productive conversation on possible models and strategies for Europe to exploit the technological and commercial opportunities in the digital economy, while fostering societal innovation. I will briefly describe the presented framework, suggesting that a new model of the Future Internet for Smart Cities and Regions is needed, which involves an integrated view of what the European Commission wants to achieve in this field. Future Internet service infrastructures, such as that encompassing all the technological components and layers outlined in the EC FI-PPP programme have to be conceived as following a holistic approach addressing not only the technological requirements, but also regulatory, social and business issues. Clear requirements, such as the governance structure advocated in this paper, should be required. Surely, the central aspect to be able to make strategic decisions will consist of a detailed analysis on the fast changing economic value network, which is cutting vertically across all the outlined layers and that in the last 5 to 10 years has been moving up to the second and third layer (data-driven applications supported by the advertising industry and managed in proprietary cloud platforms) where the value added reside and where new dynamic and innovative companies are emerging [10].

So far innovation and the growth of the Internet have been fuelled by network neutrality and fair access ensured by open and transparent protocols. Internet principles, such as network neutrality, equitable service, and peer-to-peer architecture, were crucial in building a universal, open and distributed infrastructure that fostered innovation and widespread economic growth. The evolution of the Internet over the past few years has fostered the growth of a handful of new innovative technologies and applications that emphasise user creation of content and wide participation. In recent years, popular social network sites (SNS) such as

Figure 1. Future Internet ecosystem for Smart Cities

Facebook, LinkedIn, Youtube, as well as Wikipedia and micro-blogging services are multiplying the number of users, applications, services and the amount of Internet traffic generated, giving rise to the phenomena named Web 2.0, which describes the way in which companies use the Web as a platform to *harness collective intelligence*. Today, digital business innovation focuses mainly on the development of data-driven services, web and mobile applications. The core business model of the most competitive digital ecosystems is based on firms' ability to extract value from social data and user-generated content through *data mash-up* processes and collective filtering algorithms. Companies created goal-oriented and personalised applications that *mash-up* information and knowledge in order to provide customised services to customers. In this way, they were able to identify innovative business models to create differentiation, capture value and increase profits from user-generated content. This process (that tightly integrates innovation in business and technology) was mastered by a very small group of US-based companies (Google, Facebook, Apple, Amazon, EBay), which, in turn, changed the topology of the network and of the intangible value creation by fostering the rise of natural monopolies and dominant positions. Since the global economy is increasingly based on the management of knowledge-intensive services underpinned by digital networks, we risk that knowledge and information is locked-in by dominant players within walled gardens and proprietary ecosystems. Currently, we are viewing various 'ecosystem battles' amongst a few companies that fight to control market shares especially with the expanding influence of mobiles and apps. Such players are able to seize externalities resulting from economies of scale and network effects that generate increasing returns associated with lock-in [11]. There are increasing risks that the distributed, scalable and open architecture of the Internet will evolve towards a conceptually-centralised data infrastructure based on closed and proprietary standards [12], unaccountable governance and revenue models in which big US companies are capturing monopolistic rents due to large network externalities. The latest trend, indeed, points towards concentration of actors, vendors and data lock-in, even sometimes illegally selling users personal data to third parties, putting the onus on users to opt out, rather than asking them if they want to opt in. Furthermore, the new business models in the Internet ecosystems based on 'personalisation' are supported by the advertising industry, incorporating the users in the marketing process. Personal social data is the new profitable market. Users' 'social graphs' and 'interest graphs' are harnessed and sold to advertisers to extract and 'mine' targeted market information for interactive marketing. This model exploits users' personal information to deliver targeted advertising, service and social recommendations through collective filtering and semantic data analysis. This trend is very clear in location-based services and in lifestyle apps where the geospatial information of users and sensitive information about users' and their social networks' tastes and interests are analysed and aggregated to create personalised offers. If such collective filtering is not efficient and transparent 'no crowd will be wiser than a herd of sheep', resulting in a 'filter bubble' [13]. Certainly users of these ecosystems don't own their data, but they rent their own data from Facebook and other free social networking services. And there are other dimensions, such as the digital tracks that users leave around the Internet with their searches, purchases, uploaded content, and conversations. This *data exhaust* is the personal data companies collect about what products their customers buy and how they use digital services. In this way, businesses are acting as brokers of personal and sensitive data that are manipulated through privacy infringement mechanisms. With the announcements of Facebook's 'frictionless sharing' and the various cloud services, people are showing growing concerns about these commercial practices, urging authorities to update privacy and trust regulations. Locking in users' social data is creating a new 'data enclosure' that consists of capturing users' co-created value through network or device lock-in, segmenting the network in other areas and overruling the network regulations by imposing their governance models. This segmentation poses threats to the future of the Internet, hindering the free, open, and neutral Internet that allowed disruptive innovation to emerge bottom-up.

Moreover, the business models described above don't seem to be sustainable for the European economic system that consists of 99.6 % of SMEs and has a very different equity and venture capital market compared to the US. There are major differences between European and US economic structures, especially regarding the absence of big firms that innovate at the data layer and the structure of venture capital network to fund technology start-ups. This situation will make it quite difficult for Europe to catch up with US innovation, especially if the European strategy favours incumbents. For instance, European telecom operators are having a hard time to entering and innovating in this market, trying with little success to become competitive in the data and application layer where business opportunities reside. In Europe, there are other actors that should be supported in order to drive innovation. In the first

place, cities and regions are closer to citizens and SMEs and they can more easily engage them in the innovation process, applying methodologies, incentives and policies to facilitate their involvement. This will certainly maximise the societal impact of innovation and it would make sure that services deployed answer concrete local needs and demand. This process will create local capacity, exploiting the creativity of European cities and regions and building digital literacy, skills and development. Due to the impact of the Future Internet-enabled services on the life of citizens, cities and regions should therefore be fully involved in the process of governance related to the deployment of digital infrastructures and Internet-enabled services. They represent a critical mass, able to scale up and reuse the new applications and services developed. Currently, open innovation methodologies have been successfully applied mostly in the private sector. However, betting on open innovation and the use of social networking platforms applied to the use of public information and public services can be a key strategy for the public sector at a moment of budget constraints and financial crisis. The European added value in the digital economy can be exploited if innovative mechanisms are in place to facilitate co-creation and fair redistribution of the fruits of collective intelligence rewarding creators and talent, since innovators and citizens need to be offered something of equal worth to what they are giving away. Public authorities can thus become orchestrators of innovation by adopting open innovation methodologies that mobilise public resources, citizens' creativity, and entrepreneurial talent. Open, interoperable platforms and ecosystems are necessary for innovating in Europe. Future Internet infrastructures are a strategic opportunity for Europe to foster innovation and entrepreneurship by giving companies of all sizes the opportunity to affordably access data and computational resources so that they can create disruptive business models, empower users, and speed up ICT innovation across the entire EU. Real-time data can then be used to unleash and redistribute new sources of economic value, provide new insights and make better decisions to improve human behaviours and policies.

In the following session, I will focus on what I perceive to be a crucial missing building block in the digital ecosystems, which is building a new governance structure for the Future Internet in order to set up the rules of the game and negotiating the process that allows open innovation to happen amongst key constituencies of the Future Internet. As a constructive answer to the growing public concerns, public authorities need to explore how collectively produced resources and data can be harvested and opened up, allowing developers and the public at large to turn data into useful information and applications available to everyone to actively engage with their environment and manage collective issues.

THE RULES OF THE GAME: new societal agreements, and open standards for the Future Internet

The architecture of the Future Internet, like the architecture of smart services and smart cities that will be built on it, carries an important political meaning, since we are talking about critical future infrastructures managed and used by multiple stakeholders. The Digital Agenda emphasises the need to adopt *open standards and interoperable solutions* to fully exploit the development of existing and emerging technologies. In the Digital Agenda are outlined specific actions that are crucial to ensure that common open standards, data protection, and security requirements are met. These open standards should be at the core of the technical infrastructure. Open standards should have an adequate legal and governance backing, such as the Royalty-Free Patent Agreement of the W3C [14]. Open standards are essential to deploy interoperability between data, devices, services, and networks. Data accessibility and common standards enable the automation of the environment since at the heart of the new Internet of Things paradigm is the principle of connecting environments, a shift in focus so that sensor data is accessible to European citizens because people aren't passive consumers of the data, but actively engaged in producing it. These open standards should not be an option, but at the core of the technical infrastructure. In detail, as also specified by the W3C [15], these open standards should enable the following:

- **Open accessibility**: Users of the Internet ecosystem include the independent application and service providers who have the right to using the FI infrastructure (including both data in a raw and processed form, as well as access to computing resources) and applicable data thereon should be guaranteed. Any privileged access provided to the owner/managers of the infrastructure would alter free competition. All functionality must be exposed by way of REST APIs (REpresentational State Transfer Application Programming Interfaces) that expose data using open standards. For all levels and kinds of access, user data and metadata should be represented in open formats such as XML and RDF (which includes Linked Data and SPARQL end points) [16].

- **Data portability and interoperability**: By using open standardised formats for both private and public data, the FI preserves the right of data portability and prevents lock-in, therefore allowing for innovation in the wider EU economy based on the Future Internet. Users must be able to come (no barriers to entry) and go (no barriers to exit) regardless of who they are (no discrimination) and what systems they use, and therefore the FI should also deploy not only open standards but *standardised identity management*. Innovation depends on *interoperability*, meaning that devices and services produced and delivered by different companies can communicate with one another. The Internet is the best example of the power of interoperability. Its open architecture has given billions of people around the world access to information, devices and modular applications that talk to one another. Today, mobile devices with always-on Internet connectivity are becoming widespread. In this new context, interoperability is especially important. User data is moving more and more into the 'cloud' and people are getting their music, videos, and applications digitally. Common standards are therefore very important in Internet ecosystems for digital contents and products. Standards will enable new business models for cooperation between multiple stakeholders such as companies, public authorities and citizens to develop meaningful technologies, since standards in the future Internet scenarios are there to mediate social relationships between people. Therefore, *citizen-authored standards* such as Open Street Map (OSM) should also be supported, since empowering citizens can lead to greater innovation [17]. Cooperation amongst different standards setting bodies will be fostered by the European Commission through Innovation partnerships, as outlined in the Innovation Union flagship.
- **Proper licensing**: Public data should be made available under an open knowledge licence or placed into the public domain, so that innovators can build data mash-ups on top of a distributed data infrastructure (technological neutrality) without fear of licensing issues. Supporting vendors must therefore cooperate on standards implementing those that exist and collaborating via an open process to develop new legally-binding open standards. Private data should also have its privacy and policy dimensions encoded using open standards and the correct licensing, as well as clear requirements for 'how-to' access this data and determine its ownership, both by vendors and end-users This should include the right to remove data by its creators. Ensuring *data security and data ownership* and protecting users' privacy is crucial in the described context. This is why the Digital Agenda sets the need to rewrite the *data protection regulatory framework* to ensure privacy, trust and protection of personal data. This should prevent any unauthorised collection, processing and tracking of personal information and profiling, including consumers' preferences, medical and health records, etc. European citizens will in this way be empowered to interact with data and use it to actively engage with their environment. In order to achieve these objectives 'do not track' technologies should be implemented in order to give users more control over their social data and sensitive information, to make it easier for businesses to innovate on top of the infrastructure. This will boost the opportunities for developers, designers, application creators and device makers to come up with innovation models of recording and analysing user preferences that respect users' rights and privacy. For example, open standards are crucial in social networking to avoid the hijack of users' accounts as exemplified by how FireSheep can hijack Twitter accounts [18]. Technically, encouraging the use of TLS (HTPS), the use of virtual private networks, fixing the certificate authority system, as well as providing encryption to end-users should all be on the agenda. To sum up, the Future Internet architecture should include privacy and security in the proposed technical infrastructure by design. This should involve both using policy-aware frameworks that prevent private data from being illegally accessed. Also, work that makes privacy implications understood by citizens, such as Privacy Icons by Mozilla [19], should be deployed as to avoid user backlash over privacy issues. In order to prevent 'leaks', adequate cryptographic public-key-based infrastructure and strong authentication technologies should be employed on the Future Internet, looking towards work like Google's Nigori Protocol for storing data privately and securely in the Cloud [20].

Another crucial aspect is *the governance of the Cloud and of the Future Internet* that are recognised to be a priority at all levels by policy and industry but there are no concrete activities at this stage to address them. Without addressing them, the Future Internet will suffer from a lack of trust over issues of privacy and security caused by users' and businesses' concerns about the security and privacy of data and applications moved into the Cloud. These concerns are motivated by factors like the

vast amount of personal data being processed, the need for guaranteed levels for security, privacy and accountability (which are, compounded by the inherent lack of clarity on jurisdiction and political frameworks), and the need for an enabling infrastructure for wide EU innovation. Unless governance is holistically addressed, the increased level of vulnerability will affect both consumers and public and private organisations, with a damaging effect on the generation, take-up, and diffusion of new Internet services, risking putting the EU behind in innovation. If governance is imposed only by the US companies that dominate the Cloud services market, without a clear strategy for a European Future Internet Cloud, there are risks of cutting off potential new entrepreneurs by locking them out through a combination of IP and lack of standardised access to the Future Internet, and so locking out the crucial innovation that will allow Europe to compete in cloud computing with the US. By providing an alternative strategy for the EU Future Internet created by a public-private partnership but available to all citizens and entrepreneurs across Europe, Europe can develop its own path to innovation and independence from US-based Cloud companies. To avoid vendor lock-in, industries should provide clear open royalty-free standard to import and export data as well as open interfaces to cloud services, since standardisation activities are currently not properly specified given sufficient importance in the present FI effort. The process of standards and formats setting should be negotiated with authorised standardisation bodies such as ISOC/IETF, the ITU-T Focus Group on cloud computing, and the W3C, in order to negotiate a standardisation strategy with worldwide cloud computing communities (e.g. research institutes, forums, academia), while carefully listening to the use cases and requirements of EU actors such as SMEs, governments, and end-users. These standards should be deployed with the goal of enabling wide innovation through the EU economy based on the Future Internet infrastructures.

THE KEY CONSTITUENCIES: producing urban digital commons to unleash European talent

A network of connected cities and regions is essential to establish a model for European sustainable economic development. In fact, the diffusion of Smart City interoperable services in a regional context helps: reducing the digital divide in Europe increasing the availability/use of open source and open access solutions and the development of open standards, legal and regulatory frameworks, the sharing of knowledge and modular applications amongst European cities and regions, the creation of collaboration processes and services co-production at European level, fostering entrepreneurship, creativity and innovation. Cities are the backbone of the European economy and have a strategic function in the knowledge-based global economy characterised by global information networks but also by the renewed importance of the spatial dimension in defining the new production processes, and the material and immaterial infrastructures that make global economy possible. Urbanisation is growing at a very fast speed. Half of the global population already lives in cities. By 2050, that number will rise to 70 %. The most competitive global cities have a GDP up to five times higher than their share of national population and the top 100 cities in the world today account for over 30 % of global GDP [21]. Well-being and good living conditions are very important factors influencing people's decisions to live in cities and cities build their core capabilities around the need to attract and retain people and talent. The rapid development of ICT contributed to the attraction of knowledge workers, skilled labour forces and entrepreneurs in cities that have stronger technological capabilities, advanced network infrastructures and access to ICT. At the same, time these global transformations created a new geography of centrality and marginality, which is resulting in growing divides existing both in advanced and emerging economies [22]. The unequal distribution of resources and strategic activities between the global cities at the centre of financial and international business and the rest of the world is growing. This means that the rapid growth of the financial industry and knowledge-intensive services generates new qualified and specialised jobs in the field of management, finance and knowledge production but also generic low wage jobs, widespread exploitation and unemployment. This situation gives rise to new economic and social imbalances at a global level, including within global cities and regions that need to be overcome.

Furthermore, all cities are facing many challenges such as resource constraints, pollution, traffic congestion, energy over-consumption, infrastructure maintenance, public service delivery, etc. Every citizen in Europe relies on the availability of common resources and utilities such as water, waste removal, or electricity as well as transportation in order to carry out their daily activities. Digital technologies are stimulating new theoretical investigations into the future of services with real-time aggregation of urban actionable data. The urbanisation of technologies are a clear trend, since over three billion people live in cities and four billion people use mobile devices, creating a pervasive global network of wireless sensors. Some

30 billion radio frequencies identification tags are produced globally. The proposed dominant vision shows us the physical world itself transforming into an information and knowledge system forming a huge *ecosystem of devices*. The Internet will connect 10 billion things/objects that are becoming embedded with sensors and having the ability to communicate with other objects (The Internet of Things, IoT). The major application fields for the IoT are the creation of smart environments/cities and self-aware things for climate, food, energy, mobility, and health applications. The proposed vision of a smart city can be reimagined as a platform to deploy tracking and sensing devices, for real-time monitor and control. People, places, and objects in the city will be instrumented with sensors that stream and measure data about real-world activity. These data streams can be location reports from objects, people, and cars, and environmental measurements from sensors embedded in buildings or in the streets and other sorts of feeds. Urban activity will be then embedded in software, creating new 'black box' control systems [23]. The underlying hypothesis of this model is that people will change their behaviours based on personal analytics visualisations and everyday objects will become social connected tools. However, we know that the process for changing behaviours is much more complex, and the decision regarding which data to collect and how to classify it, is already a highly political choice. Data generated by the city are interpreted by software algorithms and actuation devices through normative processes, where subjective values, legal regulations and power relations are inscribed in the code [24]. Smart Cities present novel challenges to our social, cultural, economic, and legal understandings of the public space; we need to build new societal conventions and juridical standards to account for their implications and to collectively exploit their benefits [25].

Major criticisms have been raised concerning some of the most advertised Smart Cities projects such as Masdar City in the United Arab Emirates, PlanIT Valley in Portugal and the IBM Command and Control Centre in Rio de Janeiro. Those are cities built from scratch, 'greenfield sites' conceived as perfectly functioning cities built with a top-down approach, but designed without understanding people and social life. These projects could lead to proprietary urban operating systems that result in a concentration of actors and citizens' lock-in, together with pervasive targeting of consumers through sensing technologies, thus building a *panopticon* of institutional control and surveillance. The challenge for Smart Cities is to answer these criticisms by constructing technologies responsive and accessible to the people whose lives they affect. The value of networked technology is in access to one another and deepening social relationships, not just access to data or information. Meaningful social life is the value of the system. Smart Cities should be open and flexible systems that adapt to social changes and institutional innovations. Smart Cities should apply human-centred design approaches to the specific problems of the urban environment. Many initiatives are focusing towards developing methodologies to involve users in the design process of the next generation of public infrastructures and services, therefore building common ecosystems for interoperable Internet-based services and looking at the city as an open-source civic innovation platform. 'Connected Cities' will help people and organisations to harness the potential of emerging technologies in order to develop innovative systems and services that will improve people's life. At a technological level, most of the existing 'smart' technologies, such as automatic meter reading (AMR), wireless sensor networks (WSN), RFID, and actuators, are used in isolation or restricted to particular applications. A common framework to facilitate and provide services across the whole EU and in different domains should be specified, advancing the state of the art in this field. Furthermore, processing urban information in real time and making it publicly accessible can enable a transformation in the use of public resources, together with improving public services such as mobility, transports, and health systems, therefore addressing societal challenges.

Mobilising the common wealth of software and telecom infrastructures (Code for EU, Bottom-up broadband and FTH, Apps4EU), together with increased public investments will increase the competitiveness of European cities and regions [26]. Local and regional authorities can thus be catalysts for innovation, coordinating urban innovation strategies and funding scalable pilots in real-life contexts bringing together European developers, designers, entrepreneurs, and end-users. There are many European initiatives going in this direction such as the EuroCity network, which unites the local governments of more than 140 large cities in over 30 European countries [27], the European network of Living Labs facilitating users' involvement in the innovation process [28], the EIT ICT Labs, an instrument for promoting stakeholders' collaboration in research and innovation [29], and the Smart Cities initiatives funded by the European Commission [30] [31]. It is therefore clear that all stakeholders' have to be involved and profit from Smart Cities innovations (citizens, utility and service

providers, city and regional authorities and society as a whole). Even if, at a later development stage, smart social platforms in cities and regions become a self-organising and self-sustaining system, at the beginning, its implementation will need a clear systemic approach and public investment. In such a framework, Smart Cities and Regions can play a key role in favouring interactive learning and knowledge-sharing, improving the regional potential in terms of the creation of new knowledge and skills, and, ultimately, in terms of economic development, well-being, and job creation.

Conclusion

To sum up, future Internet service infrastructures on which future Smart Cities and Regions will be built must be conceived following a holistic approach addressing not only technological requirements, but also regulatory, social and business issues. The challenge for Europe is thus to determine the particularly European added value that can stimulate actual innovation and fair competition and so, in the long run, overtake the monopolistic US model based on the concentration of resources in the hand of few large companies while, at the same time, addressing the economic needs of SMEs and societal challenges in Europe (see in the picture, the third layer specific domain — smart services in health, environment, education, transport). National governments and the European Commission should put forward a holistic future Internet strategy that addresses together the technical, social, regulatory, and business aspects as well as investigating the impact that cloud computing will have in the management of critical information infrastructure and citizens' data. The European political, cultural and economic model is based on diversity, subsidiarity, collaboration, and pervasive creativity across all of society. Therefore, European distributed innovation should be the basis for a new smart and sustainable economic model underpinned by open architectures and standards for Internet-connected environments that allow interoperability, governed privacy, and data portability. In order to reach these goals, Europe needs the first and second layers of constituencies and regulations (see Figure 1) to be structurally coupled with the technology and business infrastructure layer and the application layer. In order to foster entrepreneurial innovation on smart services and the IoT, Europe needs to have a technological infrastructure with common open specifications and reference implementations around technical standards, trust, privacy and security and business regulatory frameworks. This will in turn foster social entrepreneurship and civic innovation, enabling the creation of smart, interoperable services and applications by many potentially unforeseen European actors, including the tremendous potential value in sectors currently ignored by the US model such as public services, SMEs, and end-users. The architecture of the Future Internet, like the architecture of smart services and Smart Cities that will be built on it, carries important political consequences, influencing the future of the European economic competitiveness model. Following the process of Internet governance carried forward by the UN (WSIS), all Internet stakeholders must be involved in the definition and evolution of a future Internet architecture. Unless governance is holistically addressed, the increased level of vulnerability will affect both consumers and public and private organisations, with a damaging effect on the generation, take-up, and diffusion of new Internet services, risking putting the EU behind in innovation. By providing an innovative and ambitious strategy for the EU Future Internet created by a public-private partnership but available to all citizens and entrepreneurs across Europe, Europe can develop its own global path to innovation.

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CHAPTER II

Trends and country reports

2.1 Innovative cross-border eSolutions and eServices development in the Danube eRegion

Countries in Central Europe positioning themselves as a cross-border eRegion

The first idea about the cross-border ICT-based eCommerce in Central Europe was presented by the Slovenia Delegation of the Information Society Technologies (IST) Committee of the European Commission, Directorate-General for the Information Society and Media in Brussels on 20 September 2000. It was proposed that regional development exploiting eTechnologies may be relevant to the countries preparing for European Union membership. After that, the Department for International Cooperation, Ministry of Education, Science, and Sport, Republic of Slovenia sponsored a meeting based on that idea in Ljubljana on 15 November 2000. A decision was made to conduct a survey on issues in cross-border eCommerce as perceived by the executives of selected organisations in Slovenia [1].

Triggered by the meeting, two workshops were organised the following year on organisational prototypes of cross-border business-to-business and business-to-government eCommerce in Central Europe. The goal was to prepare for potential development projects in the region and related calls for research projects. The first workshop was sponsored by the Hungarian Research and Development Division, Ministry of Education in Budapest, 27 and 28 March 2001. The second was sponsored by the Slovene companies Intereuropa and ATNET in Koper on 31 May 2001.

The workshops led to an executive sellers and buyers meeting on regional cooperation in eCommerce development taking place at the Bled eConference on 25 June 2001 [2]. The purpose of the meeting was to bring together business and government executives involved in cross-border transactions, business process facilitation and simplification, and ICT providers. The objectives of the meeting were to encourage top executives to conduct business electronically; to motivate the use of the latest eTechnologies, and to prepare proposals for the joint cross-border eCommerce projects in the region of the neighbouring countries. The meeting was the first in a series of the business and government executive meetings on cross-border eCommerce development taking place in Slovenia in June and November for several years.

On 4 March 2002, a workshop, 'Building A Mega Portal For Regional Economic Development', was held in Ljubljana. It was sponsored by the Electronic Commerce Center of the University of Maribor, Faculty of Organisational Sciences and Government Centre for Informatics, Republic of Slovenia. There were over 40 participants, representatives of business, government and educational community in the neighbouring countries. Involved were the researchers of the University of Rijeka, Croatia; University of Graz, Austria; University of Trieste, Italy, and the University of Maribor, Slovenia, all sharing interest in a cross-border regional eCommerce development. This workshop triggered the creation of ALADIN — **AL**pe **AD**ria **IN**itiative Universities' Network. ALADIN was created by the signing of a letter of intent by the rectors/vice-rectors of four universities in the region on 23 November 2002 [3].

The term 'eRegion' was coded in Central Europe at a meeting of the diplomats sponsored by the University of Maribor and the Ministry of Foreign Affairs, Republic of Slovenia on 9 March 2004. The Ministry of Foreign Affairs hosted an informative meeting with the economic counsellors of the embassies of central and south-eastern European countries, the USA, China and the delegation of the European Commission to Slovenia [4]. The purpose of the meeting was to present the initiative to develop an eRegion in the area of central and south-eastern Europe and to promote the 17th International eCommerce Conference, 'eGlobal — A Network for the Development of an eRegion', to be held in Bled, Slovenia, from 21 to 23 June 2004. Representatives from the University of Maribor's Faculty of Organisational Sciences, and those from the Slovenian economy who offer systems for cross-border connections, acquainted the economic counsellors with Slovenian initiatives in the area of eCommerce [5]. In this context, they outlined the 'eRegion' initiative, which connects the

ALADIN group of universities (eCommerce ALADIN — ALpe ADria INitiative). Leading Slovenian institutions and companies, such as the Port of Koper, Slovenian Railways, the Institute of Health Insurance of Slovenia, the Slovenian Geodetic Institute and the Insurance Association outlined their respective views on the significance of developing an eRegion.

Members of ALADIN shared ideas on eRegion development and collected information on similar cross-border activities elsewhere in the EU. A triggering source of information was the conference on ICT-based cross-border region development sponsored by the European Commission, Directorate-General for the Information Society and Media and the Directorate-General for Regional Policy, in Gothenburg in November 2005 [6]. Ten new EU Member States have been invited to exploit the experience of, and cooperate with the Nordic countries. The Slovenia's delegation to the conference was chaired by the Minister for Local Self-Government and Regional Policy [7]. In the delegation, there were 15 representatives of the government, business and academia who have received first-hand information on the successes and challenges of the cross-border collaboration of the Nordic countries. The messages were extremely well received.

To organisations in Slovenia, the eRegion concept became very obvious and realistic. Encouraging was information on the preparations of the EU strategy for the Baltic Sea Region development [8]. The meeting with the President of the Committee of the Regions and members of the Bureau of the Committee of the Regions was organised in March 2008 [9]. During Slovenia's presidency of the European Council, a 'Slovenia Living Lab Event' was organised in Brussels in April 2008 by the Government of Slovenia in cooperation with the European Commission and the European Network of Living Labs — EnoLL [10]. In October of that year, Slovenia presented a cross-border eRegion concept at the open days of the European Commission, Directorate-General for Regional Policy [11]. It was followed by the Nordic-Slovene meeting on innovative cross-border eRegion development in February 2009 [12].

In recent years, ALADIN has been very much involved in various eRegion development activities as presented in list No 1.

List No 1
Activities of ALpe Adria universities INitiative — ALADIN in recent years

- Business, government, municipality and diplomacy executive meetings on the innovative cross-border eRegions: Baltic, Central Europe, Mediterranean, Nordic, South-East Europe [13]
- Cross-border disaster relief eManagement in the eRegion [14]
- eInvoicing in the eRegion: Meetings, Panels, Workshops [15]
- Bled eConferences [16]
- International workshops on the Living Labs in the innovative cross-border eRegion [17]
- The Merkur Day, undergraduate and graduate students' eConference [18]

In 2009, the meaning of ALADIN evolved into **AL**pe **A**dria **D**anube universities **IN**itiative. The universities involved are trying to contribute to the efforts of the European Union in supporting the Danube Region to accelerate its development [19]. Currently, in ALADIN there are 17 universities in 12 countries: Graz, Austria; Medical Graz, Austria; Mostar, Bosnia and Herzegovina; Sofia State L&IT, Bulgaria; Dubrovnik, Croatia; Rijeka, Croatia; BU Prague, Czech Republic; BW München, Germany; Trento, Italy; Trieste, Italy; Corvinus Budapest, Hungary; Politehnika Bucharest Romania; Novi Sad, Serbia; TU Košice, Slovakia; Maribor, Slovenia; Primorska, Slovenia; St. Gallen, Switzerland. ALADIN's activities directly related to the EU Strategy for the Danube Region are presented in list No 2.

List No 2
ALADIN's activities related to the EU strategy for the Danube Region

- Meeting of ALADIN at the Corvinus University of Budapest in March 2010 [20]
- Position Paper of ALADIN on the EU strategy for the Danube Region in April 2010 [21]
- Two meetings of the European Initiative 'Danube Region on the eSilk & eAmber Roads' in the European Parliament in 2010 [22]
- Danube eRegion Conference — DeRC in Ljubljana in September 2011 [23]

The author has published on general aspects of eRegion development in 2007 [24] and on a relevance of a cross-border e-regions to a competitiveness of the nations in 2009 [25].

Based on the activities described, the following lessons can be shared.

- It took 10 years from an academic initiative on a need for an accelerated cross-border collaboration to an eRegion concept as a defined territory and visible research and development topic.
- Cross-border eCollaboration is more difficult and time-consuming than anticipated.

- Numerous actors have to play an active role in the effort: national and local governments, businesses, ICT providers, universities.
- Cross-border eCollaboration is a complex task since many entities are involved, there are many interactions among the entities, and several relations are inter depended.
- eServices are of growing interest to the organisations in the region and ICT is more and more considered a trigger of a faster economic and social development.
- Membership of the eLiving Lab — a first wave Living Lab [26] in the European Network of Living Labs, EnoLL [27] — was an important trigger of, and contributor to, numerous activities in the country and in the region.
- Membership of the Open Innovation Strategy and Policy Group — OISPG [28] has contributed much to learning about open innovation and best practices in Europe.
- European Union Strategy for the Danube region is a major opportunity and a challenge for the countries in the region to eCollaborate in order to increase their competitiveness and contribute to a higher quality of life.

Inter-Municipality Initiative: Cross-border eCollaboration in the Danube eRegion

In June 2007, Slovenia's initiative 'Innovation for Life Quality — Slovenia Living Lab' was created with the following objectives [29].

- Focusing on few research and development projects of the highest relevance to the country.
- Gaining practically useful high added-value solutions by pilots implementation.
- Providing for interoperability of the existing technology platforms.
- Improving a long-term-oriented collaboration with the most developed countries.
- Obtaining political support for the initiative accomplishment where, and when the government support is needed.

Based on the spirit of the Slovenia Living Lab as a countrywide concept, a more specific initiative was launched in Slovenia in February 2011: Inter-Municipality Initiative: Cross-border eCollaboration in the Danube eRegion [30]. Organisations in the initiative (see List No 3) are preparing for the expected calls for project proposals by developing prototypes in a coordinated action. A natural entity of the effort is a municipality with an executive mayor's level involvement. In an eMunicipality, special focus is devoted to SMEs. Experimenting is an important component of the effort for which the universities are a convenient neutral environment.

List No 3
Inter-Municipality Initiative: Cross-border eCollaboration in the Danube eRegion

The Slovene organisations involved were:

- town municipalities (Ljubljana, Maribor, Murska Sobota, Novo mesto, Ptuj);
- neighbouring municipalities (Kočevje; Mirna, Mokronog-Trebelno & Šentrupert);
- tourist organisations (Bled Tourist Board, Cave Postojnska jama, Grand Hotel Union Ljubljana, Slovenian Tourist Board, Tourist Board Kranj);
- Regional Chambers of Commerce (Koper, Krško, Ljubljana, Maribor, Murska Sobota, Novo mesto, TRC Koroška);
- Regional Chambers of Craft and Small Business of Slovenia (Maribor);
- Development Centres (Kočevje-Ribnica, Novo mesto, University Development Center and University Incubator of Primorska Ltd., Koper);
- companies (Intereuropa d.d. Koper, Gorenje d.d. Velenje);
- organisers of major international events (Maribor 2012 Public Institute — European Capital of Culture, Maribor Festival, Radovljica Festival);
- IT providers (Bankart, Panteon Group Kranj, Postal Services of Slovenia, Realis Ljubljana, SAP Ljubljana, SRC Ljubljana, Telekom Slovenija);
- supporters — national administrations (Ministry of the Environment and Spatial Planning; Ministry of Finance; Ministry of Higher Education, Science and Technology; Ministry of Public Administration);
- National Assembly Deputies;
- institutes (Geodetic Institute of Slovenia, Ljubljana Urban Planning Institute, Urban Planning Institute of the Republic of Slovenia);
- universities (Maribor, Primorska, Dolenjska Academic Initiative).

Prototype development was accepted as a major methodology component of the initiative. The objectives of eSolutions and eServices developed as prototypes are the following: innovativeness, user-centricity, simplicity, low-cost accessibility, web sites connectivity, multilingual eSolutions and eServices, support to major cultural and sport events, support to cross-border eBusiness of SMEs, openness to the organisations in Slovenia and other countries, experimenting in the Living Lab environment. Prototypes as the results of the initiative developed in the period from April to October 2011 were presented at the Danube Region Business Forum organised by the Austrian Federal Economic Chamber in Vienna on 3 November 2011 [31].

Prototype as a component of open innovation

A prototype is an early sample or model built to test a concept or process or to act as a thing to be replicated or learned from (Wikipedia). A prototype is a basis for the development of a pilot. A starting point of a prototype development is a problem in which the stakeholders have an interest in solving. Living Labs as components of open innovation are considered operational vehicles for encouragement of cross-organisational, cross-disciplines and cross-borders cooperation.

A technology prototype is a new operational eSolution or eService. For example, 3-dimensional (3D) space planning, developed by an architect and technology provider as described below. It is distinguished from an organisational prototype by which we mean a new operational eSolution or eService in an organisational setting. For example, 3D planning implemented in a municipality. Or it may be an already proven eSolution or eService, like exchanging invoices in an electronic format, in a new organisational setting. For example, eInvoicing in a cross-border environment as described below.

Three of the prototypes presented in the Danube Region Business Forum are shortly described in the following text prepared by the prototype development coordinators. Finally, an observation on a relevance of the prototypes to the Danube Region development is presented by the chair of the 2011 Danube Region Business Forum.

Cross-border eInvoicing prototype

By Franci Bratkovič, Director, Chamber of Commerce of Dolenjska and Bela Krajina

The Chamber's activities are aimed at stimulating faster development of the information society with the goal of catching up with the technologically more developed regions. Therefore, we are always willing to participate in initiatives such as Inter-Municipality Initiative: Cross-border eCollaboration in the Danube eRegion.

As our experience shows, everyone knows what an electronic invoice is, but, to date, the eInvoice adoption level remains relatively low. Accordingly, the European Commission wants to see eInvoicing become the predominant method of invoicing by 2020 in Europe. We think that particular attention should be given to facilitating business transactions, especially for SMEs. eInvoicing enables improvements in efficiency and creates operational savings and contributes to the increase of competitiveness of enterprises.

Currently, the Chamber of Commerce of Dolenjska and Bela Krajina sends eInvoices to some 20 members, and is a recipient of eInvoices. We together, the participants already involved in the eInvoicing scheme, are the best promoters of eInvoicing and can help new users with our knowledge and experience. The intention of our prototype project is to promote eInvoicing between SMEs and budget users both nationally and between other countries. Our prototype group is composed by partners from four countries: Austria, Bosnia and Herzegovina, Croatia and Slovenia.

By stimulating the application of modern techniques and technology with this and similar projects, we contribute to the improvement and promise of continuous development in the quality of life, economy and tourism in the region.

3D planning information prototype

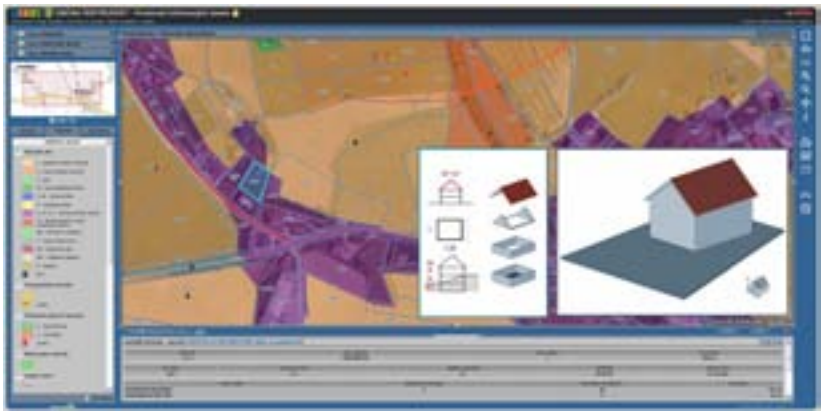
By Iztok Kovačič, Municipality of Šentrupert

3D planning information is a prototype project that has to do with space and architecture. It answers one simple question: What can someone build on a certain plot of the land? The answer to that question is usually a text document called planning information. It provides information on the permissible types of buildings appropriate for the selected plot of land. In addition to identifying protected and restricted areas, it also gives information about the spatial plan and the eligible use of land, together with permitted types of activities and works, as well as acceptable types of construction. The main goal of the prototype project is to convert all that text into visual information that we named 3D planning information.

3D planning information would be supplemented by multimedia material employing hypertext, 2D hypermaps, aerial photographs as well as 3D static and dynamic displays of terrain and buildings. The next step would include displaying examples of similar buildings that have already been constructed by interested developers.

The benefits of the prototype project would be to provide users (municipalities, local administrative units, citizens, planners,) with a simpler and more comprehensive visual display of planning information through a publicly accessible web application.

Figure 1. 3D Planning information prototype



The Municipality of Šentrupert has developed this prototype together with the collaboration of Realis d.o.o. and Geodetic Institute of Slovenia. Neighbouring municipalities of Mokronog-Trebelno, Mirna and Novo Mesto Urban Municipality together with the Chamber of Commerce of Dolenjska and Bela Krajina, SAP Slovenia d.o.o, Urbi d.o.o. US-Upravno svetovanje also joined this partnership and there are some optimistic projections that a few municipalities from Croatia and Bosnia and Herzegovina will follow. We also believe that this is one small step towards innovative collaboration of the different organisations that are dealing with urban planning and architecture. As we know, the growth of the human population is inevitable as we just recently reached the magic number of seven billion people. Therefore, it is very important how we manage the space that is left for the future generations. Based on cross-border collaboration, we could manage to properly and effectively plan the environment around us using this kind of prototype solutions.

Prototype cross-border eTourism — invitation to Danube and Alpe Adria Tourist Champions League

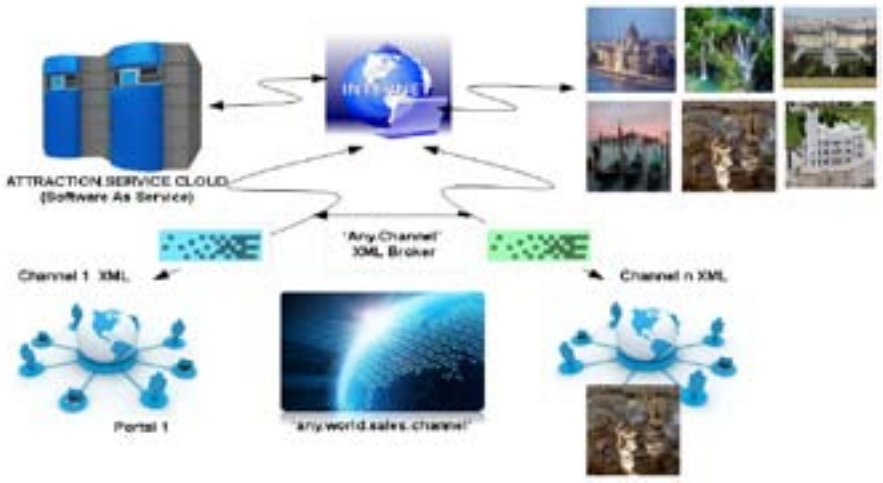
By Igor Blažina, Assistant CEO, Cave Postojnska jama

Tourism produces 10 % of GDP in Europe and Europe is planning to stay a top world top tourist destination. In Danube and Alpe Adria regions are several of the most visited world tourist destinations like Vienna, Salzburg, Budapest, Rome, Venice, Dubrovnik, Plitvice, Lipica, Bled and Postojna Cave. To overcome economic crises, it is necessary to cooperate and to use innovative and modern technologies. We need a modern ICT platform with innovative e-ticketing solution for online and 24/7 real-time tickets, packages and merchandise sales which brings new business standards B2B, B2C to tourist destinations, museums, events, festivals, culture institutions, sport clubs.

The ICT platform should be a multifunctional (promotion, marketing, booking, ticketing, accounting, data exchange, reporting, analysing, data mining), multichannel ticketing service (box office walk-up, mobile phone, automated kiosks, real-time Internet kiosk, ticketing agents, partner organisations, gas stations, etc), integrated with internal and external information environment, fast, safe, capable, durable, flexible, reliable, open system, easy to use and user-friendly, use vouchers as well as print-at-home tickets, integrate with automated tickets validation and access control and analytics tools with end-user-defined reporting, no time or geographical limits, real-time 24/7, with CRM (custom relation management) and measurable results of promotion. Added values for costumer are discounts on ticket packages, buy more — save more, user-friendly presentation in one place, prompt information about daily/weekly/monthly offers, easy and safe ways for online booking and buying tickets from home, fully safe, discretion and maximum comfort, better preparation for attraction visit brings higher satisfaction. Added values for partners are producing, promoting and selling of joint tourism products with no time or geographical limits, sell more and cut expenses, better competitiveness, higher level of experience of tourist attraction, more satisfied visitors, active and long-term communication with costumer, real-time reporting and good analysing brings better planning, B2B automatic scheme of selling between partners.

Postojna Cave in Slovenia already use such an ICT platform and started cross-border cooperation with Minimundus (Austria) and Plitvice (Croatia) in 2011 and after promoting the prototype in Vienna on the Danube Regional Business Forum (Figure 2).

Figure 2. Prototype cross-border eTourism



Postojna Cave with its partners invites all top tourist destinations of the Danube and Alpe Adria Region to join the *Danube and Alpe Adria Tourist Champions League*.

Prototyping methodology for eSolutions and eServices development

By Georg Krauchenberg, Austrian Federal Economic Chamber, Foreign Trade Department, Danube Region Strategy

Prototyping methodology can be considered as a very straight link to companies. SMEs especially could profit from prototypes presented by universities and research institutions. In most cases, SMEs don't have comparable possibilities for their own research. They have a more urgent need to cooperate with others in any research.

On the other hand, SMEs are much more flexible in implementing new ideas. Especially in eSolutions and eServices, flexibility is of utmost importance. Large companies may dispose of huge laboratories or testing machinery with numerous employees. However, they tend to lack in flexibility.

One of the aims of the European Commission, Directorate-General for Regional Policy, concerning the EU Danube Strategy is to encourage more companies and institutions in the region to cooperate cross-border.

This aim is fully shared by the Austrian Federal Economic Chamber and other Chambers in the Danube Region. Many or most companies are members of Chambers of Industry and Trade in their respective countries. Organising informative conferences for their members is one of the basic tasks of Chambers. Thus, it was a logical step taken by the Austrian Federal Economic Chamber to offer its services in organising the Danube Region Business Forum in accordance with the European Commission, Directorate-General for Regional Policy.

For the above reasons, and as a result of the excellent cooperation with Slovenia and ALADIN, it was a perfect opportunity to include the Digital Agenda in the programme of the Danube Region Business Forum and specifically prototypes in eSolutions and eServices. Thus, the intended direct contacts between universities and research institutions, on the one hand, and companies as well as provincial authorities and mayors of the Region, interested in cross-border activities on the other hand, could be established during the Forum. The feedback of the companies having participated in the Forum was exceptionally positive. The presentation of the wide range of prototypes in eSolutions and eServices met with great interest and, as a consequence, the participants of companies and institutions at the event clearly stated that the Danube Region Business Forum should be repeated. Considering the limited size of the countries along the Danube, cross-border solutions are of the utmost importance and should be a benefit to the whole region making it more dynamic.

Therefore, the Austrian Federal Economic Chamber will continue to organise the next Danube Region Business Forum further emphasising close contacts to universities and research institutions with special attention to prototypes for possible cross-border activities and cross-border solutions.

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2.2 From service innovation to service engineering — results from the Service Innovation and ICT programme

The importance of services in modern society

Europe and the US are becoming service economies. Service sectors are responsible for about 70 % of GDP in Europe [1]. In the Netherlands, the complete growth of employment over the last 10 years comes from services, especially in healthcare [2]. As the Europe 2020 strategy [3] makes clear, Europe's future wealth and citizens' well-being depend on how effectively its businesses innovate and respond to changing markets, technologies and consumer preferences. We therefore need a better understanding of how innovation is changing and how the traditional divide between manufacturing and services is blurring.

To sustain our welfare level, economic growth is needed. US productivity is higher than European, one, and has recently overtaken leading countries in Europe [1]. Moreover, European productivity growth is much lower than the US. The service sector is the main reason: industry has a growth comparable to the US. In the public sector, productivity growth is even less. In the Netherlands, only healthcare productivity has grown, whereas costs in the public sector have grown drastically. All this implies that we are in need of a better approach of service innovation, both in the public sector and the private sector.

Product-oriented companies are now adopting new service-focused business models. At the same time, service firms increasingly exploit new devices, technologies and infrastructures, such as smartphones, tablets, or interactive televisions, to improve their customers' experiences. Innovation is no longer the preserve of research and development laboratories but has become more of a distributed, cultural phenomenon, where the processes for developing new goods and services, channels to market and revenue models are evolving in response to new technological opportunities, increased customer engagement in innovation, and changing organisational structures [4] [5]. Information and communication technology is generally recognised as a driving force of innovation [3]. The impact of ICT reaches far beyond the ICT sector itself. In a recent survey among 300 innovative companies in the Netherlands, 80 % of people pointed to ICT as a driving force of innovation as well as cost reduction [6].

Despite its importance, the level of professionalism in developing services cannot match the level of expertise in product development. Business cases, user studies, design alternatives and actual development are not really linked, and information and knowledge is lost en route. Especially in the case of ICT-based services, initial requirements are underspecified, leading to change requests in the process, with higher costs, longer times to market, and increased risks of even not meeting the requirements.

Whereas developing an individual service is already complex, understanding service networks adds a level of complexity to that. The interdependencies between various actors and stakeholders, the distribution of task or services in the network brings an additional dimension to the problem area. Our goal, therefore, is to work towards a rigorous, model-based, service development methodology, or service engineering approach for ICT-supported services: a design methodology that is problem-oriented, encourages inventive and cognitive skills, generates systematic solutions that are transferable, and is teachable and learnable [7].

This paper is organised as follows. From the macro-economic challenges sketched above, we move to the challenges organisations face in this context. We then elaborate on the concept of service orientation in organisation before giving three main innovation areas in services.

This work briefly summarises a large part of the research part of the Service Innovation and ICT programme, carried out in 2010 and 2011 in the Netherlands. Many people contributed to this work through the Agile Service Development, ArchiValue and Business Model Roadmapping projects. These projects ran under the umbrella of the Service Innovation and ICT programme in the Netherlands, partly supported by the Dutch Ministry of Economic Affairs, Agriculture and Innovation. The work was done from March 2010 through December 2011.

We list the participants in this work in alphabetical order: the authors would like to acknowledge their direct or indirect contributions over the last two years. This type of research leverages the knowledge, investments, insights and inspiration of many, and could not have happened without true networked innovation.

ABN AMRO, APG, Be Informed, Betribes, BiZZdesign, CRP Henri Tudor, Luxembourg, Delft University of

Technology, Dutch Tax Department, Everest, IBM, Novay, O&i, Océ, PGGM, PwC, Radboud University, Rotterdam School of Management, TNO, University of Applied Sciences Utrecht, University of Twente, Utrecht University, Voogd & Voogd, Windesheim, SI-I Foundation.

Innovation challenges for organisations

We sketched a number of societal challenges related to service innovation. The consequences of these for individual organisations are indirect at best. Companies as well as public organisations face different challenges. Confronted with a highly dynamic customer base, especially in the B2C market, being able to adapt to changing customer needs is crucial. This holds for both the channels through which customers are found and served as well as the personalisation of services. Think of the role of new devices and apps for shopping, and the full digitisation of tax-related services.

Agility towards the customer has consequences for operational agility. The interdependencies of products, services, systems, processes and IT can severely constrain the ability of organisational change. Every organisation needs to think strategically about where it needs agility as a core competence, and develop its enterprise architecture accordingly. Only then can the time to market of new or changing services match the demands of customers. Sambamurthy et al. [8] show the connection between the IT competence of an organisation, the digital options this creates, the customer, partnering and operational agility resulting from these options, and the competitive actions the organisation can take. And all of these crucially depend on what they call entrepreneurial alertness: strategic and systemic foresight.

Less offensive, but as important for most organisations is cost reduction. Price pressure is substantial for many companies like insurance companies and banks as well as telecom operators. This especially holds for public service organisations which have been confronted with the largest budget cuts in decades. Next to reorganising the organisation, such severe cuts need rethinking of the business model of the organisation.

Cost reduction is everywhere: despite a net profit of EUR 1 285 billion in the third quarter of 2011, ING Group will lower its cost and create a faster and more effective service, dismissing 2 700 full-time employees. We have seen similar announcements from ABN and RBS. Cisco Systems announced 5 000 redundancies in July 2011 to increase profitability. The Dutch unemployment agency UWV was faced with a budget cut of EUR 500 million, forcing it towards completely digital customer interaction.

Focus on customers and costs may come at a price: reduced intrinsic innovation capabilities. An organisation needs to be able to innovate constantly and therefore needs skills to collaborate with external partners [9] [10] as well as combine operational excellence with new product development [11]. The latter requires a so-called ambidextrous organisation [12]. This means that an organisation should take care to invest in the right portfolio of projects, serving a combination of short-term goals and longer-term objectives, leading to a mixed set of competences in the organisation.

The service-oriented organisation

IT management encompasses different aspects, ranging from determining the strategic orientation of the IT organisation to management and control of delivery and operations. Furthermore, the information systems landscape itself, especially of large, information-intensive organisations, has become a complex field that combines all kinds of concepts, paradigms, building blocks, and instruments. Think of paradigms like process management, rule-based organisation, service orientation, event-based, or SaaS and cloud. How can we get a grip on this multifaceted landscape?

It is impossible to manage all these different elements individually. Some of these are too fine-grained, such as business rules or events; some are too IT-centric, such as business objects or components; some are too large and serve too many purposes to manage them as a single functional element, such as complete business applications like ERP systems; and some of these, such as business processes, are too business-specific to provide a management handle on more generic IT functionality. We need a concept that is in between these other notions and captures the essence of what an organisation does or means for its surroundings: service.

Using the notion of service as the core concept in guiding the development of organisations, both for business and for IT design, has several advantages. Firstly, services provide a clear separation of the ‘what’ and ‘how’. A service provides a clear interface to its functionality, without disclosing how this functionality is realised internally. As such, a service is self-contained and has a clear purpose and function from the perspective of its environment. Its internal behaviour represents what is required to realise this functionality. For the ‘consumers’ or

users of a service, the internal behaviour of a system or organisation is usually irrelevant: they are only interested in the functionality and quality that will be provided.

This also points to the second advantage of the service notion: a service is independently useful and therefore has a manageable level of granularity. Since it delivers a concrete business contribution, it is the subject of service-level agreements, its performance can be monitored separately, it can be combined with other services to provide new functionality, and it can be bought from and sold to other organisations.

Finally, services provide a bridge between business and IT vocabulary. In business terms, 'service' signifies what the organisation does for its customers; more recently, IT has started to use 'service' for concrete, independent units of business functionality delivered via a software interface. Both uses of the word are based on the concrete contribution to the environment and the relatively self-contained character of a service.

This, of course, is not really new. At the edges of organisations, we have long been thinking in terms of the services provided to customers, and internal business processes were designed to provide these services. Software engineers think in terms of functional interfaces, information hiding and encapsulation. Service thinking, however, can also be applied to, for example, internal business processes and software applications, rendering them into 'service networks': services become the core building block of the entire information ecosystem.

These services can be provided at a distance, over the Internet. Some years ago, subscribing to software in this way was labelled as 'Application Service Provisioning' (ASP). This never made it big, at least partly because it was based on a direct link between application and customer: the ASP provider in fact merely hosted and maintained the application for each customer separately. Many of these applications were not developed for multi-tenant use, delivery across the Internet, or pay-per-use billing models. Newer delivery models, collectively called 'Software as a Service' (SaaS) and cloud computing, have overcome these limitations.

Service orientation also stimulates new ways of thinking. Traditionally, applications are considered as supporting a specific business process, which, in turn, realises a specific business service. Service orientation allows us also to adopt a bottom-up strategy, where the business processes are just a mechanism of instantiating and commercially exploiting the lower-level services in a collective offering to the outside world. In this view, the most valuable assets are the capabilities to execute the lower-level services, and the business processes are merely a means of exploitation.

By concentrating on agile development of business and software services, we focus on the value that organisations provide to their environment. Of course, these services are realised by all kinds of business processes, software applications and technical infrastructures. However, these are subordinate to the services they deliver. Traditionally, agile methods are strongly focused on software development; here, we take a much broader scope, applying agile principles and practices to more than just software.

The service-oriented organisation paradigm provides a basis to meet these challenges. In this report, we identified three major areas where organisations can build on service orientation to tackle the challenges in a systematic way: robust service model design, creating an agile organisation, and investing in innovation. These three areas will be touched on in the next three paragraphs, indicating the issues involved, typical examples of organisation that have tackled the problem, and pinpointing instruments that can help in finding a way out.

Being able to develop robust business models

The introduction of new services and service processes in the continuously changing business landscape requires careful and informed business planning that takes into account the relevant developments in the market, society and technology. The true value of innovative concepts and technologies is largely determined by the business models in which they are embedded. Choices are complex as cooperation with others in value networks is often necessary and multiple business model options are available. Companies therefore have a need for a long-term vision on potential business models, their own position within these models and the road that may lead them to this position, including an analysis of the robustness of the business model with respect to different context influences.

For this we coined the term 'business model roadmapping', that is a description of the chain of intermediate steps and critical choices to arrive at a desired business model. This creates a longitudinal insight into the opportunities for business innovation and related business planning. To validate the robustness of business models and roadmaps, scenario analysis can be used: validating the strong and weak parts of business models and roadmaps

by applying scenario analysis methodologies. As a result, the 'fit' of a business model with a future business environment can be determined or the 'robustness' of a business model with regard to a collection of future environments. This methodology is called 'business model stress testing'.

Business model stress testing builds on ingredients in business modelling [13], business model generation [14], and scenario analysis. The main concepts and results in the approach are given in Table 1 following.

Over the past few years, the field of business models has developed from defining business models, via exploring business model components and classifying business models into categories, towards developing descriptive models (for an overview, see [15]).

First of all, it is important to consider what a business model is. We agree to a large extent with the definition presented by Chesbrough and Roosenbloom [16], that a business model is a blueprint for the way a business creates and captures value from new services or products. As such, a business model describes how a company or network of companies aims to make money and create consumer value for a specific service offering [17]. Central to the business model definition is that a viable business model should create both customer value and network value.

Scenario analysis or scenario thinking, has a long tradition as first studies originate from the 1960s. A famous scenario planning example was set by the oil company Shell, which anticipated the 1973 oil crisis by including one alternative scenario on a shortage of the oil supply due to political tensions in the Middle East and the subsequent rise in oil prices [18] [19]. Scenario planning was typically adopted by the military, and implemented by, for instance, the Rand Corporation. While this Anglo-Saxon scenario approaches focused on improving strategic decision-making and planning processes, the French La Prospective school developed a scenario approach for institution and companies to deal with long-term planning. Their 'normative scenarios' could serve as a guiding vision to policy and decision-makers. Over the years, scenario thinking has become a common approach in many industry domains, ranging from energy and telecommunications to global economics.

Making your service organisation agile

The agile movement in software development has received much attention over the last two decades. These lightweight, iterative methods have gradually taken over much of the software development community because, on the one hand, they provide better results in many types of projects and, on the other hand, they provide a more stimulating work environment for developers. Starting in the 1980s, with methods like James Martin's Rapid Application Development [20], the focus in software development started to shift from linear, waterfall-like methods to iterative and interactive approaches. In the 1990s, the three most important agile methods arose: Extreme Programming [21], DSDM [22] and

Table 1. Key concepts in the business model analysis

Processes	Results
Business model design	*Business model*
Process of describing an existing or (re)designing a new business model. Essential: the business model design should allow for a network perspective.	Description of how a company or network of companies aims to make money and create consumer value for a specific service offering [3].
Scenario analysis	*Scenario*
Process of developing one or more scenarios based on an analysis of trends, certainties and uncertainties. Essential: the scenarios and uncertainties should be relevant for the (future of) the business model.	Expectations regarding possible futures that provide insight into the way the future may develop based on clearly defined assumptions concerning the relationship between relevant developments.
Business model stress testing	*Business model strengths and weaknesses*
Process that critically evaluates if a business model is viable and feasible in a scenario. Essential: There should be an alignment between the scenarios analysis and business model design in order to be able to compare them.	Overview of those elements in the business model that fit with a certain scenario.
Business model roadmapping	*Business model roadmap*
Process of developing a business model roadmap as a plan with intermediate steps achieve a desired business model B starting from a business model A. Essential: The business models A and B should be described in the same business model language.	Description or a plan that describes what intermediate steps and critical decisions have to be taken to achieve a desired business model.

Scrum [23]. In 2001, representatives from these and other agile methods joined forces and wrote the Manifesto for Agile Development [24] that describes the common ground of these methods in a simple set of statements and principles.

Experience has been mounting that these agile ways of working, using short iterations and close customer contact, have a higher success rate than traditional methods for software development, at least for many types of software projects. The rigour and volume of research into the effects of agile methods still needs to be improved [25], but recent studies provide theoretical and empirical evidence for the effectiveness of agile methods: see, for example, the extensive overview and research by Lee and Xia [26].

Agile approaches have also gained the attention of the academic community, who have investigated its foundations and effects from a scientific point of view. A useful definition of agility consistent with the above is given by Qumer & Henderson-Sellers [27]: 'Agility is a persistent behaviour or ability of an entity that exhibits flexibility to accommodate expected or unexpected changes rapidly, follows the shortest time span, and uses economical, simple, and quality instruments in a dynamic environment.'

We need to address agility at three different levels within enterprises:

- agile enterprises, which strategically use change to their advantage, outmanoeuvring competitors with shorter time-to-market, smarter partnering strategies, lower development costs and higher customer satisfaction;
- agile practices for design and development, focused on people, rapid value delivery and responsiveness to change;
- agile systems (both organisational and technical) that are easy to reconfigure, adapt and extend when the need arises.

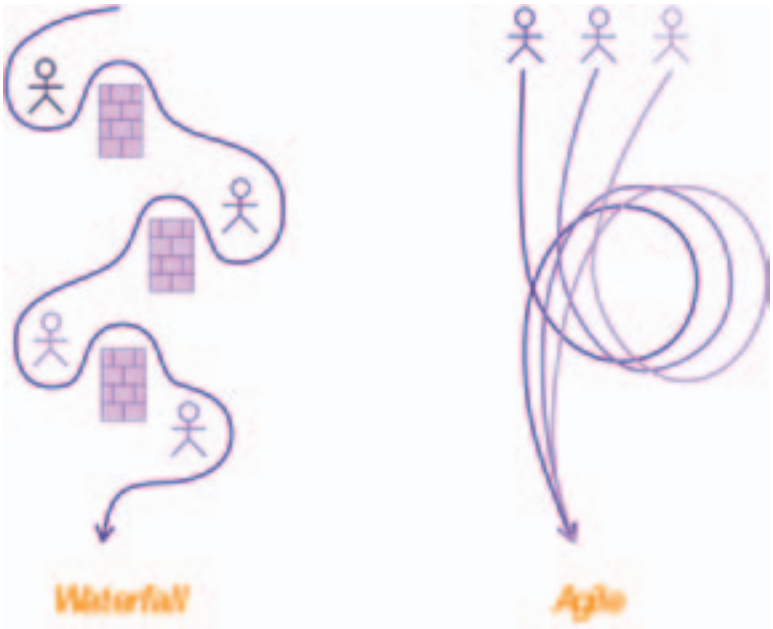
These different types of agility reinforce each other: if an organisation's infrastructure or business processes are more flexible, an iterative and incremental development process can more quickly and easily add value, and the organisation's strategy execution is enhanced. The core of this is that uncertainty is given an explicit and prominent place. Whereas traditional methods and architectures plan for fixed goals and situations, agile methods and systems are aware of the uncertainties of their environment and know that they are aiming at a moving and often ill-defined target. An integrated approach for the agile development of agile services to serve agile is not yet available. A new perspective on service design processes is needed, providing development teams with the means to tailor their way of working to specific circumstances and deal with multiple stakeholder perspectives, bottom-up innovation and co-evolution of different service aspects. We advocate that agile development processes are much better suited to accommodate these needs than classical linear, top-down design processes, in which individual aspects are often developed separately and sequentially. The iterative character of agile processes, with a focus on people and interactions, close contact with customers and cross-functional teams that tackle different aspects of development at the same time, is a much better fit with the complex and multidimensional nature of service development.

Development processes should also be explicitly focused on observing changes in their environment and acting on these. The speed of change that organisations have to deal with keeps increasing, and processes must be responsive and even predictive in character to accommodate these changes. These properties should be designed into the development process. Moreover, it should be self-aware, that is use mechanisms and practices to observe its own performance and, if necessary, change its operation accordingly. This use of reflection is a common characteristic of agile methods. Scrum, for example, uses the 'sprint retrospective' meeting in which after each iteration, the way of working of the team is evaluated and adapted.

This adaptive character of development processes does not mean that change knows no bounds. The complex nature of service design necessitates the use of sound engineering principles and techniques. External dependencies, technological complexity, regulatory compliance, risk management and other factors all require an approach of bounded or controlled variation. Architecture is a core discipline to provide such managed variation. It specifies the high-level, strategic or otherwise important principles and decisions that together span the design space, like a vector space in algebra.

Another important use of architecture is to explicitly design mechanisms in the operational systems and processes that support change. Not only should development processes be agile and adaptive, but the results they create should also be flexible and amenable to change. Various kinds of design models, ranging from domain, requirements and architecture models to detailed artefacts describing the inner workings of business processes and IT systems, play an important role in both

Figure 1. Waterfall v agile processes



controlling complexity and fostering change. Such models make business knowledge visible across the enterprise, promoting coherence and consistency.

Moreover, a flexible infrastructure that can be configured with such models, instead of laboriously writing software code, may greatly enhance the agility of the organisation and its systems. Models can be changed more easily than code, and the effects of changes may be evaluated at the model level before processes and systems are changed, thus avoiding costly errors and re-implementations.

In agile development, the role of these models is not the same as in traditional design processes, however, where specialists each work on their own aspect models and then hand them over to the next person in the design chain. Rather, different models and other artefacts need to be evolved iteratively and in parallel, while guarding their mutual coherence and consistency. Figure 1 illustrates this idea.

Investing in service innovation

Organisations with a large installed base of enterprise applications often have poor insight into the relative quality, cost-benefit ratios and risks associated with their application portfolio. As a result, many information systems are maintained far beyond their original technical and business life expectancy, as replacement risks are often overrated in comparison to maintenance costs. For older systems, maintenance costs increase, relative business benefits decrease, and the risk of failure increase over time. Maintenance, in fact, is a misleading term: bits and bytes do not rust and do not need to be painted or oiled. Most maintenance consists of adding functionality, either to accommodate new business requirements or to integrate with other systems. This additional functionality also needs to be maintained, thereby increasing maintenance costs even further.

Moreover, the complexity of a system increases with its size; more complex systems are harder to change, so each new business requirement becomes more difficult and costly to accommodate than the previous one. This can also be shown empirically: Verhoef's [28] Figure 14, for example, shows a graph depicting that the productivity per additional function point goes down with the system size, and thus maintenance costs go up. Hence, over the entire life cycle of a system, the initial development costs are only a fraction of the total cost of ownership, and the older the system, the more dominant maintenance costs become. In addition, failure risks of old systems increase and the last remaining people with knowledge of these systems leave, incurring additional costs for dealing with these risks and knowledge gaps.

Furthermore, organisations tend to have an increasingly large IT portfolio, since it turns out to be very difficult to really switch off a system. This may lead to a situation in which the entire IT budget is spent on maintaining old systems, and no budget is left for innovation. In such a situation, the only way out

is a significant increase of the IT budget, since renovating, shutting down or replacing old systems also requires an upfront investment.

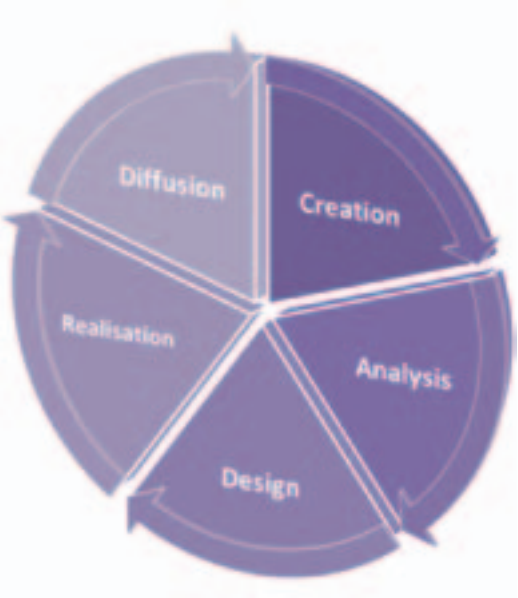
If this budget is not available, an organisation has pushed itself into a corner; if a new market entrant comes along that starts from a blank slate with a modern system landscape, with the associated lower cost level, it will outperform and outcompete the incumbent. Over the last years, this is what has happened in many markets, for example with online stockbrokers or new utility companies. Only some government organisations have such 'luck' that they do not have to face such competition, but they too come under pressure from an increasingly unfavourable comparison to the private sector.

As a consequence, organisations need instruments to assess the value of their IT as well as their IT projects with respect to their contribution to both strategic as well as operational targets. Such instruments comprise a portfolio dashboard that indicates the current and future value of applications, and the benefits, costs and risks associated with replacing them.

Systematic service innovation

We illustrated that organisations face numerous challenges, ranging from growth targets, matching rapidly changing customer demand, to cost reduction and continuous innovation. We illustrated these challenges above. The service-oriented organisation paradigm provides a basis to meet these challenges. In this report, we identified three major areas where organisations can build on service orientation to tackle the challenges in a systematic way: robust service model design, creating an agile organisation, and investing in innovation.

Figure 2. Stages in service engineering



Many different approaches to a staged design methodology exist. Most practitioners agree that waterfall models are inappropriate to handle the complexity in many designs, and iterative or prototyping approaches are needed (see Figure 2).

In different design stages, different aspects of the service network are discussed or refined. At a high-level of abstraction, these are:

- Creation: needs of customers, value to be created, and opportunities in markets, technologies or services;
- Analysis: function, restrictions from legislation or installed based, robustness of assumptions and ideas in different scenario's, and sustainability of solutions and services envisioned;
- Design: usability, adaptability, architecture and distribution of the services to be built;
- Realisation: compliance with legislation, reliability and performance of the services in different situations;
- Diffusion: acceptance monitoring, evolution of the proposition and coping with growth and life cycles of propositions.

In networked service innovation, different actors can be at different stages in the same service design trajectory. For example, when introducing remote care in hospitals, the ICT solution can be in the diffusion stage for the ICT service provider, whereas for the hospital or caretaker, the service is still part of an early experimental phase. This can lead to totally different issues being at the forefront of the minds of stakeholders, leading to confusion and misinterpretation.

At different stages, we thus have different perspectives, often with different stakeholders. This implies that the techniques used in the different stages will be different, both in the way of working as well as thinking. At the creation stage, informal, diverging and visual techniques are often employed, whereas in design, convergence and formalism is more important. The instruments we will bring forward have been developed to do exactly so.

Once different tools and methods have been linked, a coherent and complementary sets of tools and techniques can be chosen, tailored to your application domain or the competences of your

organisation and its partners. At that moment, we finally make the step from service innovation to service engineering [29], creating agile business value.

Tools for engineering the corporation

Under the Service Innovation and ICT programme, several methods and tools have been developed to tackle the three problem areas mentioned above. Without going into detail, we discuss a number of them, starting from robust business models.

First of all, business model stress testing. This is a systematic approach for stress testing a business model against future developments. Stress testing is used to identify the weak parts of the business model which could consequently be improved leading to more robust business models. Testing in a more generic setting involves defining a set of indicators against which the business model elements may be tested. Criteria may be future scenarios or uncertainties, but could also be success factors or performance indicators. Business model stress testing fills the gap between business modelling and scenario planning and provides a way to systematically analyse the quality of business models. We show how scenarios and uncertainties can be used to address the robustness of a business model. The result of the stress test is a heat signature that shows the stronger points and vulnerabilities of a business models with respect to the main uncertainties in the context of a service. It is much more than a SWOT analysis, pinpointing exactly in the model where and how the uncertainties touch on the service blueprint.

To assist enterprises in determining in which aspects they need to be agile and where their agility is currently lacking, we have developed a number of instruments. Our first instrument is a *capability model* for agile service development, which helps organisations to plot a course towards increased agility. A self-assessment helps you in determining where your organisation currently stands and which next steps may be useful to improve your agility. This capability model combines the business, process and system aspects of enterprise agility. Of course, changing the agility of your legacy IT landscape or the culture of your organisation may take considerable time, whereas improving the way of working within a project is often only a matter of months. Hence, your organisation may have different levels of capability in different aspects. Furthermore, the type of scale is different, since the system agility aspect mainly addresses the agility of various *structures* in the enterprise, whereas business and process agility focus on (management and design) *processes*. Therefore, we use two different scales.

The business and process agility capabilities uses the common maturity levels known from models such as the CMMI, adapted to an agile context. For the capabilities concerning system agility, we use a scale based on the work of Ross et al. on enterprise architecture as strategy, again adapted to an agile context.

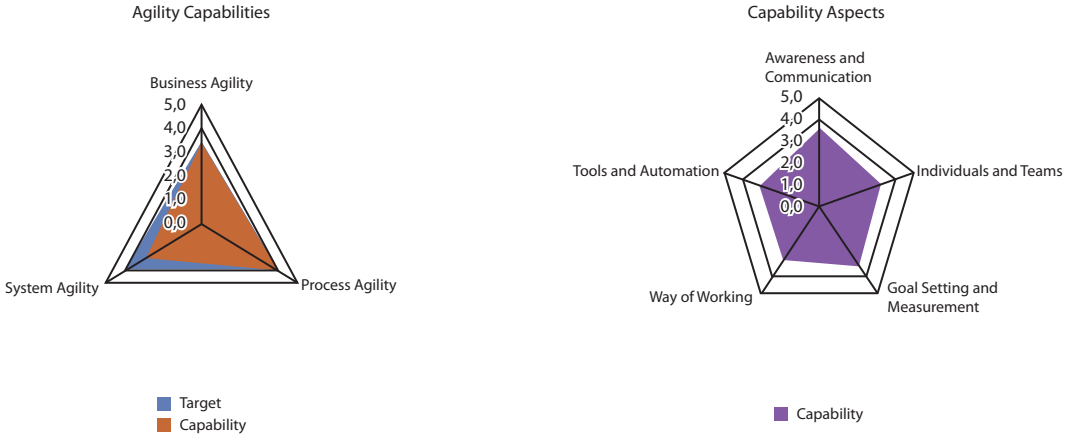
1. **Silos**: System agility is unknown and possibly quite low. Individual parts of the organisation are developing their own services independently, with no integration of data, processes, standards, or technologies.
2. **Standardised Technology**: System agility is addressed reactively, only at the level of individual systems, and focused on IT. Standardised technologies and platforms have been put in place to communicate between silos, and to integrate the data and interconnections.
3. **Optimised Core**: The IT systems in the silos have been analysed and broken down into reusable component parts. Models are used for the design of the business and IT operations, and at the level of enterprise goals, drivers, and requirements.
4. **Business Modularity**: Business drivers for agility are monitored continuously. Models are used at three levels: for requirements and design purposes; to obtain management information; and in suitable domains also for direct implementation. Business services to the environment can quickly be realised across the enterprise by combining and configuring internal and external business services.
5. **Dynamic Venturing**: The organisation's strategy is based on its agility. Architecture is used as a core instrument to support rapid adaptation, and business and IT are regarded as an integrated whole. The enterprise architecture extends beyond the borders of the individual organisation and includes the networked enterprise level.

Our assessment instrument uses a set of questionnaires to plot your organisation on these levels, and provides more detailed insight in the performance on several specific aspects. Moreover, it outlines which agile practices, models or tools might be used to improve your organisation's capabilities.

Figure 3 shows an example outcome of an assessment.

Our third instrument provides more detailed insights. This is an *agility scan* to identify: (i) the need for agility of an enterprise, based on its strategy and business drivers; (ii) potential barriers

Figure 3. Agile capability assessment



to agility; and (iii) relevant practices and patterns that the organisation might apply in this situation.

The scan consists of a set of questionnaires intended for business managers, strategists and architects. It contains questions about the organisation's strategy, business drivers from its environment or context, and the barriers or limitations it perceives in adapting to these drivers. Based on the answers to the questions, the agility requirements for the organisation can be determined. At a general level, the scan provides a dashboard with recommendations on both the process and system agility of the enterprise. This helps in determining general aspects of the development processes and (organisational and technical) systems that might be improved: the higher the bars in the graph, the greater the need.

Finally, we developed several methods and tools to support (project) portfolio management: some of them have been implemented in and validated through BiZZdesign Architect, a leading enterprise architecture tool.

IT portfolio management capability assessment: a quick scan into the opportunities for your organisation on architecture-based IT portfolio management. Includes a maturity scan into IT governance, enterprise architecture and portfolio management. The quick scan includes an Excel questionnaire and analysis tool.

Enterprise architecture-based project value analysis: a method for domain architecture development, including the link to project and project goals and the link to strategic goals. Supports analysis of the value of projects to strategic goals and assessment of strategic goal realisation. Gives an overview of projects and its relation to the several business domains.

Bedell's method extended version: supports analysis of the value of IT and IT projects in relation to strategic goals. Basically, it uses the enterprise architecture as a starting point, extended with the relation to business goals. All relations are quantified to express the value of one attribute to the other. By means of aggregation, the added value of enterprise architecture artefacts is calculated.

Enterprise Architecture Realisation Index (EARI): assesses the level of realisation of the enterprise architecture in an organisation. Includes interviews and instructions to evaluate the EARI from the interview results.

Together, these instruments are ingredients of a more rigorous approach to developing services and managing the service-oriented organisation. Once different tools and methods have been linked, a coherent and complementary sets of tools and techniques can be chosen, tailored to your application domain or the competences of your organisation and its partners. At that moment, we finally make the step from service innovation to service engineering, creating agile business value.

Postscript — service innovation policy in the Netherlands

As mentioned at the start of the paper, this work summarises some results of the Dutch innovation programme *Service Innovation and ICT,* SI-I for short. It was an initiative of Novay, the Holland Financial Centre and the ICT innovation platform for the creative industries in the Netherlands: an

interesting collaboration between ICT companies, financial institutions, the creative industry and academia. The programme started in 2010, comprising a 'top' research programme, directed by Novay, an infrastructure programme, led by the Foundation SI-I and two open tenders. The programme encompassed EUR 25 million of research, of which EUR 12.5 million was provided by the Dutch Government. This was the first phase. After an evaluation in 2011, a second phase would start of about the same size. The programme was a definite success: many companies joined the top programme, and the first tender received a lot of good proposals. We expect to outperform on all performance indicators of the top programme, a great result.

Early in 2011, however, the Dutch innovation policy changed drastically, away from service innovation, away from cross-sectoral collaboration, towards supporting industry. Nine 'top sectors' were selected, of which only logistics and creative industries are directly service-related. Awaiting the ideas coming out of these sectors, the SI-I programme was terminated during its first phase, despite its success. Parts of the ideas might come back in the plans for the creative industries, but all other components have been stopped.

At the same time, the successful innovation voucher scheme was terminated due to budgetary reasons, and SME-oriented innovation support was stripped, making it less attractive for SMEs to participate. We conclude that in 2011, the Dutch innovation policy came to a temporary standstill, and the service innovation policy was terminated all together. This is in contrast to European policy, as emphasised recently in the Horizon 2020 vision of the European commission. A strange situation, in an era where European collaboration is needed even more than ever. An incomprehensible change of direction, in my opinion.

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2.3 Managing innovation in the public sector

Introduction

We are witnessing a change in the role of governments as they look for new ways to provide for their citizens within a new financial landscape and to remain competitive in an increasingly global society. With a significant increase in partnerships with the private sector as well as non-profit organisations, there has been a shift from government as a provider of services to a model in which the public and private sectors have co-responsibility [1]. An important feature of this dynamic is the new understanding that tasks should not be allocated based on public versus private responsibility, but on which sector can answer a need most appropriately. Thus, while the public sector remains at the helm of many initiatives, it also acts to proactively explore, encourage, and engage in collaboration with the private sector [1].

Mechanisms of innovation in the private sector

This shift in government follows a similar trend in the private sector. Due to the increasing pace of technological change, businesses are looking for new ways to stay innovative and competitive. As firms recognise that all of the best talent is not necessarily in their employ, they look outside of the organisation for new ideas and collaboration. Thus, many organisations have begun to embrace open innovation as an important strategy. As defined by Chesbrough [2] open innovation is the 'use of purposeful inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for the external use of innovation, respectively'. In this effort to share knowledge and capabilities, businesses open the boundaries of the firm.

Many successes of open innovation have already been realised in the private sector [2]. One strategy that firms use for harnessing a collection of external collaborators is a platform. The main idea of a business platform is the development of a core component, which provides stability and control, along with peripheral components that contribute variety and evolvability [3]. The role of the focal firm is to provide a robust set of common assets, such as tools, services, or technologies, that other firms can use to develop their own offerings [4]. External collaborators are attracted to the platform as a means of enhancing their own performance, while the central organisation can realise benefits such as enhanced efficiency, innovation and flexibility provided by the complementors [3].

However, organisations looking to foster innovation by developing a platform must adapt to new ways of governing these external collaborators. In managing platforms, there is a shift away from arm's-length, contractual control to network governance with more informal mechanisms [5]. Depending on the business model of the core firm and its means of value capture, governance of collaborators can vary.

Boudreau and Lakhani [5] provide three platform business models to demonstrate the degrees of control that the core firm maintains in managing collaboration. In the integrator model, the core firm retains the highest degree of control. The core firm acts as an interface between external collaborators and consumers and there is no direct interaction between them. Apple operates its iPhone platform according to this model, situating itself between developers and consumers, shaping development and directly controlling transactions with the end-users. In the product model, the core firm relinquishes some control, allowing collaborators to sell directly to consumers. However, the core firm maintains a certain degree of control over the design of the core technology, tool, or service. For example, Intel uses this strategy for developing its microprocessors, leaving it to external parties to integrate them into other product lines. Finally, in the two-sided model, the core firm maintains very little control over the external collaborators as they are free to interact directly with consumers. Once the platform has been established, external parties do not need to interact directly with the core firm, except to abide by the rules or regulations that are often put in place as a condition of affiliation. For example, developers can design and develop Facebook applications without interacting with the core firm, except for the ultimate provision of the platform.

Methodology

Our study is based on three cities working to implement open innovation initiatives. These three cities (Helsinki, Amsterdam, and Barcelona) can be considered a second generation of Smart Cities, after the initial experiments carried out by American and UK cities. In order to address our research questions, we use a multiple case study methodology. We collected data from in-depth interviews of city officials and public intermediaries working to facilitate these open initiatives. Through these cases, we explore how innovation is managed in the public sector, based on examples of innovative strategies set by private firms.

Mechanisms of innovation in the public sector

In the same way that businesses are opening the boundaries of their firms to foster collaboration, governments have been increasing their partnerships with outside organisations [1]. The public sector views the adoption of these 'open' strategies as a means to becoming more collaborative, participatory, and innovative (data.gov, smart-cities.eu). Instead of being constrained by the ability of its own resources, governments are able to supplement their own capabilities with those of a network of collaborators [1]. Collaboration with external parties is still initiated by the public agency, but it includes non-state actors in decision-making process [6]. By acting as the core organisation in establishing these partnerships, the public sector looks to external organisations to bring innovative solutions to projects, just as in the case of open innovation in the private sector.

Helsinki is a city focused on encouraging collaboration among innovative strategies, recognising that cooperation among different organisations will foster greater returns. A core initiative includes reinforcing knowledge-based clusters and creating common development platforms. Instead of simply facilitating new projects, the city hopes to leverage existing clusters of innovation for information sharing and collective development between multiple partners. Helsinki is a city with high standards in education, a strong foundation in science and technology, and a proven history of collaboration between the public and private sectors. This initiative hopes to encourage synergy and interaction between expertise clusters, furthering development by combining projects into dynamic packages and promoting best practices. It hopes to transform the Helsinki Region into an international innovation environment by leveraging not only initiatives in the metropolitan area, but the region as a whole. A focus of the strategy is collaboration among numerous Living Labs in the Helsinki Region. Collaboration between those already in existence and planned Living Labs and pilot communities will be important for the development of Helsinki's innovation strategy. Helsinki's focus on collaboration aims to introduce innovation into public services and foster increasing support for innovative activities across all sectors.

In order to attract external partners, governments are looking to establish platforms for collaboration, just as in the private sector. Many cities embracing open innovation view open data as the core component of the platform from which peripheral initiatives can be developed [7] [8]. The public sector hopes to encourage the creation of web applications, improved technologies, and new economic ventures to operate around the core of open data, fostering overarching innovation strategies.

Amsterdam offers an example of a platform strategy in the public sector. Amsterdam is a city focused on innovation and has fostered an open data initiative to see it realised. Raw data is provided by the city, as the core component of the platform. Initial data sets made available were in the areas of environment, demographics, and policy and subsequent planned data sets will provide data on business/economics, elections, and tourism. Through the engagement of the triple helix of business, universities, and the public sector in the open data project, Amsterdam hopes to encourage cross collaboration among experts. The city has also organised an 'Apps for Amsterdam' competition started in February 2011 to further encourage external collaboration. The city sees open data as platform for the development of new technologies and a mechanism for fostering innovation.

In order to effectively serve as the core partner in these open initiatives, governments must develop new organisational abilities [1]. Instead of optimising management with a strong internal component, as in the case of a more integrated organisation, management of collaborative platforms must have an external focus. Cities must encourage common objectives to strengthen the network and mobilise resources within the network of collaborators. Outcomes are no longer dependent on the size of the public sector, but on the quality and size of its network of collaborators [1].

Further, just as in the private sector, cities must determine the extent to which they will control the design, management, and operation of the platform. Ideally, cities would aim to attract partners that share motivation and involvement in the project, despite their differing contributions [9]. Because the public sector is not looking for value capture, a more horizontal structure to the network of collaborators can emerge. Collaboration is fostered in the way that partners share equal footing, with relationships based on reciprocity, shared interests, and interdependence [9].

Barcelona offers an example of a city that uses collaborative governance to manage private firms and universities in a Smart City initiative. Barcelona has transformed 200 hectares of an old industrial area into an innovation district to promote the collaboration within, and international projection of, the companies and institutions present. By partnering with private business, academic institutions, and other

organisations the city hopes the district will become an engine of a new productive centre of Barcelona. Collaboration is fostered in shared spaces for the exhibition and cross-fertilisation of ideas and support services for entrepreneurs, alliances for networking, and access to venture capital and funding resources.

Furthermore, Barcelona views the 22@ initiative as a network organisation lacking the strict governance that plagues traditional public procurement. While municipal organisations head each of the knowledge clusters of media, information and communication technologies, medical technologies, energy and design, the city seeks to maintain a flat governance structure and simply takes a lead to facilitate collaboration. The public sector looks to guide and assist private companies to ensure that proposed projects meet the aims of the district, while leaving much of the control in the hands of the collaborators. The overarching aim of the city council is to create an environment that fosters innovation, improving the health of the businesses within the district and Barcelona as a whole. To achieve this aim, the city lets its partners operate as independently as possible in a collaborative framework.

Conclusion

Private firms and governments alike are embracing open innovation strategies to realise the benefits of collaboration. Though governments lag behind the private sector in making this shift, we see some of the same strategies being adopted. Initiatives encouraging collaboration, the development of platforms to attract partners, and new forms of governance are necessary for these open strategies to be successfully implemented. Helsinki, Amsterdam, and Barcelona represent three cities in the early stages of implementing innovation strategies in the public sector. We have cited some of the same mechanisms operating is these cities that have proven successful in private firms. Further study and time will tell if the benefits of open innovation will be realised as fully in the public sector.

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2.4 Innovation partnerships for next generation public services

Innovation partnerships between public and private entities are at the heart of in the European 'Innovation Union' strategy. The Innovation Union highlights the need to revolutionise the way Europe's public and private sectors work together to create services of societal value, notably through innovation partnerships between European institutions, national and regional authorities, and business. Despite the strong focus on the partnerships, there are still few examples of successful European level collaborations. Thus, the question remains: How to best support sustainable, value adding partnership strategies in Europe?

The current economic climate places the public sector in Europe under immense pressure to innovate high-performance public services to address the prevailing societal challenges. The traditional means of service creation and delivery have been disregarded as inadequate and ineffective, and new alternatives are being considered. Simultaneously, the expectations of the public are growing exhaustively. Users demand services of exceptional quality and technical expertise, delivered with great customer experience, while produced in an ecological, inclusive and economical manner. The increasing demands accompanied with the growing demand for transparency, accountability and openness highlight the need for experimentation with new models for collaboration and co-creation with companies and citizens.

This increased focus and instrumentation on innovation partnerships has triggered a renewed interest in different disciplines to understand processes, logics and incentives that can make such partnerships possible between the public, private and third sectors, and citizens, in order to create innovative public services [1] [2]. Furthermore, the European Union has been active in supporting the development of new partnership models to replace the traditional public-private partnerships. Numerous instruments have been launched in recent years, in an attempt to engage all relevant stakeholders in the development, and thus ensure impact and sustainability of the partnerships. The European research scene is becoming increasingly sophisticated and ecosystem-based, which means that the best practices transfer faster to less mature users as well. Experiences from the new European partnership models are starting to accumulate to an extent where it is possible to make a value assessment of their effectiveness and impact at both regional and European level.

Innovation partnerships

The most advanced innovation partnership models aggregate research, development and innovation perspectives, and engage multiplicity of actors, including strong European industrial stakeholders, academia and innovative SMEs. Examples of this type of partnership models, targeted especially for the benefit of public sector, include the new European Public-Private-Partnership Programmes (PPP), Living Labs (LL) and Pre-Commercial Procurement (PCP). The models recognise that innovations seldom occur in a single dimension, but are most often accompanied by innovation in other dimensions, and thus the impacts to prevailing networks and structures must be carefully considered. Europe has a long tradition of services provided by the public sector, which means incidentally deeply rooted traditions and structures for providing them. Changes in these service creation systems require changes in the perception of the public sector role and mandate. Thus, the first steps in the innovation partnerships typically include creating common culture, language and norms.

While the benefits of the partnerships are evident, public sector participation and activeness remain the limiting factors. The recent studies on various instruments for public-private innovation have taught us that we need to be more specific on what instruments to use in various contexts. This brings us to the age-old question of what should be developed nationally or regionally versus on the European level. While the trend in Europe is towards increased cross-national collaboration, the regions are similarly creating specialisation strategies based on national and regional ecosystems and assets. The key success factor for partnerships is to leverage the benefits of both dimensions and intelligently combine various instruments and collaboration models depending on the challenge at hand.

Experiences from European open innovation partnership models

Systematically applied research and innovation methodologies and supporting tools provide organisations with a controlled environment for collecting, modelling, analysing and storing qualitative user-generated data in various contextual settings. The European Commission is also increasingly instrumenting research on the development of methodologies and modes for new types of innovation partnerships, like Living Labs, pre-commercial procurement and public-private partnership programmes. The following summarises briefly the

recent findings on the implementation of these instruments.

Living Labs

The Living Lab approach has gained significant momentum in recent years, and is becoming a standard part of European Commission research projects. The establishment of the European Network of Living Labs has further cemented the Living Labs position in the European and, also, increasingly, the global, research scene. The approach addresses the identified need to engage users more actively in the development of novel products and services, and thus push user-driven and open innovation. The focus is on mature technologies, operating close to market, thus the outputs are less predictable and tangible than for investing in infrastructure and services.

The approach has traditionally been proposed for use in all parts of the innovation cycle; however, the recent findings from the European Living Lab projects, like APOLLON and SAVE ENERGY, support the notion that the approach is probably best suited for cases that call for user behaviour transformation, crowdsourcing or business model innovation. The behavioural changes take place at individual and group level, and thus the Living Lab approach, as an instrument for micro-level impact creation, is a well-suited approach. The Living Lab environment also creates a platform for simulating business models and go-to-market strategies in a low risk, but real-life environments. The recent Smart City cases have further indicated that the approach could also yield more value in terms of competence development and redefining the roles and relationships between the public and private entities than as a vehicle for service or solution development that is typically piloted in the cases.

A good example of such implementation of the Living Lab approach is the recently finished The SAVE ENERGY Project (238882-CIP-ICT-PSP-2008). The purpose of this project was to develop and implement energy efficient solutions in public buildings. The intrinsic challenge was how to make the user change their energy-consuming behaviour when they are not directly involved in the payment of that energy. To address this challenge, real-time energy consumption monitoring and public displays were implemented in the pilot buildings. This made users more aware of their consumption behaviour and actions that can trigger energy savings. The approach was piloted in real-life environment in longitudinal case studies. As the project finished with actual measured 20 % savings, the assumption that the approach is well suited in such contexts was considered validated.

The SAVE ENERGY project also showcased a case for public-private innovation. In the project, the parties deployed applied the Pre-Commercial Procurement (PCP) model. In the pilot sites, various partners and suppliers were used to solve a common challenge. The development was partly funded by the European Commission, and partly by the participating entities. However, due to the project constraints, it was not possible to implement the benchmark solution in multiple sites. Public authorities will use the SAVE ENERGY manual as a guideline for procurement in energy efficiency solutions in the pilot locations. Public authorities have expressed their interest in extending the implementation of these solutions in other buildings, which indicates that this type approach has potential to become a permanent practice in public sector innovation.

The risks that the Living Lab approach as a phenomena is facing, is the lack of standardisation and criteria for Living Labs. As the term can mean different things in different contexts and target groups, there is a risk that the approach is diluted, and thus the value proposition becomes impossible to communicate. Most of the Living Labs also lack sustainable business models, since they operate on project-based funding or as a part of universities or regional development agencies. The European Network of Living Labs is addressing this concern through tight criteria for Living Labs that can carry the ENoLL brand, as well as through establishing thematically focused subnetworks, where the added value and focus are clearly defined.

Pre-commercial procurement

Pre-commercial procurement has been considered as a new and potential instrument for renewing the way public sector innovates. Pre-commercial procurement is one of the strategic instruments for renewal in Europe, and is expected to give a boost to European Member States in the demand for innovation, and at the same time promote lead market initiatives. Communication ([COM(2007) 799) from the European Commission stated pre-commercial procurement to be the main instrument for driving innovation to ensure sustainable high-quality public services in Europe.

PCP can be described as a model for procuring innovation, and thus accelerating the renewal of public sector services and infrastructures. The process is driven by public demand, and the solution is attained through the utilisation of knowledge available among potential suppliers.

In this approach, the final solution is initially unknown, and therefore involves uncertainties and risk. However, while PCP has been identified as strategic, it is still an emerging practice. Results from several surveys carried out reveal that the PCP concept is still new to most public procurers, and its practical implementation is often perceived as an unfamiliar procedure. Awareness and lack of competence still constitutes the main barrier for the implementation of PCP. There are also significant differences in implementation among the various European countries, which indicates that the local context plays a factor in implementation.

Yet, there are also inspirational benchmark cases from the various Member States. Also the community of PCP researchers and practitioners is steadily growing and mobilising. The benchmark case here comes from Denmark due to its focus on user involvement and innovation. Danish policies on public procurement up to 2005 concerned mainly efficiency aspects. The relatively modest interaction between the public sector and private companies was identified as a problem to be addressed. The success in doing so is manifested in several reports, especially in the health sector. The products in the sector are often low-tech or mature technologies, which need adjustment to the context of the products, as well as the service delivery ecosystem surrounding them. As such, the living lab type of user-driven approach is well suited for the purpose due to the nature of the area.

In the Danish case of 'The hospital bed of the future', PCP was used to develop an innovative bed that would enable nurses to spend more time with patients. The project has also other societal and economic objectives; to contribute to innovation in the public sector, and motivate social entrepreneurship regionally through cross-sectional partnerships. The project was kicked off in 2009 with a public call for tenders, and since then has involved various actors in its regular interaction and learning cycles. The final bed solution would integrate scales, humidity sensors, and screens for television, and computer/Internet access. Development was carried out with real users, and the user interaction was not only used as a way of testing developed prototypes, but also as a means to get insights at the beginning of the project. The project is ongoing, but the experiences to date have helped to highlight numerous success factors for PCP cases in general. These involve patience and trust from the purchasers' side, since such arrangements are time-consuming and laborious to develop. Secondly, the role of local champion, a dedicated project owner, was a key factor contributing to the success of the experiment. Thirdly, the commitment of the relevant and actors with thorough knowledge of the field enabled continues development and value adding dialogue.

The first European Commission-funded Collaboration and Support actions on PCP are nearing their term, and each new framework programme call includes increasing funding for PCP. This accumulating knowledge base will help overcome the identified challenges, and help the community to better define the best implementation arenas for PCP.

The European public-private partnership programmes

The recently launched European Commission public-private partnerships for research purposes aim for sustainable European level impact in forms of increased harmonisation and standardisation, accelerated market acceptance, as well as the creation of a solid evidence base for European level policy recommendations. Impact is created through large-scale experimentation and clear focus. While the PPPs cover many different forms of organisations, the focus is on public sector infrastructures and services. It is important to distinguish between traditional PPPs in Member States and the special PPPs for research purposes set up at European level, since the focus is entirely different.

The philosophy in these partnerships is that complementary foreground created is shared among those contributing to its development. Knowledge sharing is ensured by jointly agreed rules of engagement listed in an agreement, signed by all parties. The objective is to accelerate European level development and competitiveness, but also support open service innovation at local level. Thus, the PPPs provide opportunities for research-based entrepreneurship, building on the developed concepts. The programmes support the process through matchmaking events, services and methodologies for collaboration, as well as access to state of the art technologies and research.

Latest of the launched European PPP programmes is the Future Internet PPP. The programme has explicit objectives beyond those of the single projects within the programme, and thus aims for large-scale impact on the Future Internet development in Europe, as well as for the implementations of the single market and Digital Agenda for Europe. Following its user-driven nature, the Future Internet PPP also presents an unprecedented platform for public-private partnerships and collaborative innovation. The programme builds on the principles of openness, transparency and sharing,

which is ensured further by a collaboration agreement signed by all parties. The Living Lab approach will be experimented with by several projects in the pilot phase, and societal impact is further ensured through recommendations on policies and regulations related to public sector information and infrastructures.

The PPPs are still in their early phases, but despite the broad-based partnerships, there are concerns regarding the low level of public sector participation. The collaborative service creation with numerous organisations that have not worked together in the past requires time to create common culture and norms. During the first stages of the programme, the partners have been occupied with building the foundations for collaboration at both project and programme level. The real content creation has also been kicked off, and shows enormous potential, as least for some of the collaborators. The programme partners have also identified niches for unexpected innovations for the later phases of the programme. The early experiences also highlight that the collaboration itself has its value through learning and network-building among the partners.

Summary

This analysis further highlights the complexity of the innovation partnerships, and gives evidence in a short synthesis on the success factors to consider when creating innovation partnerships.

- It would need to be made explicitly clear what the objectives and outcomes of the projects are. Establish the rules of engagement in order to ensure commitment and ease the move to the commercialisation phase. Public sector innovation must be made for profit!
- Bottom-up approaches need to be stimulated further in order to make sure that current market needs are taken into account. Users really must be placed in the driver's seat!
- Concerns regarding research silos and asymmetry in implementation are justified. More multidisciplinary research and platforms for continuous cross-industry exchange are needed.
- Partnerships take time, and the partners must be accepted as they come. The collaboration can take years to mature, but this institutional learning also has its own value.
- Phasing the results is of essence. The partnerships are built for long terms, but they must create results even in the short term in order to create spirit and keep the partners motivated.

Successful partnerships build on mutual strengths and assets, and focus on specific tasks and objectives. The partners experiment with different collaboration models in an attempt to find the model most fit for their specific environment and cases. Active screening and participation in the European programmes ensures that the developed services are up to global standards, and also have potential outside home markets. Only this will ensure that the developed services will meet the requirements and needs of the future users and customers.

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CHAPTER III

Interesting cases and examples

3.1 Idea Crowdsourcing at Nokia — 12 months wiser

Introduction

Nokia recently participated in the Service Innovation Yearbook 2010–2011 [1] by presenting some facts on the usage and the benefits of Nokia's internal and external crowdsourcing. At that time, Nokia's first established external crowdsourcing service, IdeasProject, was readying for launch. This article continues from where the last one ended by discussing the main findings from the opening of a global idea crowdsourcing service.

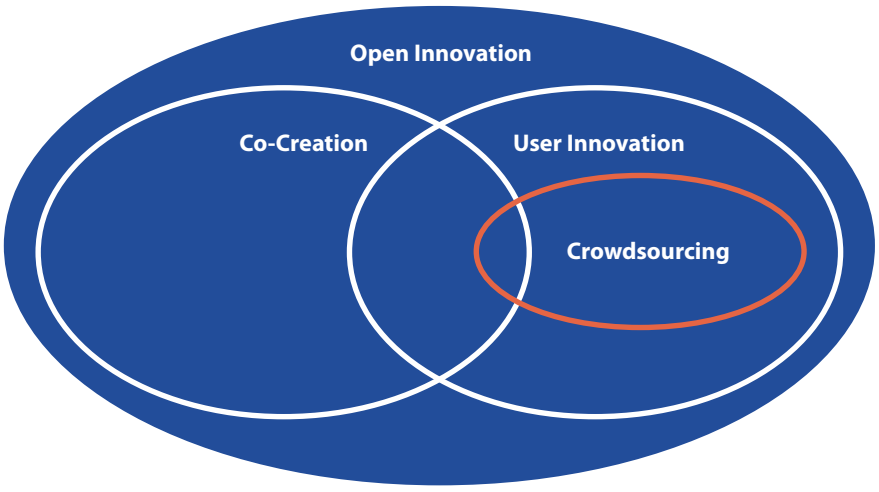
Nokia sees idea crowdsourcing as being at the centre of social media and open innovation [1]. However, in their White Paper on the IdeasProject, Aitamurto, Leiponen and Tee [2] set crowdsourcing in the wider context with different ways to practice open innovation (Figure 1).

Schenk and Guittard provide an alternative typology of crowdsourcing, they distinguish between integrative and selective crowdsourcing. For integrative crowdsourcing, the goal is to pool vast amounts of complementary information from a large number of users (e.g. OpenStreetMap, Ushahidi). On the other hand, for selective crowdsourcing, the goal is to identify and select input from competing users. The latter might take the form of an idea contest or other type of open competition [2]. Nokia's approach to idea crowdsourcing utilises both integrative and selective way of executing crowdsourcing, that is especially *idea* crowdsourcing [4] contains both dimensions.

Opening of the external idea crowdsourcing service

IdeasProject [5], Nokia's idea crowdsourcing service for an external audience, was opened at the South by Southwest festival in March 2011. By the end of November 2011, in nine months, it had gathered 7 500 ideas, 14 000 community members, 6 000 comments and 37 million page views. Some 12 idea challenges around various themes were conducted in IdeasProject, including two challenges that ran in

Figure 1. Crowdsourcing, Open Innovation, User Innovation and Open Source [2], modified from [3]



Nokia's China version of IdeasProject. All completed challenges have been analysed with text-mining combined with clustering and regression analysis. In addition, three challenges have been data visualised with the help of neuron networks. As an example of a qualitative indicator, five of the seven winning applications of Nokia World 2011 Hackathon originated from IdeasProject ideas.

In comparison, Nokia's internal idea crowdsourcing service, Nokia Sphere, had collected approximately the same number of ideas in three years from Nokia's internal crowd of 60 000 employees. In one case, both internal and external crowdsourcing has been used to solve the same challenge, to discover new, radical ideas to solve the mobile power and battery problems. Both challenges received approximately the same number of ideas. Interestingly, according to the jury, the ideas by the external crowd were generally better than ideas coming from the Nokia crowd, experts of the field.

Three questions about setting up a successful idea crowdsourcing service

In the White Paper *The Promise of Idea Crowdsourcing — Benefits, Contexts, Limitations* with Imperial College London and Stanford University [2], the authors raise three interesting questions.

1. How to design crowdsourcing processes that match the relevant characteristics of the firm, the problem, required expertise, and the competitive environment to calls?
2. How to define the calls in a way that enhances user group targeting, user appeal/motivation, and quality or appropriateness of solutions/inputs?
3. How to integrate these processes with internal innovation systems, and with other open innovation practices?

Each of the questions is discussed below from IdeasProject's perspective.

Matching the IdeasProject with Nokia

When it comes to the matching the 'philosophy' of idea crowdsourcing with our company, one could clearly see a great fit between Nokia's great heritage in the open source, industry standardisation and truly 'connecting people' and what IdeasProject is all about. Also, the problem or *a challenge* that the crowds are invited to solve, is described with a tone of voice that resonates with the life sphere of the audience, in this case, the growing IdeasProject community. The domain of IdeasProject service is defined relatively broadly — *how to ideate in the world of mobile Internet*. All challenges, how heterogeneous

Figure 2. Nokia's IdeasProject identifier

they may look at first glimpse, are clearly expressed and intertwined with mobile Internet.

When it comes to the expertise of the participants, the bar is set low: we do not wish to exclude anyone. Nowadays, there is a continuity of different types of identities and roles starting from the users being anything from consumers to enthusiasts, hobbyists, start-uppers and developers. No-one is 'just a consumer'. By teaming up with the Stanford University, the ESADE and the Lappeenranta University of Technology, we are studying the orientation, motivation and background of the community members in order to jointly serve their interest better.

From an individual's point of view, participating in idea crowdsourcing requires more commitment and effort than the mainstream social media services, such as Twitter and Facebook. In general, the participant must be passionate about his/her idea, needs to be skillful enough to verbally (and/or visually) explain the idea and trust the community and the service provider (IdeasProject in this case) in a way that he/she believes it's good for him/her and for the idea to be exposed by the influence of others.

We are in a tough competition over the share of people's minds and time. This means, that the community members are a very unique group of people — and from the engagement perspective — creating great brand stickiness. Every time a member visits IdeasProject, he/she spends more than 10 minutes on average engaging with the service, while site visits to other Nokia sites are measured in seconds. Competitions, or challenges, as they are called in IdeasProject, are a way to goad the quality and quantity of ideas shared within the community.

The call

In their second question, Aitamurto et al. [2] raised a question of defining the call in a way that it

enhances user-group targeting, user motivation, and quality or appropriateness of solutions.

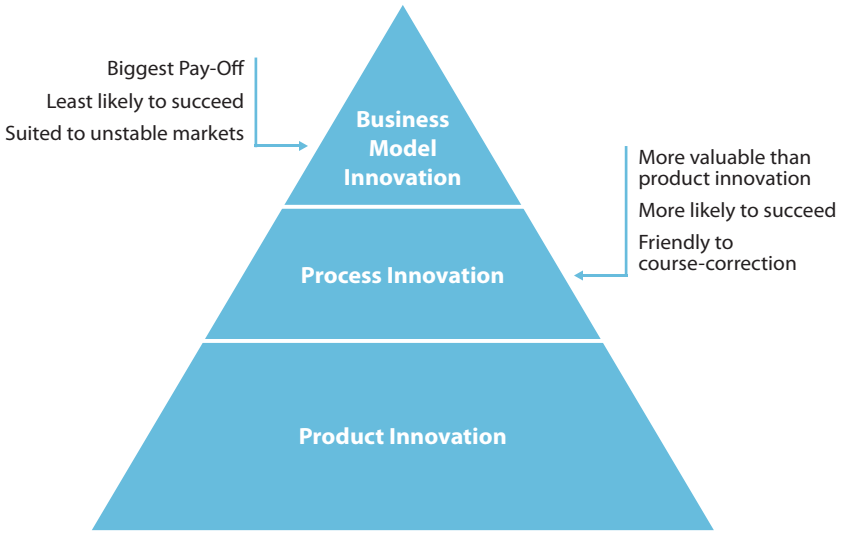
As mentioned previously, 12 idea challenges have been conducted in IdeasProject. Prior to each challenge, we identified relevant organisations suitable as partners. Partners bring their communities, communication channels and expertise to be utilised when evaluating the ideas. For example, our recent Earth Hour challenge appealed to members mainly from WWF's existing community, while our 'Apps to Empower Women' challenge brought members from the DLD Women conference. However, even if challenges are promoted mainly to currently relevant, separately-targeted people, we've obtained a gradually growing core group of users who participate in all the challenges, no matter what the subject, or how the call is defined. These people have clearly identified themselves with IdeasProject's community.

Generally, we've learned that challenge participants are motivated by one obvious factor above the rest. Regardless of what Daniel Pink says [6] about impact of extrinsic motivations to creativity, small tangible rewards such as Nokia's newest mobile devices have motivated people more than any other reward. However, the reward must always match with the target group. For example, mobile lead users and enthusiasts submitted 2 500 N9-related ideas to win one of 15 N9 devices given away over a five-week period. That was two and a half times more ideas than in any other challenge, and this was accomplished in a considerably shorter time. Five users used the Twitter social media service to tweet thousands of times to win a Nokia N8 device over the summer — the winner alone made 18 000 tweets. Then again, smartphones motivated less than 100 people to share ideas regarding sustainability and female-oriented apps. It has to be noted though that people interested in sustainability and female-oriented apps most typically aren't tech-savvy and for them to imagine what applications could be used for might be more challenging.

With regards to quality or appropriateness of solutions, we've learned that quantity should never be rewarded or encouraged: at least not if the potential reach of each idea is on a scale of one's Facebook friends. Users motivated to win are willing to put in incredible effort to collect 'likes' or 'page views' if the winner is defined based on popularity. The possibility to play the system not only leads to a risk of rewarding an idea which is not the most innovative one, but also reduces the motivation of innovative community members to participate. The community also expects the organisers to reward the effort in relation to received input. All ideas must be read and carefully evaluated. We've noticed that the best solution is to combine the wisdom of the crowds (when simultaneously engaging users) and the wisdom of the jury — when selecting a winner, the jury selects a few most promising ideas and lets the community detect the pros and the cons for each. The jury chooses the final winner based on the community's input, but not the quantity — only the quality.

Finally, the core users who participate in all the challenges seem to also be motivated by various

Figure 3. Nokia is looking for all kinds of innovations



Source: Christian Hamilton, ILO: Speakers Series Feb 29 2008

intrinsic motivations, such as feedback by the challenge jury, competing with other users, recognition by IdeasProject staff and respected peer users, and seeing their ideas becoming real [7].

Integration and open innovation practices

The sixty-four thousand dollar question is how to integrate idea crowdsourcing with internal innovation systems, and with other innovation practices [2].

In practice, idea crowdsourcing could be used to seek many kinds of ideas as raw material for innovations, allowing them to be product, process or business-model innovations (Figure 3).

In order to justify why idea crowdsourcing makes sense, the content of activities including challenges and partners should be aligned with company strategy, such as Nokia's 'Power Challenge' (How to find the best solution for extending battery life), 'Create for Millions' (apps for S40 OS markets — high growth, developing markets) or how to use open data and build apps on top of that, fulfilling the quest of strategic fit to Nokia. Some 50 % of participants are between the ages of 18 and 29, which is Nokia's exact target group, though men are currently more represented (83 %) than women (17 %).

The next step is to find 'the needle in the haystack'. As mentioned earlier, Nokia uses text mining combined with clustering analysis. Most used terms in the data set are calculated and the terms are reduced to their basic stem applying a stemming algorithm. Terms used in clustering are then hand-picked from the list of most frequent words so that they represent the issue at hand. Using vector-space model, each idea is represented by a vector of frequencies of the remaining terms weighed with the position of the word in the document (word position: the earlier in the text (title+description), the more weight is assigned to that word).

Presentation/data visualisation of ideas is also crucial when 'making sense out of ideas'. Ideas are presented in a two-dimensional 'idea map' or 'idea sky'. Ideas similar to one another (based on the analysis described previously) form 'themes', which can be shown with colours and different shaped markings. The country of origin is expressed actively in the data visualisation, so that Nokia developers can be inspired by the ideas coming from their own geographical location and develop apps for local needs (Figure 4).

Ideas are analysed for business development, strategy, R & D and consumer analytics and insights purposes. Week signals and 'evidence' to identify the next mega trends can be found within the community, as can wisdom of the crowds. In-house jury members of the challenges (please note that 75 % of jury members are non-Nokia recognised thought leaders) are the greatest advocates in selling the methodology and results to senior leaders. Nokia's CTO is leading certain research areas and cross pollination of different community members all over the world from 204 countries and autonomous regions. And, as mentioned earlier, the Nokia developer community is a regular customer for

Figure 4. Visualisation of IdeasProject ideas

the best ideas. For a developer, the geographical understanding of where the idea evolved is crucial. This indicates the maturity of the market and user experience preferences close to their business.

Conclusions

Idea crowdsourcing's approach has already shown its potential at Nokia, but to be fully exploited takes time and needs some more research. As we concentrated here solely on the idea crowdsourcing, the business model and different methods have multiple potential variations like gamification, crowdfunding, microwork or prediction market place.

Gamification refers to the use of game design techniques in non-game applications and processes to solve problems and engage audiences [8]. With some elements of gamification, such as virtual badges, trophies and leaderboards, we're able to reward IdeasProject community members in a way that is free but still more engaging. We could build an entire game around the process of making ideas coming to reality, in which only the best and most refined ideas see daylight and get rewarded. The tasks of the process of implementing ideas could be divided into simple microtasks which can be completed via the Internet anywhere by anyone [9]. For instance, anyone with an Internet connection could help us to define use cases for ideas and anyone with image manipulation skills could help to sketch the ideas. Even programming [10] and financing [11] of the end product can be crowdsourced. The concept of prediction market place is one way to challenge traditional consumer research companies even if one should think that none of the practices should exclude another. For example, when crowdsourcing started to be used for translating languages and for the localisation of Internet services and apps, state-of-the art translation companies added *language crowdsourcing* to their repertoire.

However, even surrounded by tempting Internet buzzwords and phenomena, we must keep in mind the fundamental reason for the existence of IdeasProject: the people. Ideas are nothing alone but people make them real, as people define which ideas provide extra value to their lives.

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3.2 How cloud computing can take service innovation to the next level

Much of the last century was characterised by growing industrialisation and consumption: the planet's population multiplied by four in that time, while European economies grew by 10 times. Meanwhile, materials use rocketed tenfold and fossil fuel consumption by 16.

These trends continue today and, as a result of the subsequent urbanisation, around a million people per week worldwide are moving into cities, many of them burgeoning middle classes in emerging economies. Globalisation, lowered trade barriers and the advent of the Internet have helped to dissolve borders and other barriers to trade. Innovation itself has changed, as firms and institutions of all sizes begin to operate in interconnected ecosystems where traditional boundaries evaporate. No one company can go it alone. This is the era of open innovation.

We Europeans began a transformation in our economies some decades ago: more than two thirds of our GDP is now in services. As emerging economies grow stronger, it is clear that Europe must build on this experience in services to retain a competitive edge. The way we employ technology is going to be more important than ever.

Today, there are more transistors on our planet than grains of rice, embedded in things we might not even recognise as computers: phones, cars, appliances, even bridges, roads and waterways, all linked together in networks as parts of increasingly complex systems.

As a result, the amount of data we are generating is growing exponentially — tenfold between 2007 and 2010 alone. We see no let-up in that rate of growth. High performance computers, in turn, are able to mine this data for intelligence and insight. Set this technology trend against the changes going on in the business world: only two of the world's top 10 largest companies in 2000 remain on that list today, as the world's competitive landscape reshapes. Citizens, meanwhile, have become more demanding in the services they require from business and government institutions alike.

In this context, I believe the emergence of cloud computing stands out as one of *the* key technological advances of the last 30 years — and could greatly reshape all service industries.

The benefits of working in the Cloud have become well understood. Machines and applications become 'virtual,' as cloud computing obviates the need to store and replicate them on hard-wired machines in each and every enterprise. By making computing power accessible via a network, the time required to install a database in an enterprise drops from one day to approximately 12 minutes; installing an operating system falls from 24 hours to one. Meanwhile, the time taken to design and deploy entire business applications tumbles from months to weeks or days.

The Cloud's key benefits are rightly identified as rapid delivery, efficiency and — because it is far easier to stitch together new applications on the Cloud — integration. But there's something even more interesting at play here: the way technology is delivered has the potential to change the game in every industry.

Take the University of Bari in Italy as an example. This venerable institution, founded in 1925, is located in Puglia, southern Italy. It is organised into colleges covering agricultural science, arts and philosophy, biotechnological sciences, economics, educational science, foreign languages and literature, law, mathematics, physics and natural science, medicine and surgery, pharmacy, political science, and veterinary medicine.

The university has forged a Cloud solution, powered by an advanced IBM zSeries server running Linux, which is designed to help communities and small businesses in the region. It is working with a handful of local industries — fishing, wine-growing and transport — to explore how traditional businesses can adopt new ways of working.

As a result, fishermen in the region are now able to report their catch using mobile devices that link, via the Cloud, to live auctions which serve local markets and restaurants. Any catch is then pre-allocated, processed and packaged, while still at sea, in the most appropriate way.

Close by, a local logistics company is employing sensors in cargo wagons to determine temperature, humidity and even vibration in transit. This data is made available via the Cloud to help managers ensure even the most sensitive goods are delivered in first class condition.

Meanwhile, in vineyards that overlook the Adriatic Sea, data from soil monitors is transmitted to the Cloud. Isotopic soil monitoring enables wines to

be categorised by characteristics which determine grape colour and taste. Constant measurement and feedback helps growers improve the quality of their wines. The monitoring equipment also provides information about the origin of the grapes for an academic research project.

Security is at the core of design of the platform, allowing it to meet some of the highest levels of certification in the industry. This enables the university to deploy each project in its own virtual server, knowing that it is isolated and independent from the other virtual servers in the system. Knowing that sensitive data and assets are secure and protected with leading cryptographic and encryption technologies provides the university's clients with an unparalleled level of confidence.

Only now are we seeing the emergence of these kinds of business applications which can be started simply and grown fast. Fundamentally, cloud computing allows the University of Bari's students — and other developers — to concentrate on building new services, rather than worry about high-cost infrastructure-related issues. User requirements lie at the heart of the approach.

This rush of innovation is at the heart of the cloud computing revolution. The way technology is employed — and delivered — changes fundamentally. We are moving from a world where the big eat the small to one where the fast eat the slow.

But all Clouds are not the same. For example, IBM employs more than 200 researchers worldwide on cloud security and privacy. We have 11 cloud laboratories globally and six cloud data centres — including several in Europe. Last year, we managed more than 13 billion security events for more than 4 000 customers per day. That's why our own SmartCloud approach is to allow clients to define their own performance requirements, based on factors that include not only security and compliance with data protection rules but performance, downtime-avoidance and preferred technology platform too.

There remain a couple of technical and regulatory issues to consider. The European Commission's proposal for a new ICT standardisation policy as part of the new EU Regulation on standardisation is an important element in this context. It allows for referencing global open standards by public authorities in policies and in procurement. As much as anywhere, we need *open* standards in the Cloud — not any one company's proprietary system — so that interoperability remains sacrosanct. We also require a committed, realistic and progressive view of data privacy. The Cloud may transcend borders, yet it must not be above proper jurisdiction. The European Commission is working hard to provide clarity on this point.

I believe Europe fulfils all of the conditions required to capitalise fully on cloud computing. More than two thirds of our economy is already services-related and, as we've seen, cloud-based applications are highly appealing to developers of innovative, automated service offerings.

At the same time, more than 100 European universities now offer degree programmes in Service Science, spawning a new generation of students to build the service systems of tomorrow. We certainly have the building blocks in place to capitalise. Now, is there the will?

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3.3 SAP Research Living Labs — a perfect infrastructure to drive open innovation

BASED ON THE EXAMPLE OF THE SAP RESEARCH FUTURE FACTORY INITIATIVE

Introduction

SAP Research is the global technology research and innovation unit of SAP, with a network of 19 research locations worldwide. By exploring emerging IT trends, we significantly drive innovation for SAP and its ecosystem. Activities span from collaborative research with academic partners to co-innovation with industry partners and customers. The best validated results and technologies are further developed into prototypes and potential business opportunities.

The business model of SAP Research is based on co-innovation through collaborative research. We currently have a global community of more than 800 partners from industry, academia, and governments as well as SAP customers. Besides contributing to external projects (bi- and multilateral, publicly funded and grants), our researchers collaborate with SAP's development and field organisation on internal projects transferring and implementing the research results.

Since 2001, the European Union has been supporting a new paradigm for technological research — the Living Labs. This concept is designed to boost open innovation by ensuring that all relevant stakeholders, including end-users, are closely involved throughout the research and development process of new products and services.

Driving the concept of Living Labs as collaboration platforms for open innovation, SAP Research has been successful in bringing together customers, partners, SAP researchers, and developers for in-depth collaboration and discussions on various current topics. The concept involves demonstrating technological research in real-world settings, turning prospective SAP solutions into tangible experiences [1].

Open innovation — there is no other way to go at SAP

Universities, academic institutes as well as industrial companies, have been aware of the need for 'open innovation' for years. As many others before, the author of this article would also like to refer to Henry Chesbrough, who formed the term 'open innovation'. Within his book, *Open Innovation: The New Imperative for Creating and Profiting from Technology* (2003), he describes how companies have shifted from so-called closed innovation processes towards a more open way of innovating [2].

SAP strongly relies on the open innovation approach and runs its global technology research unit, SAP Research, which is part of a worldwide collaborative network of partners from industry and academia, accordingly.

Considering Chesbrough's statements, that business development processes and the marketing of new products within firm boundaries is limiting the reach of innovation due to the closed environment that people are working in, we do believe that a pool of highly educated people who have access to the large amounts of knowledge that exist outside the research laboratories and who, at the same time, share their innovative thoughts and ideas with these external sources, is the only way to explore and define new business models and finally step into new markets (Figure 1).

Open Innovation is, therefore, nothing more than the combination of internal and external ideas and paths to push the development to new technologies to new markets.

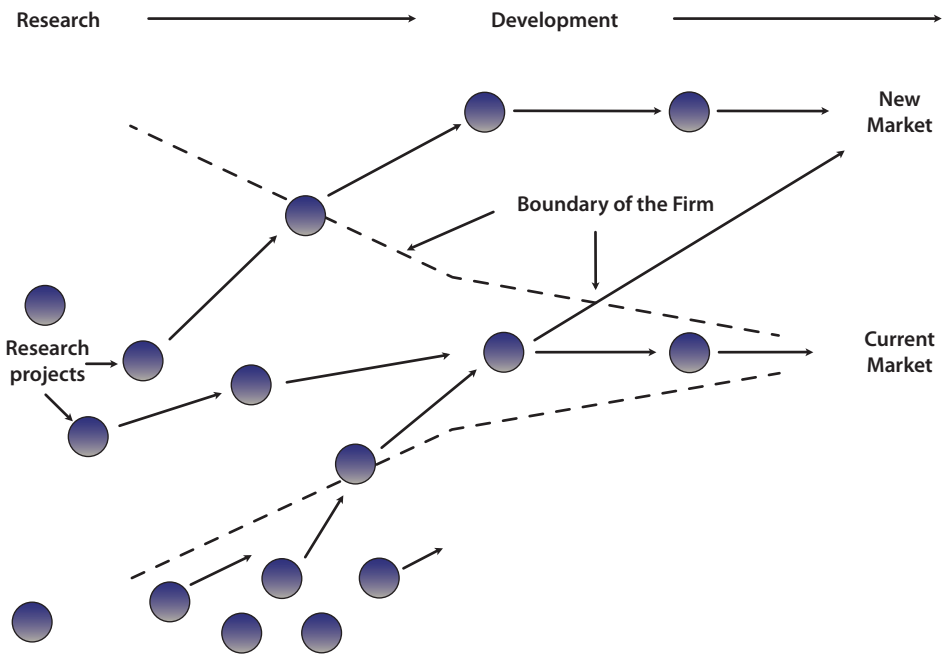
From the beginning, we also looked into other ways to increase our efficiency and the effectiveness of our innovation processes. Not just through active searching for new technologies and ideas outside of the firm, but also through cooperation with customers, partners and even competitors, in order to create customer value.

Many aspects need to be taken into account such as public policies, the management of open innovation and the underlying networks, cultural diversity, etc., which are described in many articles [3]. In the end, it is key to have a clear process that all partners adhere to (Figure 2).

From ideas to solutions — how SAP Research Living Labs speed up open innovation

The motto 'SAP to touch and explore' describes best our efforts with our SAP Research Living Labs as collaboration platforms for open innovation. SAP Research has established five Living Lab locations in Australia, Germany and Switzerland, and applies the living lab methodology to the field of emerging economies in South Africa [1] (Figure 3).

Figure 1. Chesbrough model of open innovation



All these Living Labs have been built to foster the collaboration with customers, partners, researchers, developers and further stakeholders. Being a research and development platform and, at the same time, a demonstration environment for innovative technologies in a real-world setup, they are extremely valuable to all players. Ideas and concepts that are brought to our Living Labs are turned into tangible demonstrators and prototypes which make it much easier to gather and integrate feedback and improvements. Thus, potential customers and partners can directly impact the research and development process while it is progressing.

Figure 2. SAP Research Process (© 2011 SAP AG)

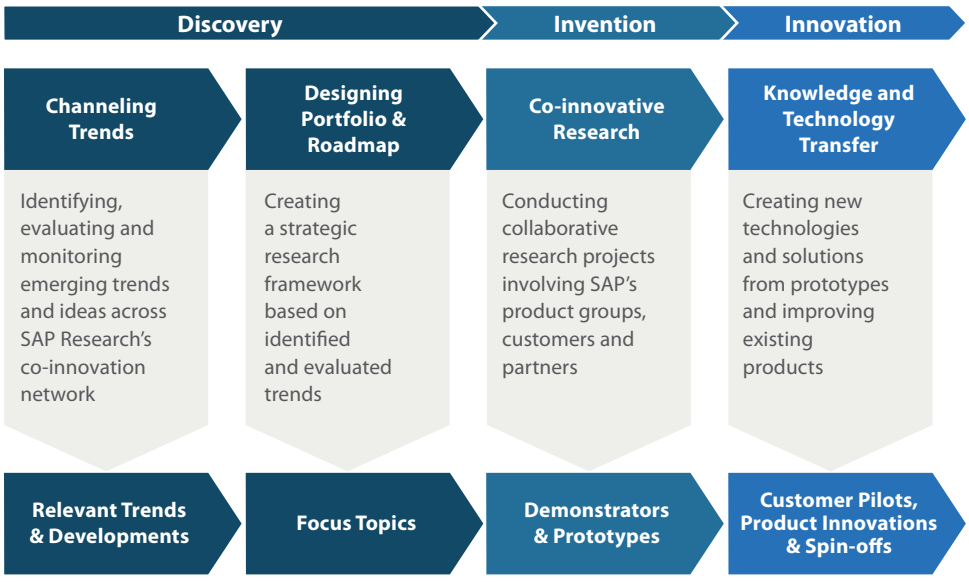


Figure 3. SAP Research Living Labs (© 2011 SAP AG)

Case study: the SAP Research Future Factory Initiative

The SAP Research Future Factory Living Lab was founded in 2008. Starting with a few devices that SAP received from initial Future Factory partners it evolved to a real-world factory setup. In the meantime many innovative companies, small and medium-sized companies (SMEs) as well as large enterprises, from the automation and process industries became Future Factory partners.

As outlined above, this diversity of stakeholders ensures that a business or research challenge or requirement will be observed from many different angles. Of course, for the most part, the initial idea is an individual kick off so to speak. But then many people contribute with their thoughts and ideas to solutions built that consider more facets of innovative enhancements as though the individual with the initial great idea would pursue alone.

Actually, the SAP Research Future Factory consists of more than 30 different scenarios that combine such innovative thoughts and technologies. In addition, many publicly funded projects use the existing infrastructure to build their project-specific prototypes meaning that not just the Future Factory initiative core partners interact with each other but also companies as consortia partners which then use the results for their project-related purposes.

Not only projects which are directly focusing on innovative technologies are drivers for our Living Labs. Open Innovation will also consider strategic objectives. Recently, the European Commission encouraged the launch of a project called ActionPlanT which is co-funded under the private-public partnership 'Factories of the Future' within the seventh framework programme (FP7). This initiative aims to establish a vision for the role of information and communication technology (ICT) in manufacturing of the future. The ActionPlanT Vision for Manufacturing 2.0 identifies the global megatrends influencing the growth of European manufacturers and proposes new concepts for reviving the state of the European manufacturing sector. The overarching intention is to demonstrate that ICT has a major role to play in resolving some of the most crucial pinch points in European manufacturing. The ActionPlanT Vision for Manufacturing 2.0 will pave the way for a roadmap and strategy, which will identify, prioritise and schedule the most promising research topics in ICT for manufacturing for the next framework programme for research and innovation — 'Horizon 2020', covering the period 2014 to 2020 [4].

The identification of socio-economic megatrends like demographics and consumption, global competition and innovation and all-round sustainability as well as technological megatrends like dynamic collaboration, enterprise mobility, real-world connectivity and manufacturing intelligence will have a direct bearing on European manufacturing. Therefore, projects like ActionPlanT [4] will, of course, also influence the thematic orientation of our work

Figure 4. SAP Research Future Factory (© 2011 SAP AG)

at the SAP Research Future Factory (Figure 4). We are matching the strategic objectives against operational requirements that we get as an input from many discussions with visitors of our Living Lab.

Summary

Our success proves us right. Open innovation is indispensable for companies and their research and development units regardless whether they are SMEs or large enterprises.

With the example of our SAP Research Future Factory in particular and with our Living Labs in general, we can show that collaborative practical work facing the combination of hard and software in a very heterogeneous environment leads to better results in a shorter period of time. All parties derive a huge advantage from the intensive information exchange, knowledge transfer and networking — not just between the industrial and academic researchers but also with customers, potential users and field people like consultants or account managers.

In our opinion, Living Labs are the best method to facilitate co-innovation and to promote and position new concepts, prototypes and demonstrators at a very early stage in their design. This includes both short-term innovation projects and strategic programmes like the above mentioned ActionPlanT project. With this setup, we are looking forward to the future challenges and the many people who will cross our way.

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3.4 Promoting serendipity in research: semantic keyword analysis

The context of this study is the increasing usage of filter mechanisms in the World Wide Web, a concept recently popularised by Eli Pariser [1]. By applying filters to services like Facebook, Google, or Amazon, users are increasingly being fed back information specifically tailored to them, a type of censored feedback loop that, for some, is destroying the promise of discovery that the Web was meant to offer. Though there are necessary advantages to customising the Web to individual users, when applied to research, such filters can be detrimental, and artificially dissuade a 'natural' serendipity that has brought about some of the greatest innovations in history.

In order to make sense of the conflict that now exists between information overload and stringent filtering methods, Hypios has conducted an analysis of different notions of relevance used in different existing systems, to help users discover new, unknown, forgotten and yet relevant ideas. In this paper, we present an analysis of those different 'flavours' of relevance focusing on the applicability of those relevance measures in different user scenarios. We especially identify semantic notions of relevance as promising for scenarios where discovery and unexpectedness are crucial. As a consequence of our research, we have implemented a semantic keyword discovery system called hyProximity to help discover unexpected competence domains, laterally relevant to an innovation problem. We present our system together with the evaluation of its performance in real-life open innovation scenarios with real problems on our problem-solving platform hypios.com.

Introduction

Every day, billions of bytes of information flood our browser, our inbox, our social newsfeeds. And billions of dollars hang in the balance of how to best filter that information. What started as simple search algorithms have redefined the world of advertising. As companies learn more about users, they can predict what they are looking for, what they are most likely to buy, what they are most likely to 'like' and 'dislike'. Because social media *is* at the heart of this revolution. Users are willingly trading private information (i.e. their interests, their friend networks) for filters, virtual damns that let in only the trickle of information they are interested in. The unpleasant alternative, of course, is diving in the chaotic flood of information that the Web has become.

These filters are therefore necessary for our personal use. Recommendation software, for example, has become extremely useful to find out more about a subject, when buying a book on amazon.com (other users purchased these, you might find them interesting) or when reading an article on newyorktimes.com (other relevant articles on the same topic appear below). Yet this goes much further as over 30 % of direct traffic to newyorktimes.com comes from article recommendations on Facebook [2]. For researcher Danah Boyd, the Web's underlying technological structure (filters, social media, etc.) has created what she refers to as 'networked publics', 'a collection of people who share "a common understanding of the world," a shared identity, a claim to inclusiveness, a consensus regarding the collective interest [3].' The problem, in this case, is that these networked publics reproduce may of the biases that exist in other public-social inequalities, including social stratification around race, gender, sexuality, and age [4].

The current Web is ensuring that less of the information that reaches us is random, as serendipity is systematically being eliminated from our online experience. Within social media, our newsfeed provides updates from the friends we already interact with the most. But looking to the near future, the feedback loop they create could clearly undermine the incredible promise of the Web as a tool of discovery.

If for personal usage, locking oneself into a networked public is a problematic question in itself; in research, these filter mechanisms are detrimental to promoting innovation. Writer Steven Johnson is not the first to have taken a keen interest in the matter [5]. He believes the so-called cross-pollination of fields has powered the most innovative ideas throughout history. From the influence of regional wine presses on Johannes Gutenberg, to how coral reefs inspired marine biologist Brent Constantz to develop novel ways of fighting osteoporosis, the examples span centuries of innovation. Their common construct has always rested on the adjacent possibilities of discovery, resulting from the friction between unexpected disciplines or cultural identities; the reason why large urban centres have always been centres of innovation and discovery, powered by the interaction between different perspectives.

To promote this type of interaction, universities and research centres have long been practicing interdisciplinarity and encouraged exchange. However, in the private sector, R & D laboratories often find themselves limited by self-generated filter mechanisms — so-called silos. The Web has provided an incredibly powerful tool to collapse these silos and promote interaction between various actors. One such example has to do with online problem-solving platforms like

hypios.com that rely on crowsdourcing to invite a number of relevant scientific 'networked publics' (biologists, chemists, engineers) to solve specific R & D problems. Recent research has explored the area of open problem-solving and confirmed Johnson's thesis: contrary to what would be evident, 'the provision of a winning solution was positively related to increasing distance between the solver's field of technical expertise and the focal field of the problem' [6]. One explanation for this is that these individuals 'are not bound to the current thinking in the field of the focal problem and therefore can offer perspectives and heuristics that are novel thus useful for generating solutions to these problems' [7]. The silos collapse.

Such crowdsourcing platforms do break down some of the Web's filters, by presenting, for example, problems to individuals from all scientific disciplines. Yet even with these tools, constraints still exist. The first is that potential solvers need to sign up to receive information on given problems. The second is that they themselves determine whether they can offer a valid solution. Therefore, the ability to broadcast (in this case, 'narrowcast') problems to solvers in relevant fields, bypassing the last filter mechanism (the solver's own 'self-censorship' on whether or not he/she can provide a solution) will be key in enhancing successful problem resolution. Yet to identify the disciplines and people best capable of providing novel solutions, we must define the most relevant keywords from the given problem. In this paper, we investigate the different types of relevance that can be used by web systems to *support* and *encourage* serendipity in research, rather than *inhibit* it. A better understanding of relevance (as explained in the next section) can lead to systems that can encourage both relevance and 'discovery' at the same time, guiding the user of the World Wide Web without limiting their view.

Different flavours of relevance

Different recommender systems use different notions of relevance to find relevant concepts and provide them to the user as suggestions in different scenarios (e.g. Web search, advertising, tagging, shopping). We outline three fundamentally different notions of relevance and the possibility to combine them in order to fine-tune the desired qualities of a recommendation system. The classification is purely theoretic with no guarantees of being complete.

Different notions of relevance (Figure 1)

Social relevance

Social relevance comes out of social connections or similarity between people. The systems that use this notion rely on the assumption that a person is likely to be interested in what the person's friends are interested in. Facebook suggests friends of our friends as people we might be interested in befriending. It also shows content liked by our friends as relevant to us. Other systems construct user profiles and, in the absence of any information about friendship, deduce the information about similar people—and use those profiles of similar people to recommend things (in a way similar to what Amazon does).

Advantages

- The basic assumption of this approach is strongly confirmed by the actual human practices. People often like to know what their friends are interested in. Friendships and connections contribute to the development of interests and, therefore, recommendations based on this assumption are likely to be judged as desired.
- Known by users and easy to understand why something is recommended to them.

Disadvantages

- Often difficult to construct due to intransparency of the social graph. It is difficult to obtain social graph information, and this approach is mostly applicable only for social networks which have access to such data.

Content relevance

Content relevance comes out of co-occurrence of concepts/terms in texts. The basic assumption behind this approach is that if two terms or concepts appear frequently together in texts, or similar concepts sets, they are likely to be related and relevant to one another. Such an approach is used by Google AdWords to look into terms that co-occur in search queries and suggest relevant terms for advertising campaigns, or for Google Suggest that proposes useful additional keywords in Web searches.

Advantages

- Relatively easy to obtain a corpus on the Web, which makes this method highly accessible.
- Tools for performing it are available as open source.
- Widely used and known by developers.

Disadvantages

- The quality of recommendations depends heavily on the corpus used, and its fitness for the recommendation domain and scenario.
- Relatively easy to influence the results by producing content with an intention to enforce false relevance. Content farms represent a threat to the approach if the Web content is used unrestrictively.

Semantic relevance

Semantic relevance comes out of relations between concepts explicated in some semantic knowledge

base/graph. Approaches using WordNet, DBpedia and similar knowledge bases have been proposed, mostly in research, to establish a notion of semantic relatedness and use those knowledge bases for concept suggestion.

Advantage

- The approach is based on the meaning and, therefore, likely to provide insight into more complete and less expected recommendations than statistics-based approaches.

Disadvantages

- The quality of recommendations depends heavily on the chosen knowledge base, and its fitness for the recommendation domain and scenario.
- The availability of knowledge bases usable in this approach is not high and, in some cases, the application of this method would have to involve a construction of a specific knowledge base.

Combined approaches

Once we have outlined the three basic notions of relevance it is interesting to look at their possible combinations. Being grounded in different basic assumptions, the three basic approaches produce qualitatively different suggestions of related concepts. We look at those differences and provide an overview of their possible combinations, by trying to predict the qualitative nature of recommendations that the combined approaches would be able to provide.

Social, content and semantic relevance

Concepts that are considered relevant by all the notions of relevance, are likely to be the most highly relevant concepts, almost the same as the initial input concepts.

Social and semantic relevance, non-content

Concepts that are both related by meaning, and are used by connected and similar people, would indicate the things used by a same circle of people and that are related by meaning. Recommendations based on this combined notion can help define communities of practice, and especially point to the concepts that are not often used in the same context, but rather used by the same and similar people in different contexts.

Social and content relevance, non-semantic

Concepts that often co-occur in content and are used by people who are connected, are likely to define common situations and contexts that a particular community usually faces. The co-occurrence in texts indicates that the concepts are used in the same context (the one that the text is about), and the additional relevance achieved by connected people indicates that this context is actually used by people who know each other (or who may otherwise be considered as similar). However, because of the lack of semantic relations between the concepts, it is not likely that the people are connected by their domain of knowledge and activity, but rather by other interests and affinities.

Semantic and content relevance, non-social

Concepts that are both related by their meaning and co-occur in content are likely to represent similar or interdependent things that are often mentioned together because of their functional interdependence.

Social, non-content, non-semantic

Concepts that are relevant only in the social sense, with no semantic relevance and that do not co-occur in content, are likely to be interest associations — things that similar and like-minded people are interested in, but are so different that they may rarely be referred to in the same context. Relevance in this sense might, for instance, result from the fact that people interested in football often befriend people interested in biology.

Content, non-social, non-semantic

Concepts related only by co-occurrence in content, without any semantic similarity and without a community using them together, are likely to define a vocabulary of situations and contexts that people who are not like-minded nor connected can face.

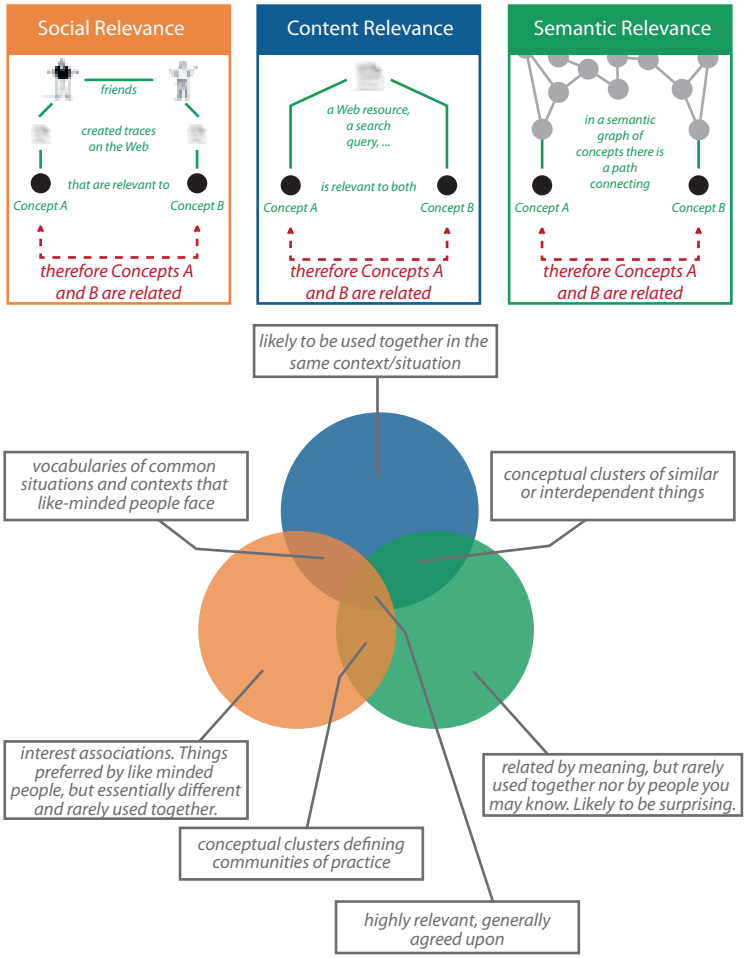
Semantic, non-social, non-content

Concepts related only by meaning, and not used by similar/connected people, and not co-occurring in content, are likely to be related concepts that a common user would not think of as related but would recognise them as such. The lack of joint use means such semantic connections often overlooked, possibly even by experts — as those relevance relations do not take part in defining the communities of practice.

Discovering unexpected relevant keywords with hyProximity

Research approaches to keywords suggestion have been around for quite some time. The need to help users chose their keywords for tagging, web searches and similar tasks have led to the development of a number of ways to suggest relevant keywords. Today, with the advent of web advertising, finding relevant keywords has an added dimension, as suggesting keywords no longer means just helping the user navigate on the Web, but also means driving the relevant visitors to your web page. An increasing number of services [8] offer to suggest the best relevant keywords, which cost less and can pull in more traffic. However, there is an important dimension that these approaches have been missing and that significantly improve the way we discover new relevant keywords: their meaning. We will now discuss how we use this

Figure 1. Facets of relevance in Recommender Systems (to include)



important dimension for our keyword discovery needs at hypios.com and report about the interesting results we have had.

hyProximity

The existing keyword suggestion approaches rely on (a) co-occurrence [9] of terms in text corpora; (b) co-occurrence in search results; (c) controlled taxonomies such as the Open Directory Project (ODP) [10], and controlled vocabularies such as Wordnet [11]. The approaches (a) and (b) both provide quite limited potential for discovery of unknown keywords, as they are based on co-occurrence. In other words, they try to look at terms that someone else has already used in combination with your initial terms, and suggest them. This approach does not allow for the discovery of terms that are rarely used in combination with your initial terms, but that are very close in meaning. This is important, as the language we use on the Web is highly dependent our own community of practice/thought. Going beyond the terms used by people similar to us, is very difficult if we rely solely on co-occurrence. Approaches of type (c) have more potential as they do not use co-occurrence-based statistics, but rely on taxonomies and vocabularies. However, ODP is a web directory, and thus the relations between terms are defined by Web browsing practice. There might be semantic relations between terms, which are not commonly browsed together, and thus would not appear in ODP. Wordnet is, on the other hand, more oriented at finding synonyms, and remotely related terms fall outside of its scope.

For these reasons, we have turned to a Semantic web-based approach, using DBPedia [12] — a semantic Web version of Wikipedia, to discover relevant terms. In DBPedia, terms (concepts) are grouped in categories by their meaning. As such, this source of encyclopedic knowledge should enable the discovery of the keywords that are semantically related but that an average user might not even be aware of.

Our system uses the distance between two terms in the graph of DBPedia semantic concepts, to calculate their semantic relatedness, called hyProximity. The shorter the distance in the graph, the higher the hyProximity. The more links the two concepts share, the higher the hyProximity will be.

Case study

We have used hyProximity for our own use in hypios, and have obtained very interesting results. Our standard procedure, when we have a new innovation problem on Hypios, is to take the keywords related to the problem, and look for experts in our large, cross-domain, 800 000 expert database. Finding keywords relevant to the problem, that do not appear in the problem text is important in order to reach the relevant experts in most diverse domains, who might be able to bring an innovative solution. We have used hyProximity to obtain additional keywords for expert search, and compared those keywords with what we get from AdWords' keyword tool for the same inputs (Figure 2). We identified 1 802 experts using the keywords directly present in the problem text; 2 849 experts with hyProximity keywords, and 2 061 experts using the keywords from AdWords' keyword tool. The most interesting phenomenon is that the overlap between the experts identified by hyProximity and AdWords' keywords is very low. Finally, we measured the interest expressed by the identified experts (through their response to our e-mails). The response rate obtained in the hyProximity group was 10 % greater than with the AdWords' keywords, and 19 % greater than with the keywords present directly in the text.

This result leads to the conclusion that there are a significant number of semantically related keywords that fall completely out of the scope of the co-occurrence-based keywords suggestion approaches. If you trust that the non-semantic keyword suggestion approaches are giving you all the relevant keywords, you are missing a lot of relevant traffic.

In our studies [13], we have shown that these semantically related keywords, when compared to AdWords, are more often judged by users as being unexpected in addition to relevant.

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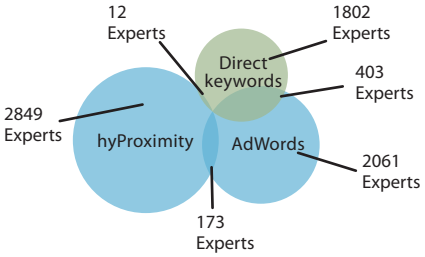
Figure 2. Case study hyProximity v AdWords



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[7] Ibid., p. 11.

[8] http://www.keyworddiscovery.com, https://adwords.google.com

[9] Co-occurrence can either mean concurrence/coincidence or, in a more specific sense, the above-chance frequent occurrence of two terms from a text corpus alongside each other in a certain order. Co-occurrence in this linguistic sense can be interpreted as an indicator of semantic proximity or an idiomatic expression.

[10] http://www.dmoz.org/

[11] http://en.wikipedia.org/wiki/WordNet

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3.5 The application of Open Innovation 2.0, engaged scholarship and design science research in the Innovation Value Institute

Introduction

The discipline of information systems (IS) has been considered to have certain failings in its effort to impact on practice [1]. Additionally, Sambamurthy and Zmud noted that there is a growing gap between scholarly research and the need for practitioners [2]. There have been numerous research studies identifying failures in IS in its attempts to achieve desired outcomes and disappointments in assessments of return on investment [3] [4]. The analyses in these studies often yield recommendations that operate at a high level of abstraction and lack the detail and specificity to lead to action-oriented solutions. Such findings, while offered in a constructive spirit of helpfulness and concern for continuous improvement, do little to advance either (i) the capability of practitioners to achieve their goals or (ii) the theoretical knowledge underpinning information system academic research. One of the requirements for a more helpful approach is a more systematic approach with greater sensitivity to the contextual complexity of the organisational problem-solving environment where IS practitioners work.

The development of the IT-CMF (the Information Technology Capability Maturity Framework) [5] [6] [7] is a response to the need for a more systematic, comprehensive approach to managing IT in a manner that meets the requirements of practicing IT professionals. In this paper, an overview of the rationale for the IT-CMF will be provided and, in particular, some of the guiding principles for its design and development will be presented.

This research is being undertaken by the Innovation Value Institute (http://www.ivi.ie) applying the principles of engaged scholarship [8] [9], Design Science Research (DSR) [10] and Open Innovation 2.0 [11]. IT Management is being investigated using a design process with defined review stages and development activities based on the DSR guidelines advocated by Hevner et al. [10]. During the design process, researchers participate together with practitioners and subject matter experts within research teams to capture the working knowledge, practices and views of key domain experts.

Engaged scholarship

Van de Ven describes engaged scholarship as a participative form of research for obtaining the views of key stakeholders to understand a complex problem. By exploiting differences between these viewpoints, he argues that engaged scholarship produces knowledge that is more penetrating and insightful than when researchers work alone. Engaged scholarship has a number of facets: a form of inquiry where researchers involve others and leverage their different perspectives to learn about a problem domain; a relationship involving negotiation, mutual respect, and collaboration to produce a learning community; and an identity of how scholars view their relationships with their communities and their subject matter. In Van de Ven's view, you can increase the likelihood of advancing knowledge for science and practice by engaging with practitioners and other stakeholders in four steps:

- ground problem/question in reality up close and from afar;
- develop alternative theories to address the question;
- collect evidence to compare models of theories; and
- communicate and apply findings to address the problem/question.

Van de Ven's conceptualisation of engaged scholarship [8, pp.10–1] has four stages in an engaged scholarship project. The stages can happen in any sequence.

1. Problem formulation — situate, ground, diagnose, and infer the research problem by determining who, what, where, when, why, and how the problem exists up close and from afar.
2. Theory building — create, elaborate, and justify a theory by abductive, deductive, and inductive reasoning.
3. Research design — develop a variance or process model for empirically examining the alternative theories.
4. Problem-solving — communicate, interpret, and apply the empirical findings on which alternative models better answer the research question about the problem.

Mathiessan and Nielsen [9] see engaged scholarship as an opportunity to address key challenges within the IS discipline in a novel and constructive way. They applied the principles of engaged scholarship to analyse Scandinavian IS research through the lens of the *Scandinavian Journal of Information Systems* (SJIS). After reviewing all the research papers published in SJIS over the past 20 years, they advocated a role for engaged scholarship in shaping the future of Scandinavian IS research and IS research and practice in general.

Figure 1 shows Van de Ven's four forms of engaged scholarship.

1. Informed basic research is undertaken to describe, explain, or predict social phenomenon.
2. Collaborative basic research entails a greater sharing of power and activities among researchers and stakeholders than informed research.
3. Design and evaluation research is undertaken to examine normative questions dealing with the design and evaluation of policies, programmes, or models for solving practical problems of a profession in question.
4. Action/intervention research takes a clinical intervention approach to diagnose and treat a problem for a specific client.

In particular, it is noteworthy that Van de Ven locates design science research within the scope of engaged scholarship [8, p. 27].

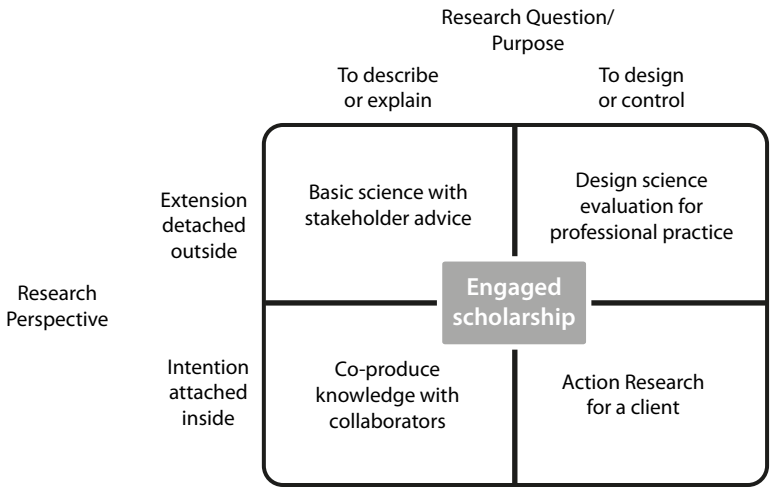
The application of design science research in the IT-CMF

Design science research can be considered as a type of Mode 2 knowledge creation [12] where knowledge is co-created in an area which is interdisciplinary, problem-focused and context-sensitive. This is typically knowledge generated by practitioners dealing with real problems in a real context as distinct from knowledge which is generated from traditional research (called Mode 1) which is academic and based within a particular discipline [13]. In developments in other social science fields such as management research, the relevance problem has been highlighted [14]. Van Aken proposed increasing the use of Mode 2 knowledge production in management research to increase the relevance and utility of the research. Additionally, Van Aken advocated a focus on output which is field tested and grounded [14].

Ilvari and Venable [15] define DSR as a research activity that invents or builds new, innovative artefacts for solving problems or achieving improvements, that is DSR creates new means for achieving some general (unsituated) goal, as its major research contributions. Such new and innovative artefacts create new reality, rather than explaining existing reality or helping to make sense of it [15]. It has been argued that while design science, or design theory, was discussed over 50 years ago by Simon [16], and further developed in the mid 1990s [17] and in the new millennium [18], it was Hevner et al.'s publication [10] that propelled design science out of its niche into the mainstream of the IS research community [19]. The central thrust of Hevner's approach was that design science research attempts to create and evaluate IT artefacts intended to solve identified relevant organisational problems and he went on to propose a set of problem-solving guidelines where the understanding of a design problem and its solution are acquired in the building and application of an artefact.

Developing innovative artefacts is a central activity in DSR [20]. Such artefacts can be in the form of constructs, models, methods or instantiations [20]. For the construction of such artefacts, two basic activities can be differentiated: build and evaluate where building 'is the process of constructing an artefact for a specific purpose' and evaluation 'is the process of determining how well the artefact performs' [20, p. 254]. The construction of an artefact is a heuristic search process [20]. Within this process, an extensive use of theoretical contributions and research methodologies stored in

Figure 1. Forms of engaged scholarship [8, p. 10–11]



the knowledge base should be made [10]. On the one hand, theoretical contributions can come from governance, value-based management, risk management, compliance management, etc., to build an artefact, that is the situational method. The IT-CMF uses the following DSR patterns proposed in [20].

- *Different perspectives:* The research problem is examined from different perspectives, for example conceptual, strategic, organisational, technical and cultural.
- *Interdisciplinary solution extrapolation:* A solution or solution approach (i.e. methods, instructions, guidelines, etc.) to a problem in one discipline can be applied in or adapted to the integrated IT CMF.
- *Building blocks:* The complex research problem of IT Management is broken into 33 critical competencies that are examined in turn.
- *Combining partial solutions:* The partial solutions from the building blocks are integrated into the overall IT CMF and the interdependencies between the building blocks are identified and highlighted. In order to rigorously demonstrate the utility of the developed artefact, different evaluation methods can be used. Amongst others, the 'informed argument' is suggested as an appropriate evaluation method [20].

Maturity models in design-oriented research are regarded as being located between models and methods in the form of state descriptions (e.g. the maturity levels) and guidelines [20]. In this sense, maturity models contain two aspects, one capturing the assessment of the current status and another guiding organisations towards higher maturity levels. In the context of design science research the first aspect can be described as a model perspective describing various maturity levels (states) of organisations whereas the second aspect describes guidelines to improve the current situation of organisations in form of method components [21]. In order to transform organisations from one maturity level to another, usually the method component is described by 'maturity curves' or 'maturity profiles'.

Open Innovation 2.0

A key goal of the development of the IT-CMF was to enable a structural change in the way companies and organisations get value from IT. A key assumption in developing the IT-CMF was that a 360 degree view of the issue and knowledge/practices used in contemporary IT management practice was necessary. Accordingly, a research community which transcended academic research and even the concept of engaged scholarship was established and nurtured to provide comprehensive views, knowledge and practices. Thus a new research ecosystem was established involving members from six different communities: technology providers, public sector IT executives, enterprise IT executives, analysts, IT professional organisations and academics. This form of research ecosystem activity is a form of Open Innovation 2.0 [11] where all the actors in an ecosystem are involved in the research and innovation activity. This is an extension of the open innovation activity defined by Chesbrough [22] which refers to capitalising on the inflows and outflows of ideas to and from a company.

Mobilising an entire ecosystem using an open innovation approach combined with engaged scholarship and design science research resulted in the development of a new set of artefacts and design patterns that are being adopted by a broad set of IT executives and organisations. The increasing adoption of the artefacts are perhaps the strongest validation of the utility and effectiveness of the approach.

Conclusion

This paper has described the development of the IT-CMF [5] [6] [7] as a response to the need for a more systematic, comprehensive approach to managing IT in a manner that meets the requirements of practicing IT professionals. A short rationale for the IT-CMF was provided and, in particular, some of the guiding principles for it design and development were presented.

The Innovation Value Institute (http:/www.ivi.ie) is applying and extending the principles of engaged scholarship [8] [9], Design Science Research (DSR) [14] and Open Innovation 2.0 [11] to create a new research ecosystem involving members from six different communities — technology providers, public sector IT executives, enterprise IT executives, analysts, IT professional organisations and academics. The validation of the utility and effectiveness of the approach can be seen through the early significant adoption of IT-CMF.

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3.6 Navigating intellectual capital of nations for service Innovation in the European Union

... the Occupy Wall Street protests that began in New York, tens of thousands of people around the world took to the streets ... to reiterate their anger at the global financial system, corporate greed and government cutbacks. Rallies were held in more than 900 cities in Europe, Africa and Asia, as well as in the United States, with some of the largest occurring in Europe.

Karla Adam, Washington Post, 16 October 2011

Based on investigations of empirical data from 800 years of financial crises, two economists Kenneth Rogoff of Harvard, and Carmen Reinhart of Princeton University, said in their book *This Time is Different* that the aftermath of a financial crisis brings slow and halting growth, sustained high unemployment, and rocketing public debt — 'with the overhang of public and private debt being the most important impediment to a normal recovery from recession.' Although policymakers in some countries are relieved and hoping that their financial temporary healing might have worked, some EU economies are still facing an outlook with severe financial capital challenges and its societal implications.

Since the intangible is increasingly acknowledged as a key driving force for future development, especially the service sectors, examining relevant statistics from the perspective of national intellectual capital (NIC) may provide some clues as to how EU governments can work things out together.

In this article, we propose a *Dynamic IC Triangle* approach that governments can take when facing national economic problems. This new approach is derived from our research findings after analysing 10 years' data (2001–10) of the 17 EU countries in our data set. The Dynamic IC Triangle model is based on the idea of leveraging each country's previous national development experiences. In the context of the European Union, policymakers could forge 'intellectual capital alliances' with other nations to strengthen their areas of weaknesses. The 17 countries are:

Austria	Belgium
Czech Republic	Denmark
Finland	France
Germany	Greece
Hungary	Ireland
Italy	Netherlands
Poland	Portugal
Spain	Sweden
United Kingdom	

National intellectual capital ranking of the 17 EU countries

First, we show, in Table 1, the capital scores and ranking orders of human capital, market capital, process capital, renewal capital, financial capital and overall intellectual capital for the 17 EU countries of our data.

From the table, it can be seen that each country has its own set of strengths and weaknesses. This then leaves space for collaboration with other member countries to learn from each other and strengthen their weakness.

In our 2011 book *National Intellectual Capital: A Comparison of 40 Countries* [1], we have identified that human capital and renewal capital are long-term-oriented and need time to develop, yet market capital and process capital require less time to develop and achieve.

Using this time distinction, we then created scatter plots of the long-term and short-term capitals. The results are shown in Figures 1 and 2 respectively. From the plot of the long-term human v renewal capital, it can be seen that the 17 countries are spread out into three distinctive clusters. On the other hand, the short-term market v process capital, the country positions exhibit a belt-shaped development continuum. Interpreted separately, Figure 1 shows that it is relatively hard to cross over the long-term IC gap to the next cluster. Yet, Figure 2 shows that advancing to the next stage development can be anticipated with investment into time and resources.

However, the real insight comes from our combined interpretation of the two scatter plots. Taken as a set, it shows that Figure 1 is a goal-setting map for the middle and low NIC countries and Figure 2 shows the path by which they may achieve that goal: in other words, a clustering of nations as well as opportunity spaces/paths for the future!

Strategic IC alliances

Yet, how to achieve the goal of enhancing intellectual capital (IC) for future national development? *Interdependence, co-creation and synergy are the keywords.* The whole purpose of the EU is to

Table 1. National Intellectual Capital Scores and Ranking of 17 EU Countries (by descending ranking order)

Years 2001–10	Human capital		Market capital		Process capital		Renewal capital		Financial capital		Overall IC	
Country	**Score**	**Ranking**	**Score**	**Ranking**	**Score**	**Ranking**	**Score**	**Ranking**	**Score**	**Ranking**	**Score**	**Ranking**
Finland	8.731	2	7.771	7	8.645	3	7.188	3	9.594	17	41.930	2
Sweden	8.571	3	7.771	8	8.565	5	7.268	2	9.663	13	41.838	3
Denmark	8.571	4	7.805	6	8.835	1	6.494	6	9.671	12	41.375	4
Netherlands	8.059	15	7.927	4	8.459	7	5.809	13	9.733	6	39.987	7
Austria	8.003	17	7.705	9	8.426	9	5.817	12	9.703	9	39.655	11
Ireland	8.148	12	7.836	5	7.961	18	5.189	19	9.772	4	38.907	13
Germany	7.808	19	7.190	14	8.182	14	5.875	11	9.612	16	38.666	16
Belgium	8.198	11	7.423	12	8.015	16	5.355	17	9.638	14	38.628	17
United Kingdom	7.634	24	6.963	17	7.985	17	5.266	18	9.626	15	37.474	19
France	8.052	16	6.740	19	7.935	20	5.087	20	9.593	18	37.406	20
Spain	7.635	23	6.719	20	7.386	25	3.724	27	9.487	21	34.951	24
Czech Republic	7.529	26	6.597	22	7.096	28	3.774	25	9.218	28	34.215	25
Portugal	7.414	27	6.489	24	7.474	23	3.425	32	9.241	27	34.043	26
Italy	7.327	30	6.202	28	7.259	26	3.487	30	9.508	20	33.783	27
Hungary	7.594	25	6.152	29	7.094	29	3.748	26	9.016	29	33.603	28
Greece	7.339	29	5.973	30	6.947	30	3.339	33	9.414	23	33.013	31
Poland	7.362	28	5.418	36	6.320	34	2.957	41	8.878	30	30.935	32

NB: Ranking order is the ranking number of total 48 countries.

realise the synergy of its Member States, which is the IC multiplier effect rather than just the addition effect. A Dynamic IC Triangle model as elaborated here under is a simple and easy to follow measure. Based on the capital scores and rankings in Table 1, the interdependent relationship among the Member States can be set up for co-creating national intellectual capital to maximise EU synergy. At the simplest level, countries with a lower rating of a certain aspect of intellectual capital can partner with other countries excelling in that area.

For instance, France and Poland are relatively weak in market capital, process capital, and renewal

Figure 1. Human capital v renewal capital for 17 EU countries (10-year mean score)

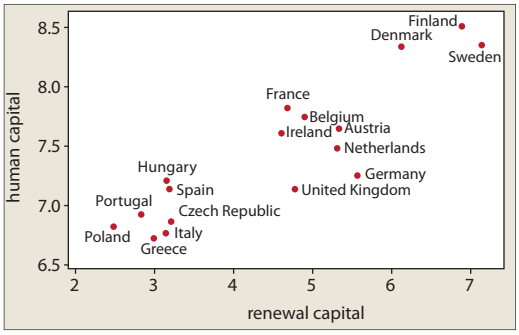
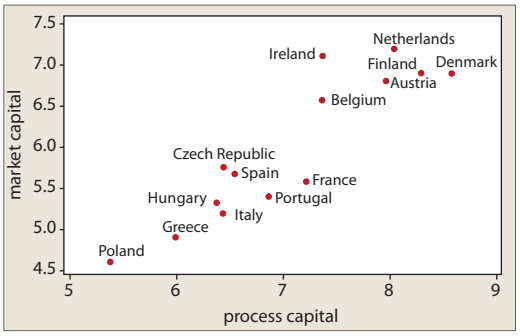


Figure 2. Market capital v process capital for 17 EU countries (10-year mean score)



capital. Figure 3 shows that France can try to obtain assistance from Finland or Sweden (examples only) to enhance its renewal capital, can learn from Ireland or the Netherlands to enhance its market capital, and can model Denmark or Finland to enhance its process capital. Of course, the rule of common sense is that these international collaborations should be mutually beneficial: that is, countries receiving assistance should always give something back in return. For example, in exchange for obtaining Sweden's assistance in building renewal capital, France needs to give something back to Sweden, such as inviting Swedish teams to join the public sector renewal projects like the Louvre Museum renovation (examples only).

In a similar way, Figure 4 indicates that Poland can target Germany or the Netherlands for assistance in enhancing its renewal capital, can learn from Austria or Belgium to enhance its market capital, and can model Ireland or the United Kingdom to enhance its process capital. Again, for example, in exchange for Germany's assistance in building renewal capital, Poland needs to open up more opportunities for German companies. The main point is that each country finds appropriate intellectual capital alliances and securely hooks on to the next level of IC-development, rather than jumps to an unrealistic politically phrased goal and then fails and loses societal confidence, as the intangibles need time to develop.

Dynamic IC interdependences

Another application of the Dynamic IC Triangle is the interdependence of the four capitals. Figure 5 shows the GDP predicting power of human capital, market capital, process capital, and renewal capital. The thickness of the yellow arrow represents the degree of predicting power. That is, in these 17 EU countries, market capital contributes to GDP per capita (ppp) the most and human capital the least. In Figure 6, the bent arrow indicates the interaction effect. It shows that when human capital interacts with market capital, process capital, and renewal capital, not only is the main effect of human capital enhanced but also every interaction effect is significant at a very high level of .001. This is further evidence of the power of interdependence as shown in Figure 7.

An additional example is the serious unemployment rate in Poland. Across the board, high unemployment rate is a concern in Europe. Figure 8 displays the general unemployment rate and youth unemployment of the 17 EU countries. The Netherlands has the lowest rate and Poland the highest. In our National Intellectual Capital (NIC) model, unemployment is a process capital issue, therefore the dynamic triangle can be drawn as Figure 9. Unemployment may be caused by issues relating to human capital, market capital, and renewal capital: the solution to unemployment may rely on its interaction with human capital, market capital, and renewal capital.

Figure 3. France needs assistance from external IC alliances in three types of intellectual capital

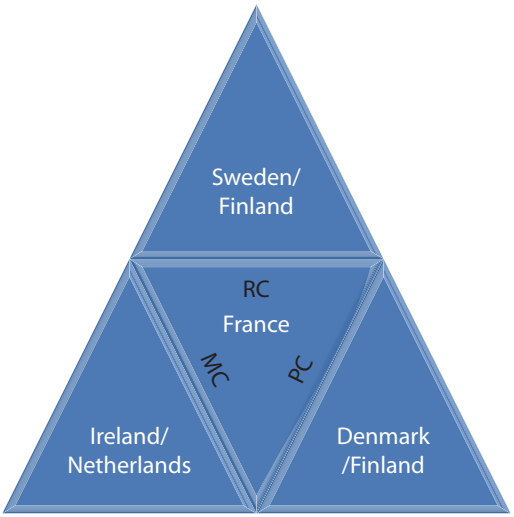


Figure 4. Poland needs assistance from external IC alliances in three types of intellectual capital

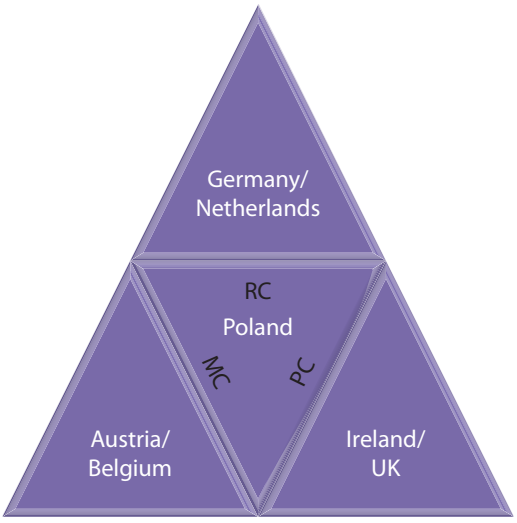


Figure 5. The degree of GDP predicting power of the four capitals in 17 EU countries

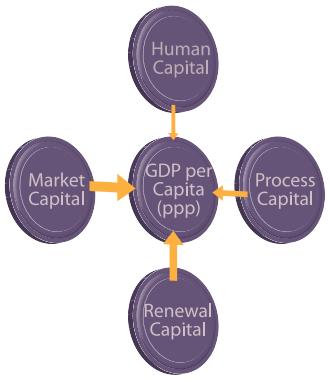
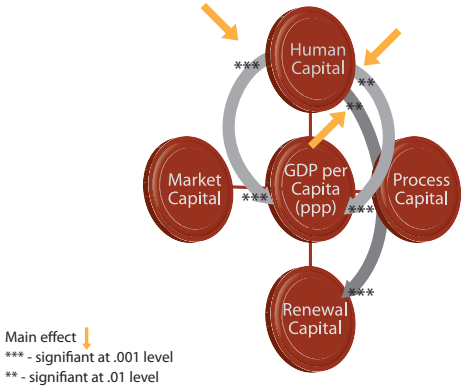


Figure 6. The interaction effect of human capital with other capitals in predicting GDP



The simple rule for using the Dynamic the IC Triangle model is to put the issue in the centre, and finding three sources of assistance or three major channels to address the challenges. Three is a good number, as more than three might dilute the government's attention and less than three may provide insufficient view points.

Dynamic IC map

Leveraging Member States' experiences and resources to achieve national welfare and well-being is a co-creation and co-development process. Figure 10 maps the relative position of national intellectual capital v GDP per capita (adjusted by purchasing power parity) of the 17 EU countries in year 2010. The colour is the degree of renewal capital.

Based on the table and graphs presented in this article, each country may try to sort out the root of the IC challenges and the sources of potential

Figure 7. The influence of human capital on GDP is energised through other capitals

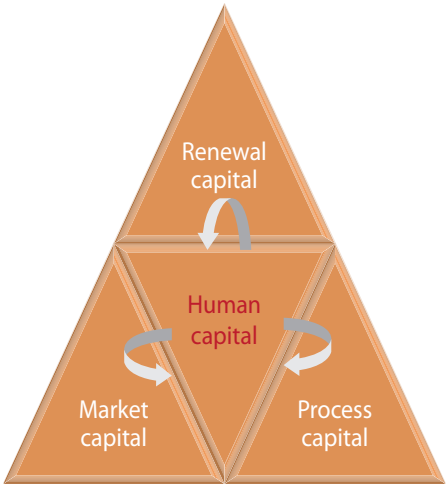
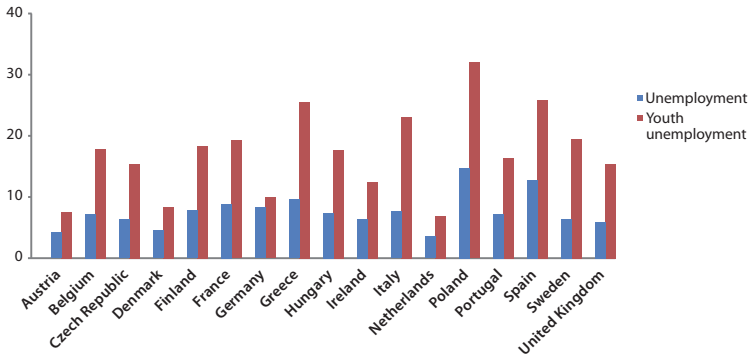


Figure 8. Average unemployment rate of 17 EU countries 2001–10



solutions through utilising a simple Dynamic IC Triangle model. Through the interdependent relationship with selected Member States on selected issues to co-create the synergy, the route to recovery may become a lot easier.

Having a national IC map as above will assist in navigating the future welfare and avoid the trap of only looking to the financial capital. For this dynamic IC navigation, we might ask policymakers to contemplate the following 10 critical NIC questions.

1. What is your starting point?
2. What is your relative position (colour) among 40+ others?
3. What is the distance of your NIC to other countries?
4. What is your evolutionary path during the recent 10 years?
5. What is the tentative trend for the next five years?
6. What is the speed or path of your renewal or the core of your IC renewal policy?
7. How do you plan to in-source or make IC alliances with others to upgrade quicker?
8. What is the opportunity cost of not addressing your NIC agenda?
9. How sustainable is your present NIC position?
10. What are the implications of the major liabilities to citizens, to other countries, and to future generation?

Figure 9. Sources of the problems and solutions of unemployment may lie on various directions of interdependence

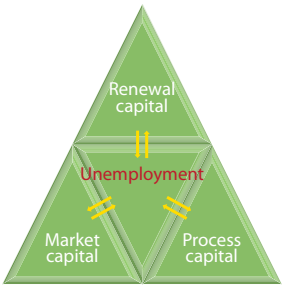
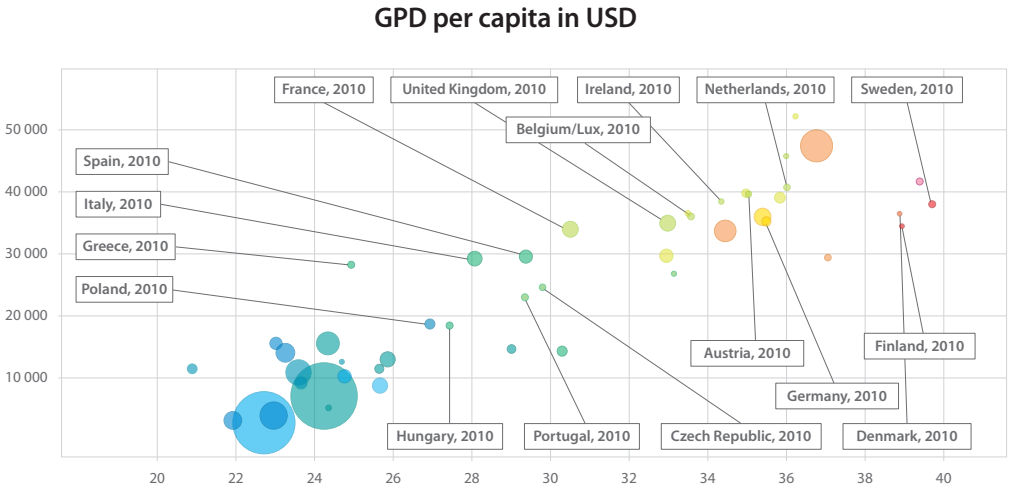


Figure 10. Overall national intellectual capital v GDP per capita (ppp) of 17 EU countries in 2010



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Reference

[1] http://www.nic40.org

3.7 Mapping the intellectual capital of post-Soviet states

Introduction

Each era poses its own challenges not only for individual countries but also for mankind as a whole. It is undeniable that the main challenge of the 21st century is the creation of a knowledge-based society that ensures a country's position, its prosperity and status in the rapidly changing global landscape.

Unarguably, modern development trends are basically affected by overall integration. Among one of the most affected and the targeted aspect of integration still remains science. Science, technology and innovation become key components in assuring sustainable socio-economic development of the state, which, in turn, encourages social integration, enhances international cooperation and facilitates the dissemination of information. Integration not only challenges the economy, technology and research, it also affects countries and regions deeply to their core. Together with industry and economy, social structures are also changing and renewing, raising new needs in society. In this context, the science sector need to adopt new roles and importance. Nowadays, the most important resource for economic development is well-educated, creative human capital, and the only way to secure this capital is by investing in human capital, which has become an imperative.

Assessing the huge work carried out by Prof. Leif Edvinsson and Dr Carol Yeh-Yun Lin [1], we intend to cover a gap in their study, which, because of some objective reasons, did not cover the post-Soviet area. Whereas, the mere numbers of some basic factors reveal the huge importance and potential of the region. Twelve republics of the former Soviet Union[1] occupy more than 16 % of world territory. Their total population is nearly 300 million people, which is nearly 5 % of the total world population. Assessing the scientific human capital of these states, it is worth mentioning the following: the number of people engaged in science is 583 000, of which 34 000 are doctors and 107 000 are candidates of science [2].

The post-Soviet countries form, in some respects, a cultural shed between much deviating science policy concepts, which either stand in the Russian or western tradition. This divide is deepened by language barriers. To overcome these problems hampering both educational and scientific systems, the post-Soviet countries and its European partners intend to suggest international, interdisciplinary projects, which, the the longer term, aim to provide different transnational tools for the science-innovation policy and future harmonisation of the regions. As a first and most important step towards the long-term goal, there is a need to create the logistical and technical frame as well as the much needed political platform. Diverse projects carried out between the scientific communities of both these sides, clearly demonstrate the path towards the achievement of the above mentioned goal.

The appraisal of intellectual capital

Traditionally, economists consider physical and human capital as key resources for facilitating productive and economic activity. However, knowledge, too, has been reorganised as a valuable resource. Alfred Marshall suggested that 'capital consists in a great part of knowledge and organisation ... knowledge is our most powerful engine of production' [3]. Elaborating on this point, another economist, Quinn, mentioned that 'the economic and producing power of the firm mainly lies in its intellectual and service capabilities than its hard assets' [4]. Although the role of knowledge has been acknowledged long ago, its investment into everyday life processes came to existence later, particularly in some regions and states.

Eventually, IC becomes a key component of modern development. It is now widely used to produce wealth, multiply output of physical assets, gain competitive advantage, as well as enhance value of other types of capital [5]. Investments in human resources are tantamount to investments in physical assets. Although in professional literature, IC includes different forms of capital (customer capital, intellectual property, structural capital) the main focus of this paper will be on the human capital part of IC.

According to the World Intellectual Property Organisation, Intellectual Property (IP) refers to creations of the mind: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce. In appraising a country's IP, the latter is divided into two categories: industrial property, which includes inventions (patents), trademarks, industrial designs, and geographic indications of source; and copyright, which includes literary and artistic works such as novels, poems and plays, films, musical works, artistic works such as drawings, paintings, photographs and sculptures, and architectural designs [6]. Table 1 demonstrates the IP of post-Soviet states (WIPO Statistics Database).

1 Baltic States are not included in this survey.

Table 1. Intellectual Property (IP) of post-Soviet countries (2010)

State	Patent	Trademark	Industrial design	GDP (million USD)
Russian Federation	28 843	42 744	2 962	1 230.72
Belarus	3 228	4.82	277	49.04
Ukraine	2 868	17 868	1 607	117.40
Kazakhstan*	351	2 478	119	109.16
Azerbaijan*	320	1 178	25	43.02
Georgia	261	784	56	10.74
Uzbekistan	239	1 488	57	32.97
Kyrgyzstan	220	244	7	4.58
Moldova	160	1 527	171	5.40
Armenia	160	1 224	54	8.54
Tajikistan	29	206		263.89
Turkmenistan*	0	0.01	0.01	17.36

* Data provided for these states are for the previous year due to absence of current information.

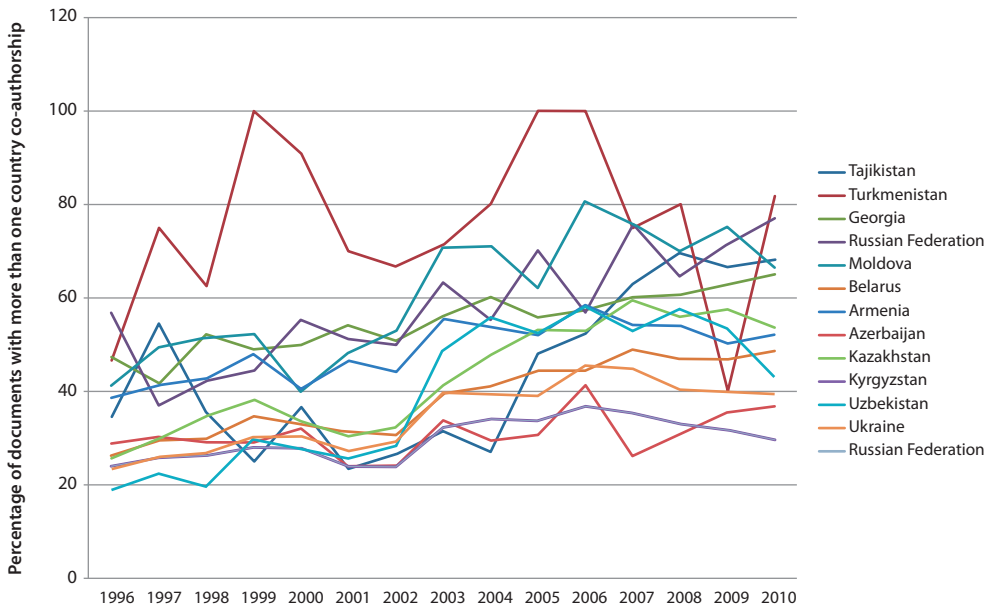
Viewing the process of knowledge creation, the role and importance of integration and innovation is more than evident. The knowledge is being created through two generic processes, namely, combination and exchange: combination as a process for gathering materials and forces; and exchange combines the efforts and resources held by different parties as a prerequisite for development. The first condition for the above mentioned to become reality is accessibility to the collective forms of social knowledge. Deep integration and IT provides real opportunity for exchange and development [7].

Figure 1 demonstrates the international scientific collaboration of post-Soviet states 1996–2010 [8].

The current state of science in the post-Soviet area

In Soviet times, the education and science sector was regulated by a centralised governing body, as

Figure 1. International scientific collaboration of the post-Soviet countries (1996–2010)



institutes, education and science systems of the Soviet Republics were dependent parts of the whole Soviet educational and science system. The strategy and operation of the system were strictly planned and monitored as was every other facet of institutional society. The science sector was not regulated by free market forces: the demand-supply balance was more or less defined by central regulation only.

Meanwhile, the collapse of the Soviet Union did not match a breakthrough in the R & D sector. All economic and social sectors of the newly formed republics were faced with a deep crisis and challenged by sharply decreasing state financing [9] [10] (see Table 2).

To face the impending challenges, newly established post-Soviet republics entered a stage of sharp reforms and imperative developments. The reforms and strategically important initiatives were developed in nearly all spheres. However, the reforms towards the reanimation of intellectual capital began to be implemented only after significant delay. Moreover, they were far from conformity with economic needs. One of the past heritages still remained: a significant gap between what industries need and the quality of human resources.

Initiatives were launched to abolish the disconnection and establish linkages between knowledge and market. The key drivers of change in the science sector and the key trends in the sector were connected to the following factors.

- *Economic integration:* Economic integration has had several implications for former Soviet republics' labour force markets and science sectors. While operating in open markets, local industries were faced with a necessity to compete with global companies. The new market rules in turn lead to new requirements by local companies in the education, knowledge and skills of the labour force. Local companies often suffer from the brain-drain phenomenon, given the heightened international mobility of workforce [11].
- *IT revolution and innovations:* In the era of integration, the flow of information is very much accelerated. It is estimated that each year the existing volume of global information doubles. As a result of unveiling the past ideological curtain and the information revolution, the post-Soviet republics have gained access to global information. Alternative sources and channels of information began not only better inform the population about external opportunities, but their presence as information channels poses the first serious questioning of the hegemony of Soviet (and via inertia, post-Soviet) instruction. The emergence of new platforms of knowledge content delivery creates demand for a new generation of specialists for both the gathering and consumption of advanced technologies [11].

The World Bank Institute developed a Knowledge Index[2] (Table 3) to measure a country's ability to generate, adopt and diffuse knowledge, representing the overall level of development of a country or region concerning the knowledge economy. It demonstrates whether the environment is conducive for

2 Methodologically, the KI performs the simple average of the normalised performance scores of a country or region on the key variables in three knowledge economy pillars — education and human resources, the innovation system and information and communication technology (ICT).

Table 2. The dynamics of changes in the expenditure on science in CIS Republics (% of GDP)

CIS Republics	1990	1995	2000	2003	2004	2005	2006	2007	2008	2009
Azerbaijan	1.00	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20
Armenia	2.50	0.10	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20
Belarus	2.30	1.00	0.80	0.70	0.70	1.20	0.70	0.70	0.60	0.70
Georgia	1.20	0.10	0.20	0.10	0.10	0.10	—	—	—	—
Kazakhstan	0.70	0.30	0.20	0.30	0.30	0.30	0.30	0.20	0.30	0.20
Kyrgyzstan	0.70	0.30	0.10	0.20	0.20	0.20	0.20	0.30	0.20	0.10
Moldova	1.60	0.80	0.60	0.40	0.40	0.40	0.40	0.60	0.50	0.50
Russian Federation	3.00	0.80	1.20	1.30	1.90	1.20	1.20	1.30	1.20	1.70
Tajikistan	0.70	0.10	0.10	0.06	0.06	0.10	0.10	0.10	0.10	0.10
Ukraine	2.30	1.30	1.10	1.20	1.20	1.10	1.00	0.90	0.90	0.90
CIS	1.60	0.51	0.49	0.39	0.54	0.51	0.48	0.50	0.52	0.51

Table 3. The Knowledge Economy Index (KEI) of post-Soviet countries

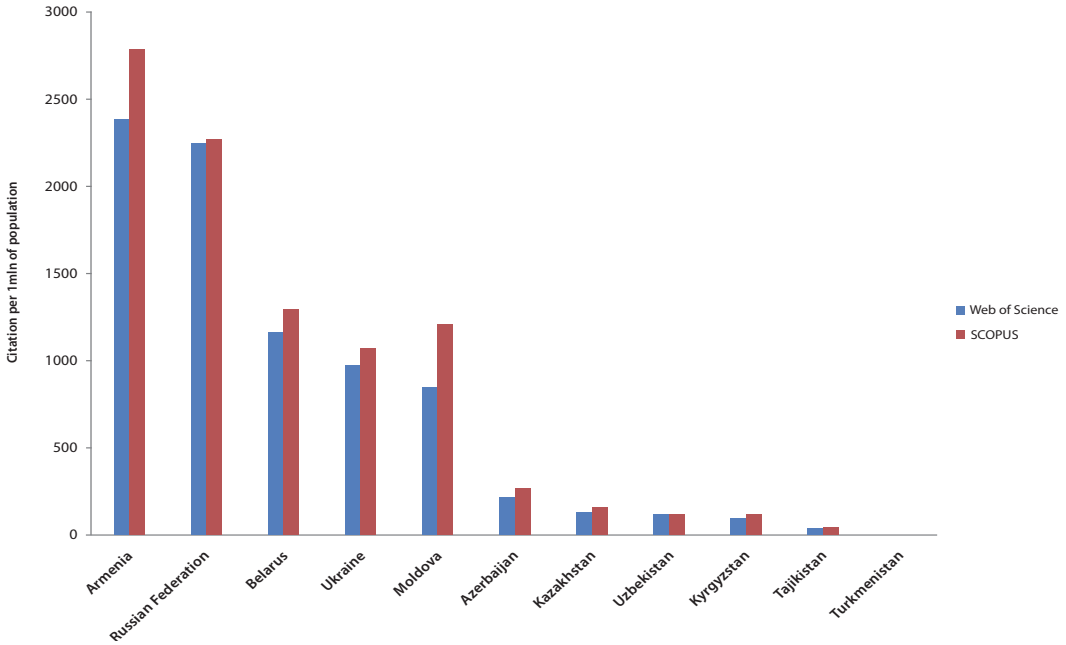
	KEI		Economic Incentive and Institutional Regime		Innovation		Education		ICT	
Country	recent	1995	recent	1995	recent	1995	recent	1995	recent	1995
Ukraine	6.00	5.97	4.27	3.18	5.83	6.10	8.15	8.26	5.77	6.32
Armenia	5.65	5.35	6.48	3.69	6.25	5.76	6.36	6.14	3.52	5.83
Russian Federation	5.55	5.73	1.76	2.55	6.88	5.64	7.19	8.12	6.38	6.60
Georgia	5.21	5.63	5.36	3.20	5.22	5.38	6.46	7.47	3.78	6.45
Moldova	5.07	5.11	4.38	3.47	4.79	4.43	6.05	7.00	5.08	5.55
Kazakhstan	5.05	5.08	4.70	2.18	3.68	4.03	7.07	7.63	4.76	6.48
Belarus	4.93	5.80	1.15	2.37	5.79	5.42	8.02	8.37	4.74	7.03
Kyrgyz Rep.	4.29	4.44	4.49	2.42	2.93	3.41	6.35	5.77	3.40	6.17
Azerbaijan	3.83	4.85	3.18	2.25	3.64	4.97	5.01	6.02	3.49	6.17
Uzbekistan	3.25	4.46	1.13	0.76	3.35	4.24	6.15	6.90	2.35	5.93
Tajikistan	3.22	4.05	2.88	0.14	2.01	3.59	5.53	6.77	2.46	5.72

knowledge to be used effectively for the economic development of the particular state [12].

The knowledge economy is based on the four pillars, which clearly demonstrate the potential of the particular state.

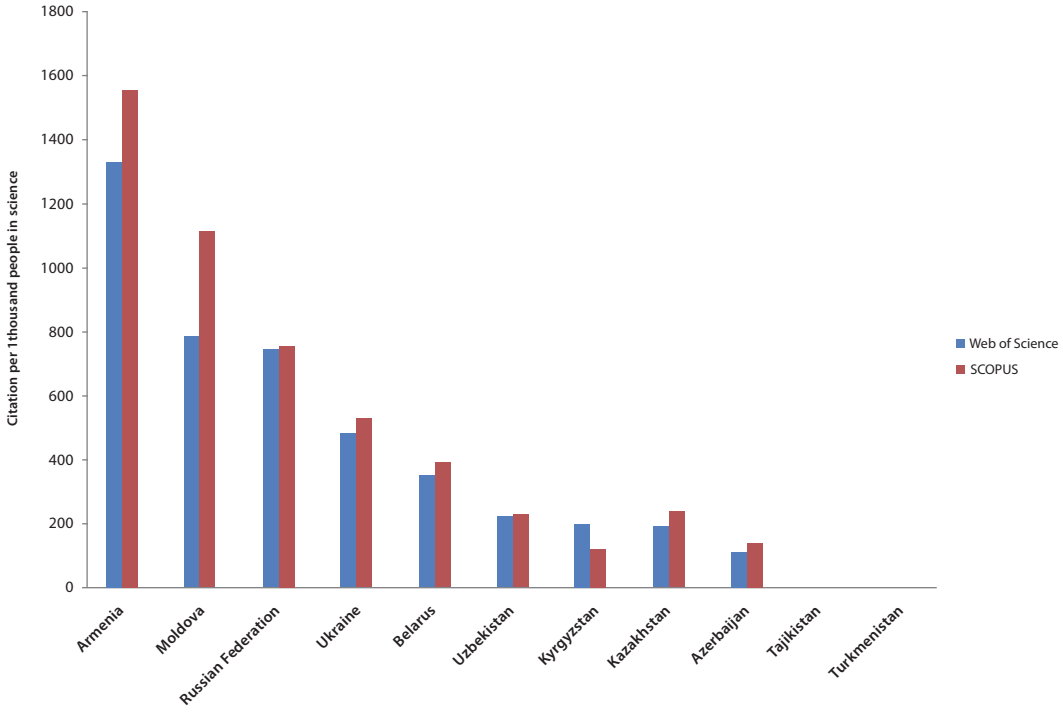
- Economic incentive and institutional regime provide incentives for the efficient use of existing and new knowledge and the development of entrepreneurship.
- An efficient innovation system of firms, research centres, universities and other organisations is

Figure 2. Scatter plot of citation index for 1991–2010 v million of population in CIS countries



Source: SCImago (2007) (http://www.scimagojr.com) (retrieved 31 October 2011)

Figure 3. Scatter plot of citation index for 1991–2010 v thousands of researchers in CIS countries



making it possible to tap into the growing stock of global knowledge, assimilating and adapting the latter to local needs, as well as creating new technology.

- An educated and skilled population can properly and efficiently create, share, and use knowledge.
- Information and communication technology facilitate the effective creation, dissemination, and processing of information.

Once the macroeconomic stabilisation was achieved (with the support of international financial institutions), structural reform programmes became the next policy focus area. Promising GDP growth prepared the ground for a new social context for the country's development policy [13]. Structural reforms spread into the science sector as well. The prioritisation given to the science sector and the high level of state intervention were supported by significant budget allocations for education and science. Some of the positive effects on the educational sector and the overall economy were highlighted by:

- boosting innovation and technological progress;
- linking education and the learning process with science;
- linking science with industry;
- the opportunity for internationalisation.

The current state of affairs in the science sector of post-Soviet republics is demonstrated in Table 4 and in Figures 2, 3, 4 and 5 [14].

Meanwhile, the attempts to enact long-term policies and initiatives were soon challenged by a new recession, this time triggered by global financial crisis. The government again diverted resources into anti-crisis programmes without, however, abandoning the long-term fundamental programmes aimed at increasing the competitiveness of the republics' economies.

The establishment of the Commonwealth of Independent States in 1991 constituted a new forum for cooperation and development for the post-Soviet states, which share a common past, common threats and common needs [15]. However, the overall integration processes demand not only regional cooperation. The European Union and the integration of some post-Soviet states into the EU greatly affected the R & D sector of the mentioned states. These alterations have demonstrated the necessity, along with the economic and political unity, to implement the tasks, aiming to unify the social, scientific and educational systems as well. To these ends, initiatives and reforms have been undertaken to harmonise different sectors to that of the EU [16] [17].

Table 4. Post-Soviet countries ranking by the publication activities (1996–2010)

Country	Documents	Citable documents	Citations	Self-citations	Citations per dvocument	H index
Russian Federation	479 095	474 317	2 288 869	693 521	4.87	274
Ukraine	88 612	87 669	320 194	92 231	3.71	118
Belarus	20 414	20 257	85 425	18 429	4.26	86
Armenia	6 990	6 865	45 442	8 353	7.03	83
Georgia	6 056	5 894	36 333	4 875	7.16	67
Moldova	3 642	3 605	18 448	3 854	5.29	47
Uzbekistan	6 037	5 943	20 037	4 039	3.50	46
Kazakhstan	4 088	4 028	13 388	2 067	3.61	41
Azerbaijan	5 252	5 189	10 686	2 764	2.55	35
Kyrgyzstan	733	727	3 337	320	5.12	27
Tajikistan	673	666	1 616	254	2.55	20
Turkmenistan	123	121	833	34	6.19	12

Funding

The role of funding is undeniable for the further development of science, research and innovation. The fundraising processes are in a very poor position in the mentioned states, which were further challenged by the overall world economic situation. After the collapse of the Soviet Union, there was a sharp decrease in the financing of science. The global economic crisis revealed that post-Soviet republics' economies are more vulnerable to external events. Still, the wealth of the nations is highly dependent on technology innovation, which develops with high speed. In line with new imperatives, there is a constant need for societal progress, which is largely connected with funding. Using modern societal innovations, this problem can be solved by also attracting private capital in the development of science, particularly private contributions and launching different social initiatives, aiming at combining possible resources towards the revival of the science sector.

However, despite multiple challenges, IC in some republics holds promise, particularly from the perspective of economic competitiveness. Bearing in mind past experiences and mental threats, there is a possibility to adopt new societal innovations and make a breakthrough.

Figure 4. Post-Soviet countries ranking by H-factor (1996–2010)

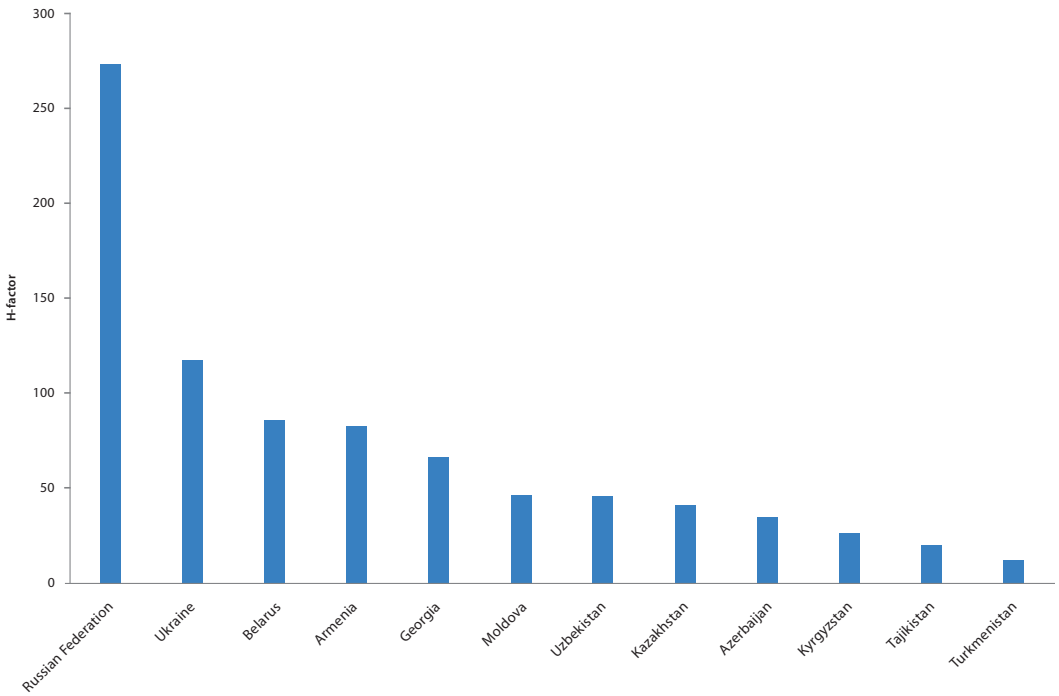
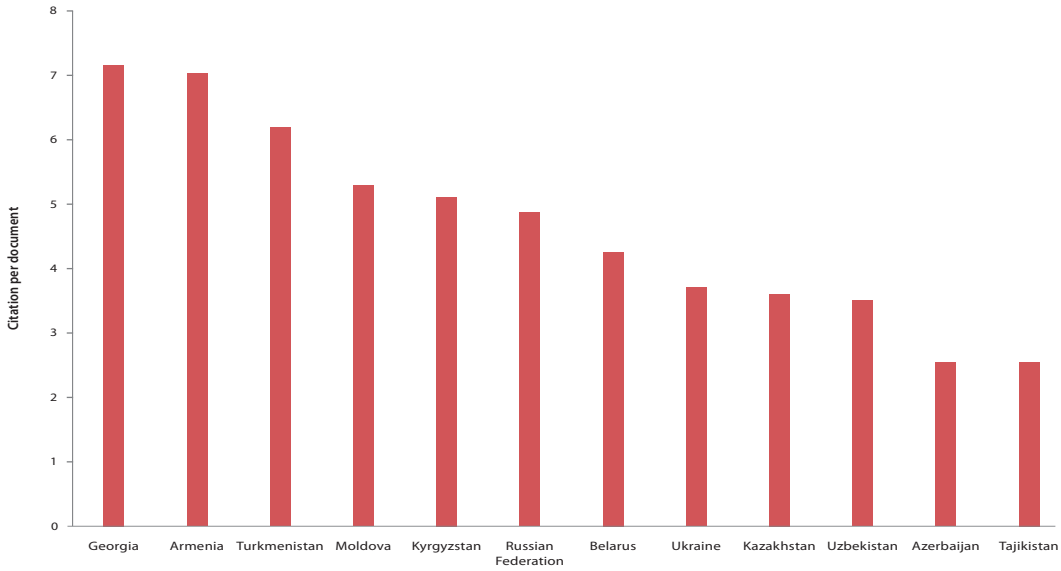


Figure 5. Post-Soviet countries ranking by per document citation (1996–2010)



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3.8 Dialogues Incubator: open service innovation in the financial sector

Logica and Dialogues Incubator (Corporate Venture of ABN AMRO bank) are successful partners in open service innovation, value creation and valorisation of intellectual capital. This article illustrates a case study of Dialogues Incubator (DI) as an open service innovation enabler in the financial sector. It describes some of the representative DI partnership projects which were selected for the EU study *OSI: Socio-Economic Impact of Open Service Innovation* supporting the Digital Agenda for Europe led by Logica Business Consulting [1]. This paper also introduces the challenges that actors face in open innovation processes, the lessons learnt and observations for future considerations.

Facilitating innovation and entrepreneurship in financial services

Since August 2007, part of the ABN AMRO Bank [2], the Dialogues Incubator [3], has been conceived to create value in a rapidly moving society, with the 21st century edge that it requires. The core of Dialogues Incubator constitutes of research and development for ABN AMRO Bank. DI is a combination of corporate venturing with open innovation research in the field of financial services. 'Dialogues' stands for business cooperation, innovation and sustainable responsibility. DI matches real ABN AMRO expertise, human and intellectual capital and actual market needs to provide solutions to real people, business and social issues. The DI team is dedicated to capturing the essence of the transient economic and social environment and does so with a fresh perspective, commitment and entrepreneurial spirit. The goal is to utilise potential at hand to launch a multitude of new companies that will help a different sort of economy to grow: one that is genuinely sustainable — socially, environmentally and economically. Development at Dialogues Incubator is a collaborative, action-learning approach that maximises value for people, profitability and environment. Example ventures include ARTSTART (trading art and education art buyers) [4], Associates (freelancers' platform) [5], Dialogues Technology (agile ICT development) [6] and BrightboxHR (best practice HR solutions for corporates) [7].

Dialogues Incubator operates in the field of open services innovation (OSI). To successfully implement OSI, Dialogues Incubator: (i) leverages its own and partners' intellectual to create a competitive advantage; (ii) calculates results in financial and non-financial metrics; and (iii) facilitates its people in real innovation by having a climate in which failures are okay, if they happen despite best intentions (so-called combinatoric innovation [8]).

In 2010–11, 'Dialogues Incubator' was selected as an innovative, successful and representative case study for the EU study *OSI: Socio-Economic Impact*

Figure 1. ABN AMRO Dialogues house: Open innovation environment [9]

of Open Service Innovation led by Logica Business Consulting supported and assigned by the European Commission's Directorate-General for the Information Society and Media in support to the Europe 2020 agenda and the Digital Agenda for Europe [1].

This case focuses on the broad field of crowdfunding and knowledge valorisation. Two projects are active in this area: iDexpress [10] and Seeds [11]. iDexpress started in 2010; Seeds is to be launched in the first quarter of 2012.

Both projects are in a beta phase: open to public, but dynamic in their growth and strategy. Partners may join or stop, depending on the results for the coming period.

The case is an example of the difficulties and challenges companies have to overcome in creating joint business value. The aim for both projects is the generation of business and social value for all parties involved. The innovation methodology used during this project is Dialogues Scrum [12], along with scenario analysis and business model generation.

For this case study, Dialogues Incubator focused on its knowledge and financial valorisation joint venture initiatives iDexpress and Seeds.

iDexpress puts inventions of inventors, researchers and corporate product development groups on the market by actively bringing these parties into contact with investors and companies (matchmaking). iDexpress can also put research questions to its own inventors' network for the benefit of organisations that do not have a solution for their business challenges. iDexpress has been active on the market since Q1 2010.

Seeds will be launched as online crowdfunding platform where new ventures with funding needs between EUR 35 000 and EUR 150 000 are introduced to a large group of informal investors. These informal investors have the possibility to participate in one of these ventures, by making an investment of a minimum of EUR 20.

The productivity growth of Dialogues Incubator achieved with open service innovation is estimated

Table 1. Participants

Participants	
ABN AMRO Bank	ABN AMRO is a large bank, headquartered in Amsterdam, the Netherlands. ABN AMRO has large commercial and consumer operations in several countries. Role as network partner
Dialogues Incubator	Dialogues Incubator is a subsidiary of ABN AMRO Bank, focused on open innovation. Role as facilitator, physical location for team, business development knowledge, connection to crowdfunding, ICT related issues
NOVU	NOVU is the Dutch organisation of inventors, product developers and researchers and based in Utrecht in the centre of the Netherlands. The organisation looks after the interests of its members in the widest possible sense. Members include company employees as well as individual inventors whose main activity is inventing. At the moment there are over 1.000 members. Partner in iDexpress. One of the objectives of NOVU is networking among the individual members. Role: adding network and specific knowledge on patents and inventions
Dutch	Dutch is part of the Dutch group, which includes the joint activities of consultancy firm Dutch, the scientific part Decide and D-W&S Interim management. Dutch provides advice and implements it. Approach is characterised by close collaboration, equality and a commitment to results. Services are focused on the most important business issues of today: value creation, risk management and/or cost optimisation. Partner in iDexpress. Role: getting things done. Leveraging own network, supplying FTE
Province of Utrecht	Provinces do the work too small for the State and too big for the municipalities. The Province of Utrecht consists of 29 municipalities. Provinces solve regional problems and create jobs and value for her inhabitants. Partner in iDexpress. Role: financial aid to the project, connections to other parties
Seeds	
Dialogues Incubator	Dialogues Incubator is a subsidiary of ABN AMRO Bank, focused on open innovation. Role as facilitator, physical location for team, business development knowledge, connection to crowdfunding, ICT related issues
Several partners	SMEs to be crowdfunded, Dutch Government, several legal branches, Investment Angel networks, cannot be disclosed yet

at 5–10 % year-on-year. The open service innovation efforts are contributing to the variety of services and new forms of revenues. Open service innovation creates new markets. Within the firm, knowledge is explored through knowledge exchange and leveraging intellectual capital. Within the firm, there is no full understanding of the need to innovate breakthrough manner. Skill development within the organisation is aligned with business and agile development. Innovation is organised via the incubator, open innovation lab and corporate venturing group. The team consists of 40 people. Dialogues Incubator focuses in the people/employees in the broader perspective: highly analytical, but also creative, which are difficult to find (Figure 2).

Dialogues Incubator's innovation network consists of more than 50 national and international organisations, 40 % of them are knowledge institutes, 40 % medium to large corporates and 20 % SMEs. Some 80 % of the companies are outside of the financial/banking sector. In the last five years, approximately 60 % growth in the organisations of DI's innovation network can be noted. DI develops long-term relations with innovation partners, and also selects partners from the internal innovation network on a case basis. With some partners, DI's have established a trust relation (e.g. TCS, Holland Financial Centre, IBM, Maastricht University, IIP Create, University of Amsterdam, Logica and Mediaguild).

The main collaboration drivers needed to participate in open innovation are dialogues. To understand technological trends and societal changes, DI follows an action-driven approach, in which changes are monitored and the strongest signals transformed into business cases and prototypes. If case and prototype both survive several litmus tests, a new company will be formed. Crowdfunding was one of those trends in which DI decided to use an action research-driven approach. Crowdfunding and facilitating the valorisation process gave Dialogues Incubator a lot of insight. Clients who know the DI projects (Crowdfunding, Time Banking, Incubation Services, etc.) view ABN AMRO as more entrepreneurial. The users are involved at all the stages of innovation from process design, service offering to the usability of the platform. Users/customers generally do not know that ABN AMRO is such an innovative company. ABN AMRO is very reluctant to open up its innovation projects to the public. This is a paradox. However, this is slowly changing.

Figure 2. Dialogues Incubator typical teamwork

The innovation process happens in the following way. There is a R & D department annex to the corporate venturing group within Dialogues House, which is the main implementator/organiser of open service innovation process for DI. Users are involved at all the stages of the innovation process and they play a very important role. Innovation process as indicated above goes from creation to implementation involving all relevant stakeholders inside and outside of the organisation. There is, however, a barrier to the innovation process, which is that it is a traditional company, so innovation mostly falls under the 'not invented here' scenarios.

Services innovation

Services developed within Dialogues Incubator are mostly new to the market and always new to the company. DI focuses on services innovation. Open innovation led to a more flexible service offering: agile development is now more and more the standard. 'The delivery speed, what a client gets is what he has requested' is the dominant improvement strategy in service delivery. Equal partnership is the strategy of the innovation partnership. The aim of any partnership is to create common values, generate and share knowledge and joint venture.

DI creates and implements the innovation. It is not interested only in creating, but also practicing what it preaches and also learning from implementation. The main incentives for innovation for at Dialogues Incubator are venturing, worthwhile research and generating a better world. Main innovation drivers are finding new markets and revenues and exploring new business models to understand new economic models. However, corporate dynamics and changing strategy prevent open innovation flourishing at DI.

Challenges

- Open innovation is challenging because it involves many actors in the openness. This means having to deal with corporate politics and changing strategy during the project. This may also include different roles in the project as insights evolve also during the project, not just beforehand. A good SWOT and stakeholder analysis can solve part of the puzzle, although part of it is emergent. The solution to this is to create flexibility in the process. The last solution is to think of networked innovation.
- A service is difficult to protect and easy to copy. The combination of the actors and intellectual capital create lasting value. It takes time to figure out what combination and people work best together. Agile development and trust in each other can overcome this barrier.
- If you want to succeed in services innovation, probably the best way is either to create a perfect client experience or to go into markets no one has entered before. This increases the failure rate, but will be one of the most interesting times of your life.
- Starting up takes time and money and, most of the time, more than expected and appreciated. Overcoming this needs a strong vision, supported by managing boards and strong personal skills of all individuals involved,
- IPR can be a challenge for the creative mind, so it's better to be regulated appropriately from the start.

Lessons learnt

- Innovation is combinatoric [8]. Innovation is based on new combinations of knowledge, ideas and people with diverse backgrounds. The process can successfully be stimulated by creating connections between people and organisations, which will start a dialogue based on serendipity.
- Failing in the beginning is excellent, because this gives the opportunity to rethink the business model and improve your service. Think big, start small and accelerate fast.
- Make money scarce and not the goal of your project. Scarcity will let you focus and different (also non-financial) goals will give your project team an opportunity to explore different means to generate results.
- Investigate areas of taboos and unwritten rules in your organisation: failing can be one, also dependence of metrics and strategy in firms provide a vast area of opportunities for innovation and breaking out of the ordinary.

Observations

As both projects have recently been started/launched (in less than 18 months), it is difficult to measure concrete financial and non-financial results. Due to different stakeholders, financial information and some partner information cannot be disclosed yet. Last but not least, the financial sector has been going through a very turbulent time. Corporate dynamics and (un)desired connection to strategy have been more intrusive than the normal changes in the environment would have been.

We expect that this case study has advanced the quest for successful service innovation by adding serendipity, daring to be different (and possibly fail) and focusing on bringing intellectual capital to the chessboard.

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ANNEX

Open Innovation Strategy and Policy Group (OISPG)

Open Innovation - the main focus

Current changes in pervasive connectivity and computing are creating new approaches to, and values in, the design, development and deployment of services. It is arguable that a paradigm shift is underway that involves a move away from centralized decision-making processes to more open and polycentric environments that enable processes of innovation.

This shift makes the capturing of the dynamics that underpin service innovation of paramount importance. From a technological standpoint, innovation is largely based on new web technologies and open platforms for collaboration that present the potential of extensive user involvement. This is creating a basis of a new collaborative culture that can involve all key actors in the innovation of services.

At the same time, service users' roles are changing rapidly. When the potential of users as innovators is taken into account, not only the hit rate for services is increasing, but also the possibility of creating new, competitive, personalized and scalable services, directly deployable in real world settings is significantly strengthened.

One of the key issues in this shift is to capture the experiences of leading industries in this Open Innovation process. This is the main objective of the OISPG as the group has a wealth of experiences of successful approaches to Open Innovation. Open Innovation generates several economic and social benefits to service providers and, consequently to its consumers by delivering services which are better adjusted to the market expectation, increased creative adoptability, better access to knowledge, and quicker and cost-effective innovation cycle. However, to this functional interoperability depends not only on technical but mainly service convergence that is in line with market demand.

For the EU services industry one of the key questions is how to capture societal innovation, societal networks, and social capital as a basis for new user-centric business. Public Private Partnerships is evolving to Public-Private-People Partnerships where all the stakeholders build together (service)innovation ecosystems. Open Innovation presents considerable challenges to existing EU laws, such as IPRs, competition, and privacy, and creates a pressing need for action at both a policy and regulatory levels, in order to make the legal framework supportive of Open Innovation.

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