

New Nature of Innovation /



“The New Nature of Innovation provides helpful insights in how innovation has changed in recent years. It also provides helpful thinking on how governments should respond to these changes and strengthen innovation. The study provides useful input for OECD’s work on innovation, including the OECD Innovation Strategy that will be delivered in 2010.”

Dirk Pilat, Head, Structural Policy Division, Directorate for Science, Technology and Industry, OECD.

Preface

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A new nature of innovation is emerging. In order to formulate appropriate innovation policy encompassing a new nature of innovation, it is important to understand how the nature of innovation is changing. Innovation is no longer mainly about science and technology. Firms can innovate in other ways. Co-creation, user involvement, environmental and societal challenges increasingly drive innovation today. Collaborative, global networking and new public private partnerships are becoming crucial elements in companies' innovation process.

This report is funded jointly by the Danish and Finnish governments and analyzes new emerging forms and new areas of innovation and how governments are responding to the new nature of innovation. The study is a contribution to the ongoing OECD innovation strategy work.

We are convinced that a better understanding of the new nature of innovation, supported by case studies from both the private and public sector, will inspire the way in which we think innovation and create the best conditions for our countries to become global leaders on innovation.

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September 2009



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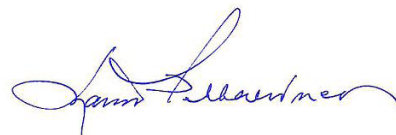


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Introduction



This study is a contribution to the OECD Committee for Industry, Innovation, and Entrepreneurship (CIIE). It is an input to the new OECD innovation strategy which will be presented in 2010 and focuses on identifying and describing new ways in which companies work and the need for a transformed business environment – a New Nature of Innovation.

The study relies heavily on the work of the Paul and Ruth McCracken Distinguished University Professor of Strategy C.K. Prahalad at Ross School of Business, University of Michigan and Professor of Practice in Global Management Jose Santos at INSEAD. We would not have been able to complete this study without their help. Their engagement has been outstanding, and FORA would like to thank both of them for their valuable and irreplaceable contributions.

We would also like to thank the business professors, innovation experts and company managers who have contributed with their expertise and help when identifying and compiling the business cases. A complete list of contributors can be found at the beginning of Chapter 2.

On our travels visiting countries with innovation policies that reflect the new nature of innovation, we were grateful to be able to meet with some of the most prominent policy makers and policy experts. We are very grateful to our national counterparts and CIIE colleagues who helped setting up interesting meetings in Washington, Ottawa, Berlin, London, Helsinki and Canberra. A special thanks goes to Saul Japson, Matthew Lucas, Fernando Galindo, Matthias Marx and Matthew Squire. A complete list of policymakers who we visited and spoke to can be found at the beginning of Chapter 3. Their insights have given us inspiration for formulating policy suggestions relevant to the OECD innovation strategy.

The Finnish Ministry of Employment and the Economy and the Danish Authority for Enterprise and Construction have funded the study, and we thank them for their contribution. The UK-based National Endowment for Science, Technology and the Arts (NESTA) has participated in the initial phase of the study.

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Chapter 1

Setting the Scene

1.1 Introduction

Innovation is a driving force of welfare and contributes to increasing the standard of living. This work addresses new forms of innovation taking place in the private sector - within companies as well as between companies. A public perspective is taken by exploring the policy implications of a new nature of innovation.

The work and the assumptions on which it rests have been discussed with both innovation experts and policymakers around the world. The purpose of the discussion has been to test hypotheses as well as collect most recent policy experience. It is noteworthy that when discussing the work and the understanding and meaning of a new nature of innovation, the feedback has been very positive. Most innovation experts and policymakers across countries have certainly been able to relate to the issues and agreed on the need to identify the policy implications related to a new nature of innovation.

1.2 Transformation of Societies

A new nature of innovation is emerging and reshaping public policy. Economic and financial stability is fundamentally important. Stabilising macro policies and efficient markets will still be decisive for economic development, but will no longer be sufficient to ensure welfare and meet threatening global challenges.

In the innovation economy, a more responsive public sector and a comprehensive set of micro policies are central in order to reap the benefits from a new nature of innovation.

The globalised world and the connectivity created by digitalisation changes society and are also changing public policy. Several forces underpin the ongoing structural transformation of societies.

The centrality of the individual opens new possibilities for micro consumers, micro producers and micro innovators and investors. In the globalised and digitalised world, all have the possibility to be connected and act, allowing individuals to participate more actively in society.

Activeness and symbiotic relationships are occurring as informed customers are empowering the scene and forcing companies to react. Even the biggest companies do not possess the resources or the ability to act alone. In the emerging new nature of innovation, a multitude of skills are required for solving complex challenges – which is why partnerships and collaborative networks arise and symbiotic relationships are created between transnational companies, micro companies and public institutions.

Interdependence of institutions occurs as no single institution is able to act and innovate on its own. As partnerships and collaborations are formed between companies, organisations and the public sector, new innovation ecosystems emerge, and networks are created between all types of institutions.

Companies are moving away from a traditional supplier base towards supply webs and the creation of nodal firms. Governments are partnering up with companies and are including them in creating new solutions to the delivery of public services.

Companies and institutions are going away from control towards influence and away from ownership towards access.

Wealth creation through innovation will be the dominant way of creating progress for an increasingly larger population. Wealth creation and better welfare must take place using fewer resources for more people, which calls for continuous innovation in interactive and iterative processes including big companies, entrepreneurs and public institutions.

Governments will have to play a new role in the future. They must be responsive and able to engage in interdependent relationships with companies and organizations in the private sector. Governments must provide solutions to societal challenges by involving the private sector and relying heavily on innovation.

A new nature of innovation requires completely new, multidisciplinary skills and competencies, and the demand for these new human resources will be immense. Universities, educational institutions and knowledge centres in particular must react and new institutions will appear to address a new nature of innovation.

New partnerships will emerge and be crucial for future innovation. Government and public institution participation in collaborative networks will be vital. Symbiotic relationships will challenge most public institutions and will call for new mindsets and competencies in the public sector.

The private sector will provide new innovative solutions to a much larger extent because they spot a market for it. In addition, new partnerships will emerge between firms of different sizes in knowledge hubs, regionally, nationally and across the globe.

Public institutions must adapt to the conditions in a new nature of innovation. They will be interdependent of other actors and must also be ready to move away from control-based policy formulation towards more influence-based.

Regulation must be used more intelligently. Governments will invoke innovation and achieve win-win situations by using innovative regulatory and regulatory-like designs to direct users and producers towards a more innovative behaviour.

1.3 What is new?

To predict or even declare “a new nature of innovation” may be regarded as somewhat of an exaggeration. From a macro perspective, new technology has historically been the dominating driver of innovation and a very important reason for an increased standard of living. The process of creative destruction has been driven by new technology and entrepreneurs.

This will still be the case in a new nature of innovation, so what is new?

In the past, technology and competition were the main drivers of company innovation. Companies had an “inside-out” way of thinking. Based on internal resources, they designed new products and services and used marketing to persuade consumers to purchase.

Companies defined their role in society in accordance with the industrial paradigm. In this system, the political system set the legal framework and defined the rules, while companies could optimise their business as long as they complied with the rules.

Technology has always played an important role in driving innovation, and it will continue to do so in the future, but for many companies technology will gradually move from being a driver of innovation to becoming an enabler of innovation. Today there are new drivers of innovation which are gaining importance and becoming just as important as technology once was.

In the future, companies will need to become more open; i.e. to learn from their customers, collaborate with others and assume greater social responsibility. If they fail to do so, they will not survive. While companies will still optimise their business, globalisation and the digital technology have changed the rules of the game.

A new global openness implies that citizens from all over the world are potential customers, and that high quality resources can be found all over the world. From a company's perspective, this will change innovation. A deeper understanding of user needs will be an important driver of innovation, and new technology will enable companies to come up with entirely new solutions where companies and customers co-create value and create unique individual experiences. In a new nature of innovation, we will see a new balance between technology-driven, competitive-driven and user-driven innovation – with much more emphasis on the users. We will see new business thinking and new business models where companies assume a much higher level of social responsibility.

A new nature of innovation is taking place at the micro level. One should not expect policy implications on the macro level. Still, an interesting question is: how important are policies at the micro level? Hopefully this study will shed some light on this question.

1.4 Four Drivers of Innovation

The emerging new nature of innovation has a number of critical characteristics which differentiate future innovation from the innovation of the industrial era. Four drivers will gradually transform the manner in which companies innovate and for each driver new innovation principles will arise. The four drivers are:

1. Co-creating value with customers and tapping knowledge about users
2. Global knowledge sourcing and collaborative networks
3. Global challenges as a driver of innovation
4. Public sector challenges as a driver of innovation

The four drivers illustrate important new trends or areas where something new is emerging. Until recently, these trends have developed on a small scale within unique companies or niche

markets. What is new is that more and more companies are reacting to the changing conditions for business and are beginning to innovate in new ways. In other words, they are changing their strategies and business models.

No single company will react to all of the trends described. However, we believe that if companies want to remain innovative and competitive, they will have to adapt to today's business environment in one way or another as will be described in the nine innovation principles.

In Chapter 2, each principle will be illustrated by business cases that seize the new era of innovation. The business cases should be regarded as signals of emerging trends of practice. The case studies should be able to be used as examples of changes that can take place across all sectors.

Co-creating Value with Customers and Tapping Knowledge from Users

Companies have to open their innovation processes. They must listen carefully to customers and address needs based on the customer's terms – not the company's. Information and communication technology (ICT) will be a key enabler in co-creating unique value with individual customers and in enhancing the experiences of the consumers. ICT enables companies to co-create with many customers simultaneously. Companies will involve users in early stages of their innovation processes by tapping tacit or hidden knowledge from customers, and by finding inspiration in users' new solutions to problems.

In the industrial age, companies competed in the areas of production efficiency, low-cost distribution and persuasive marketing. In doing so, company innovation relied on internal resources, organized and efficient mass production, and the use of branding and marketing to spot new markets. Today, insight into customer needs and behaviour must be an integral part of a company's strategy and business model.

Companies must listen and have dialogue with customers and give them access to all kinds of information, platforms and company systems. Companies must be transparent and evaluate risk with their customers. In doing so, companies will co-create unique experiences in collaboration with individual customers, as well as with many different customers at the same time. The emergence of new ICT has made this possible at a very low cost - sometimes at nearly zero cost.

Tapping hidden knowledge from customers and involving users in the beginning of innovation processes requires different knowledge and competencies than has previously been necessary for innovation. To understand how new generations think and act may require a whole new set of skills or even a new company culture.

Global Knowledge Sourcing and Collaborative Networks

Companies will form collaborative networks and engage themselves in binding innovation partnerships. No single company – regardless of size – will possess all the knowledge and resources needed to innovate on its own. Therefore, companies will have to access and combine globally-dispersed knowledge on a larger scale than ever seen before.

Transnational companies have always sourced knowledge globally, but in the future even the smallest companies will have the opportunity to source knowledge on a global scale. This will be necessary to respond to global competition.

Previously, companies usually searched for knowledge from renowned experts and institutions. Today, with some sector variation, companies locate knowledge from a wide range of sources, even from individuals with a background and location that may appear less than obvious, but who

nonetheless are highly relevant when attempting to solve a specific challenge.

The new global search for knowledge bears important policy implications. In the industrial era, the free movement of commodities and capital was, and still is, crucial, but in the global innovation economy the free movement of knowledge workers will also be critical. Codified knowledge can be shared at a distance, but tacit or hidden knowledge can only be shared through physical presence.

Global Challenges as a Driver of Innovation

Companies will constantly search for new business opportunities, and they will realize that global challenges such as climate change, the supply of clean water, epidemics and social needs constitute a huge new market. By creating new and more responsible and sustainable solutions, companies can cultivate new business opportunities. 'Corporate social innovation' may be an important new business area for private companies and a core driver of innovation.

Global challenges such as climate change, access to clean water and various social needs have until now been regarded as political challenges and not as business challenges, implying that the responsibility for finding solutions rested with the political world. Companies responded to requests and demands put forward by public sector institutions by providing the required service or product.

In the industrial age, companies focused on production and profit maximization within the existing demarcation line between private and public. For the most part, companies did not innovate and create new solutions to meet global challenges.

The private/public demarcation line is becoming increasingly blurred and is being challenged by a myriad of companies, in particular leading global companies. They find new business opportunities by designing new solutions to problems caused by mankind's behaviour.

This should not be regarded as charity, as companies maintain their economic focus and look for revenue opportunities. But companies may be forced to change their business culture. They have to listen to and form partnerships with other companies, non-governmental organizations (NGOs) and governments. They need to open up their innovation processes and create new solutions in collaboration with their partners.

The blurring line between public and private demands has repercussions for the role of governments. Governments will have to play a greater role in collaboration and will sometimes form partnerships with private companies. This requires a new set of skills and perhaps also a new culture in the public sector.

Changes of this nature can probably not be commanded from the top but must take place in more collaborative ways. How should the political system facilitate such a cultural evolution?

Future regulation must provide space for both companies and policymakers to create common solutions, but how can these solutions be found when future innovations might be unknown?

The idea of creating lead markets will stimulate innovation. If there is widespread support to solve an environmental or social problem and a political will for action, governments may formulate goals and create sufficient trust for private companies to react and to innovate.

Public demand is considerable and remains important to economic activity and could be used in a strategic way to stimulate corporate social innovation.

Foreign aid has been established and implemented in accordance with the industrial society's demarcation line between the public and the private sector. Emerging needs in developing countries may provide a new and important business opportunity and thus calls for a revision of the guiding principles behind foreign aid. Foreign aid could and should to a greater extent stimulate and facilitate collaboration and partnership between private companies, international organisations, NGO's and governments in both developed and developing countries.

Public Sector Challenges as a Driver of Innovation

The demand for innovation in public services would appear obvious. However, the difficulties also seem quite substantial. Citizens look for more individualized welfare services of higher quality, but the amount of resources allocated to the welfare system are under pressure, and the system's ability to innovate can be questioned.

These challenges open a huge territory for private companies if they can find ways for innovating with the owners of welfare institutions, but the path into public services is a road with many political obstacles. Across all OECD countries, there are political priorities in terms of economic and social equality but also in terms of efficiency and individual freedom.

This cross pressure underlines the need for a discussion of how private companies can be involved in innovating the welfare system without affecting the delicate political balance between economic and social equality on the one hand and efficiency and quality for individuals on the other hand.

In line with the changing demarcation line between the public sector and the role of private companies in creating public services, the public sector and the welfare system can be important drivers of innovation for the business community.

1.5 Policy Implications

The changing nature of innovation is expected to have far-reaching policy implications. At the same time, only few countries have experience with formulating and implementing broad-based innovation policies. As a result, a common understanding of the policy implications has not yet been established.

An attempt has been made to identify new forms of innovation policy. Based on country visits and dialogue with innovation experts and policymakers, some practical policy implications of a new nature of innovation have been outlined. These implications are described in more detail in Chapter 3. A brief overview of the suggested new policy areas are presented below.

Governments should:

- Build knowledge and competencies necessary for a new nature of innovation to flourish
- Introduce smart regulation
- Use intelligent demand

Governments could enhance innovation by investing heavily in new knowledge and competencies that are necessary for a new nature of innovation to get a stronghold.

The existing national innovation system is built around science and technology. Dominant innovation policies have consisted of subsidising private science and technology, government investments in science and technology, support to technology transfer and efficient IPR rules. New technology will still be crucial for national innovation and wealth, while existing national innovation systems must be strengthened and developed in the light of an emerging global market for technology and global knowledge sharing.

In a new nature of innovation, businesses need access to knowledge beyond science and technology. Companies need access to explorative knowledge about user needs and behaviour on a global scale. They need competencies to design new concepts and platforms for co-creation and competencies to tap unacknowledged knowledge from users. They need access to a wide range of disciplines such as social science, human science and arts, enabling e.g. designers and architects who have business understanding to work in multidisciplinary teams with natural scientists and engineers.

It can be argued that a majority of companies in the future will invest more in this kind of knowledge and competencies than in science and technology.

To meet such a demand from companies requires very responsive universities and research and educational institutions, but it also requires heavy investment from governments.

Governments could introduce smarter regulation. Global challenges such as climate change, clean water, epidemics and social needs can only be addressed by a combination of innovation and regulation.

To find the right balance between regulation and innovation requires smart public sector policies. The government must set new and demanding standards, but the timing must depend on technological possibilities. When regulatory authorities do not have enough knowledge to introduce smart regulation, it requires collaboration with research institutions and private companies to design and implement smart regulation.

Trusting partnerships between regulating authorities and private companies could presuppose a new culture and new competencies in the public sector, as well as the willingness to allow experiments and to participate in them.

Smart regulation demands deep public understanding of problems and possibilities, and strong government leadership.

Government could use public demand more intelligently. The public sector and especially the welfare system are under pressure. There are severe budgetary constraints and a lack of innovation capacity in the public sector.

Governments could open the public sector for private innovators. Public procurement could be designed more intelligently to enhance private innovation, and public institutions and private companies could form innovation partnerships and create new welfare services.

Intelligent public demand also requires willingness to perform experiments, deep understanding and government leadership.

In Chapter 3, case examples on government investment in new knowledge, smart regulation and intelligent demand can be found.

Chapter 2

New Drivers of Innovation

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This chapter presents new drivers of innovation and the underlying nine innovation principles. Each of the innovation principles are based on evidence of new innovation behaviour. In order to illustrate the emerging behaviour, we have used business cases to describe what is new and what some companies from all over the world are doing today. The business cases should be seen as new, albeit “weak signals” of forms of innovation.

In order to identify and describe the nine principles of a new nature of innovation, we have received valuable input and guidance from a range of people (Box 2.1)

Box 2.1: Business Professors and Innovation Experts Contributing to the Study

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2.1

Drivers of Innovation and Innovation Principles

The centrality and connectivity of individuals made possible by digital technology and the internet opens new business opportunities for companies. Innovation Principle 1 describes how new business models emerge where companies and customers co-create value and individual customers get unique experiences. Innovation Principle 2 illustrates how companies use new methods to tap hidden knowledge from users in order to design new solutions.

The complexity of both new technology and co-creation with many customers in real time means that no company can rely on their own resources and innovate alone. Innovation Principle 3 describes how companies need to access and combine globally-dispersed knowledge. Innovation Principle 4 describes how companies form collaborative networks and innovation partnerships. It is not only large companies that source globally, but also small companies. The dynamic of small companies, entrepreneurs – and their partnerships with large companies – is described in Innovation Principle 5.

Co-creation, tapping hidden knowledge from users, global knowledge sourcing and innovation partnerships are drivers of innovation in themselves, but they also enable companies to explore new business areas.

Designing new solutions to meet growing global challenges is already a new business for some companies and will be a new field with a large potential for many companies in the future. Innovation Principle 6 describes how environmental concerns are a driver for innovation, while Innovation Principle 7 describes how needs in developing countries are drivers of innovation.

Designing new solutions to meet emerging pressures on the welfare system can also be a large potential business area for company innovation. This is described in Innovation Principle 8.

Innovation Principles 1 to 8 represent new forms of innovation where companies create new solutions to meet real needs. The innovation process is no longer company-centred and inside-out innovation, but user-centred and outside-in innovation. New solutions can often be created by existing technology or new combinations of existing technology where technology is not the driver of innovation but the enabler. This new role of technology is described in Innovation Principle 9.

The nine Innovation Principles are summarized in Box 2.2.

Box 2.2: The Nine Innovation Principles

Co-creating value with customers and tapping knowledge from users

Innovation Principle 1: Co-creating values with customers

Innovation Principle 2: Users' Involvement in Innovation Processes

Global knowledge sourcing and collaborative networks

Innovation Principle 3: Accessing and combining globally-dispersed knowledge

Innovation Principle 4: Forming collaborative networks and partnerships

Innovation Principle 5: Dynamics between large companies and entrepreneurs

Global challenges as a driver of innovation

Innovation Principle 6: Environmental concerns drive innovation

Innovation Principle 7: Needs in developing countries drive innovation

Public sector challenges as a driver of innovation

Innovation Principle 8: Welfare system concerns drive innovation

Technology's new role

Innovation Principle 9: Technology's role as an enabler of innovation

In the description of each of the nine innovation principles, the same template is used. First, a brief presentation of the principle is outlined. Then, characteristics from the previous period are mentioned, followed by a discussion of the emerging signs of change illustrated by business cases. Then, the gradual changes that are occurring are illustrated, and finally some visible consequences are drawn up.

2.2

Co-creating Value with Customers and Tapping Knowledge from Users

The individual consumer is being placed at the locus of innovation today. This leads to a shift in the focus of innovation towards providing individuals with unique and customised experiences when they purchase products and services. For this experience to be meaningful, companies will have to understand their user's behaviour and include them early on in the innovation process to provide them with solutions that satisfy their needs. As consumers and users become more informed, and are able to exchange and utilise globally-available knowledge, they are placing higher demands on products and services delivered by companies as well as the public sector. At the same time, the world is becoming flat - offering all individuals the possibility of participating in the economy and value creation.

Principle 1. Co-creating Value with Customers

The Principle

In the new age of innovation, companies will co-create unique individual solutions with customers.¹ The number of customers each company can co-create with might, in some cases, be virtually unlimited.

Of course, there has always been a market for unique products, but this has tended to target a relatively small and exclusive customer group, and has been costly and time-consuming.

Companies will need to use digital platforms to handle a lot of customers at the same time (in real-time). In addition, companies must collaborate with other companies through different networks, sometimes forming partnerships.

The Previous Period

In the industrial era, business strategies were mainly company-centred. Companies used their own resources to develop products and services and competed mostly on price and quality.

This competition on cost led companies into the mass production of unified products and services. The more identical products or services a company could create, the lower the unit costs and the higher the earnings. To compensate for this, companies invested heavily in sales and marketing to convince or persuade customers that they needed a specific commodity or service.

In the last couple of decades, price competition has also led companies to concentrate on their core competencies, leading to increased vertical disintegration and fierce competition among suppliers.

Today, every company has access to mass production and more efficient value chains, making it increasingly difficult to win on price alone.

Signs of Change

Customers have always had a need for individualised products and services. The revenue limitations derived from customers' purchasing power. Highly-individualised products were mainly luxury goods, only affordable to a minority. However, today's technology and digitisation reduces the production and distribution costs of many products and services, making it possible for an increasing number of customers to purchase individualised products or services.

Digitisation, technical production, and production in networks make it possible to produce individual solutions which take into consideration the specific needs of individual customers. Digital technologies and Web 2.0 provide companies with a platform to interact with individuals all over the world at low cost. Technology also makes it possible to produce unique solutions at little extra cost.

The value of having a cardiac pacemaker is changing – going from the value created by the pacemaker itself, to the value created around the services connected to the pacemaker in a network of suppliers.

Case 2.2.1 : Medtronic CareLink Monitor

1 Prahalad & Krishnan (2008); Prahalad (2004)

The medical company Medtronic Inc. has developed a system that enables physicians to check patients' implanted cardiac devices via the internet. The patient can hold an antenna over his implanted device in order to collect data. The data is captured by the antenna, downloaded by the monitor, and transmitted to the Medtronic CareLink Network. Physicians can review patients' data, and patients can check on their own conditions and grant access to family members or other caregivers.

The patient with a cardiac device can now be monitored from anywhere in the world through a network of doctors in various locations. With information technology and wireless communication, a pacemaker becomes part of a network that includes the patient, doctor, other experts, hospitals and family. The pacemaker is no longer just a product. It is the nexus of a network. The value of the pacemaker derives from the experience and the ongoing sense of security and peace of mind that it provides the patient.

Source: Prahalad & Ramaswamy (2004)

The Medtronic's CareLink system goes beyond the cardiac device itself and unleashes opportunities for an expanding range of value creation activities. The technology platform can support a wide range of devices and remote monitoring/diagnostic systems, potentially used for monitoring blood sugar readings, blood pressure, brain activity and other important physiological measures.

The creation of unique solutions is not limited to digital products. Within several other industries, companies are co-creating value with their customers in order to deliver a unique experience for the customer.

To enhance competitiveness, the tyre manufacturer, Bridgestone Tyres, has been piloting an early version of a new co-creation service in Europe, developed around a new business model.

Case 2.2.2 : Bridgestone Tyres

Bridgestone has initiated a pilot project where the focus of their business is no longer only the sale of tyres but added services which enhance the value of buying and using tyres. The tyres have incorporated sensors, which register the usage and the mileage. Instead of selling the tyres as a product on its own, the tyres are leased based on usage.

When sensors are incorporated in the tyres and they relay data to a central data server, Bridgestone can (in real time) register what condition their customers' tyres are in. Hence they can inform the customer when he needs new tires, check the pressure or signs of rough usage.

As a consequence, the customer receives a driver experience, instead of just tyres. Bridgestone is moving away from being a product manufacturer to becoming a service provider, providing a co-created service to the end users.

Source: Prahalad & Krishnan (2008)

The revenue is based on the tyre usage. It is a move from selling resources, to leasing and accessing the resources. Companies collaborate in networks in order to create total solutions to customers' needs.

The value of being taught is changing – going from the value created by access to a single teacher or tutor, to the value created around services individual students can obtain based on a network of tutors which are available online.

Case 2.2.3: Tutor Vista

Tutor Vista connects students in the USA with tutors from India using a proprietary technology platform. The tutors are highly trained “independent contractors” who work with Tutor Vista. For \$100 per month and with an “all you can eat philosophy”, students in the USA can connect and be taught a wide variety of subjects at their convenience by a network of tutors.

Students can access the service “on demand”; a tutor is available when the student is ready. The student can pick “preferred tutors”. The scheduling algorithms seamlessly connect the students (based on grade and subject) with tutors. Tutor Vista makes considerable investments in IT platforms, focused analytics, tutor training and developing academic content. The lessons are customized to student needs; the student can decide on the tutor, the time for the lesson, number of lessons and the level of mastery they wish to achieve.

This is personalized, co-created value. The firm does not employ any tutors; they are all contractors. Tutor utilization differs based on their preferences. The tutor network spans 100 cities in India. Resources are widely distributed, and the firm has unique access to the tutors. The firm has established the standards of customer care.

Source: Prahalad & Krishnan (2009)

Tutor Vista had a customer base of Grades 1-8 (52%), grades 9-12 (28%) and college (20%), and more than 600 tutors are involved.

The creation of unique solutions can also be relevant in industries selling very “ordinary products” such as office stationary.

To enhance competitiveness, United Stationers has built an information and logistical web around their suppliers, resellers and customers.

Case 2.2.4: United Stationers

United Stationers is the largest broad line wholesale distributor of business products in North America with revenue of \$ 4.6 billion in 2007. To enhance competitiveness, United Stationers has built an information and logistical web around their suppliers, retailers and customers.

United Stationers built a project called “marketopia”, whose goal was to understand the unique needs of each one of the retailers and help them tailor their operations to serve their customers better. Each retailer can have a unique product portfolio, focused promotion programs, and the ability to respond quickly to their customers’ demands. United Stationers sources their products from a large network of manufacturers who also provide a significant portion of the advertising and promotional budget .

Source: Prahalad & Krishnan (2009)

Companies will innovate in a market of individual experiences where the value of the product lies in the interaction between customer and company. The individualised experience is realised in the actual consumption of the solution, meaning that many people can have a unique experience simultaneously.

The Gradual Transition

Changes in business models do not happen overnight. Some types of companies may never be a part of this transmission. But there is evidence that individual experiences will gain importance among globally-trading companies. Companies will produce solutions in networks, providing customers with individualised experiences. People will choose the individualised solution over the standardised one.

Television and news providers have been going in this direction for some time. Television companies and newspapers will begin to see themselves as content providers, allowing customers to create individual solutions based on their needs. Medical services will move in the same direction. Treatments will be targeted to individual needs and lifestyles. Travel industries will develop individualised experiences by interacting with customers. It is not hard to imagine how companies will partner to produce solutions for individual customers, driven by the growing complexity of customers' needs.

While there are examples of companies that have taken significant steps and reorganised their internal processes to cater to co-creating value with their customers, most companies will take one step at a time. Companies can experiment within their organisations, starting with small changes. There is still a long way to go before most companies will be geared towards co-creating unique individual solutions with customers.

Visible Consequences

Today's generation is born in the digital age and is used to accessing whatever they need, whenever they need it via the internet and other digital technologies. They spend time on searching, reading, collaborating and organising everything from their MP3 files to social activities. They are not content to be passive consumers. Thus, this generation is increasingly satisfying their needs for choice, convenience and customization by designing, producing and distributing products and services themselves. Hence, they love participatory collaborative business models such as Threadless.com and comparable companies. Their expectations of what companies can deliver vary significantly from previous generations. Companies will have to understand this generation's behaviour and demand for unique experiences.

In 2000, two young t-shirt enthusiasts wanted to make their own online t-shirt design competitions. But instead of using a jury, they would let the designers themselves pick the winner. They founded the online community of Threadless.com, which is based on the democratic principle of letting the users decide what should be produced.

Case 2.2.5: Threadless.com

On Threadless.com, designs can be submitted by anybody. Threadless.com receives about one thousand designs every week. Then, community members (now numbering around 600,000) vote for the best design. The company picks nine shirts from the top 100 to print.

In the beginning, the winner would get a free t-shirt with his/her design. Today the winner is awarded with a prize of \$2000 plus a gift certificate of \$500 – while Threadless.com keeps the property rights.

This kind of collective product development has become a larger success than the founders had imagined. They are now considering launching a community for home appliances. The case of Threadless.com illustrates a new kind of a business model which is based on democratic values – democratic in the sense that it is the community that collaboratively decides which T-shirts should win, and democratic in the sense that anyone can be a designer. The community members participate because it is fun to vote, and because they like the participatory value of the process.

Source: Howe (2008)

The new business model became a great success with sales of US\$ 17 million in 2006.

Principle 2. Users' Involvement in Innovation Processes

The Principle

Companies have started involving users at an earlier stage in the innovation process. Companies are observing users to understand what problems they face and need solved, and are including them at the beginning of the innovation process². By carefully planning user involvement in the innovation process, companies get access to user knowledge which can be crucial for developing new concepts and creating market-shaking innovation.

Until recently, users were mainly involved in the later stages of the innovation process e.g. testing prototypes – often once the product was close to being ready for sale and marketing. This often involved forming focus groups to hear customers' opinions of products, or asking users to test prototypes and products.

'Users' can be other companies or end users. In some cases, a company will interact with other companies to gain knowledge on what solutions should be created, while in other cases a company will involve the end-user in the development of the solution.

In order to obtain the often hidden knowledge that users possess, they might be involved either indirectly in the innovation process (for example through user observations and user experiments), or they might be directly involved in innovating for the company (for example as advanced users).

The Previous Period

Involving users in the development of products and services is nothing new in itself. For a long time, firms have wanted to hear their users' opinions on whether they like products – their shape, smell, the effect and so on. Based on user feedback, firms could improve or adjust their products.

Competing on technology alone has become harder. New technology hotspots are sprouting up all over the world, increasing competition among companies. How can companies now differentiate their products if they have access to and offer the same technological solutions?

2 NICE & FORA (2008)

The new era of innovation is forcing companies to find new sources of innovation. By understanding user behaviour and what problems users need solved, companies are able to create market-shaking innovations.

Signs of Change

If companies understand the reason behind users' behaviour, they can gain insights that will enable them to develop new concepts or platforms. In other words, companies will be able to go beyond incremental innovations and aim for more radical innovations to take place through user involvement.

Companies are rethinking their innovation processes and focusing more on the role of the user. Innovation is no longer only taking place in traditional R&D departments, where the main focus is developing the latest technology. Innovation processes are starting with the user – understanding what problems users face and need solved – and understanding users' behaviour which then gives clues about what products or services to develop. Users are being involved in earlier phases of the innovation process - already when companies are identifying opportunity areas.

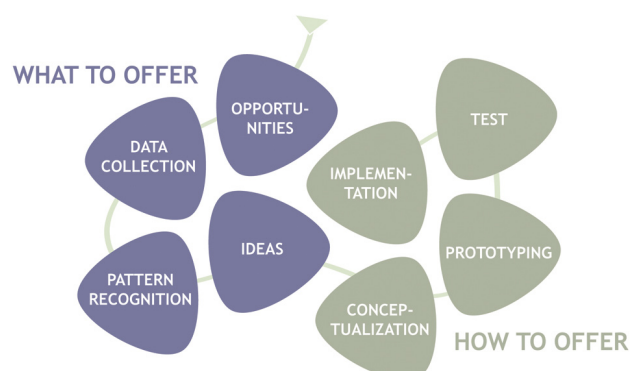
While the inclusion of technology into products or services is taking place later on in the innovation process, the inclusion of users is taking place at an earlier stage in the innovation process. The innovation process is becoming user-driven.

Companies are focusing on a systematic innovation process and making strategic choices regarding when and how to involve users. The innovation process can be divided into different activities, and it can be relevant to involve users in all of them. The innovation process can be divided into two phases: the pre-innovation (or front-end) phase where companies focus on what to offer, and the more traditional innovation phase where companies focus on how to offer it. Each phase is comprised of several innovation activities. An innovation process does not always include all possible activities and seldom is an innovation process linear, but iterative.

The possible activities within the what phase are opportunity identification, data collection, pattern recognition and concept ideas. Users can be included in these activities through e.g. observations of users or experiments with users. Until recently, the pre-innovation phase was rather limited and less systematic in most companies and would very seldom include users, but this is changing rapidly. More companies are developing new innovation processes with new and advanced methods for tapping user knowledge in the pre-innovation phase where new business opportunities are explored.

The possible activities within the how phase are conceptualisation, prototyping, test and implementation. Users can be included in these activities by e.g. participating in focus groups, interviews or surveys to evaluate the products. Most companies have a long tradition for doing this, but users can also be involved in the how phase by being a part of the company's innovation team, which is a rather new and demanding task³.

Figure 1: Activities in the innovation process
Source: FORA (2008)



Companies are increasingly involving users in different ways in their innovation processes. Users can be involved in the innovation process indirectly – in other words they are not part of the company's innovation team. Companies are tapping tacit knowledge from their users by employing methods during the innovation process which previously have not been used for commercial purposes, for example ethnographic methods. This can involve user observations such as living in peoples' homes or shadowing them for a longer period of time, collecting diaries with descriptions of users' daily life, asking the users to take photographs of relevant situations and so on. The data which is collected is analysed in order to understand the patterns of user behaviour – a lengthy process which involves going through all the data and creating patterns of user behaviour. What all the methods have in common is trying to understand the users' behaviour which the users themselves may not be able to articulate. What users say is one thing – what they do is another.

More and more companies experiment with involving users in new ways in the pre-innovation phase.

In 2004, the Norwegian toothbrush producer Jordan was feeling the pressure from market giants Procter & Gamble (Oral B) and Palmolive-Colgate (Colgate), whose R&D expenditure is higher than Jordan's total revenue. By using various ethnographic methods in order to understand what dental hygiene meant to their users, Jordan was able to create a new innovation platform and reposition its brand.

Case 2.2.6: Jordan

Jordan decided to focus on gaining knowledge about users in the Nordic countries by employing ethnographic methods among others. 100 users from Denmark, Norway, Sweden and Finland participated in the studies. The users were given disposable cameras and asked to take photos of everyday routines related to hygiene and care. The users also had to write a diary where they described their morning and evening routines.

The study of the users' unacknowledged needs revealed that women in particular divide their routines into hygiene and care. Hygiene is related to everyday quick routines which have a short-term effect, while care is related to preventive measures that have a long-term effect. The toothbrush industry focuses primarily on technical hygiene solutions which are expensive to develop and which require high R&D budgets. Hence, there was a potential for Jordan to move into the care category, creating a niche within the toothbrush sector, and moving away from the costly technology race.

A new innovation platform was developed, and a new brand position concept "Love your Teeth" was created. At the same time, a range of physical products were developed – products that women could carry with them at all times and which could be exposed everywhere as a care product and not as a private hygiene product.

Source: Hoegenhaven Consulting (2008)

Two years after the new innovation platform was implemented, Jordan's market share in toothbrushes increased from 61% to 70% in Norway, from 20% to 28% in Denmark, from 18% to 23% in Sweden and from 20% to 23% in Finland.

The German telecom company Deutsche Telekom provides another example of involving users in the pre-innovation phase. Deutsche Telekom's R&D lab has been using ethnographic research in

order to understand user behaviour and develop products based on user insights.

Deutsche Telekom decided to target the growing segment of 50+ year-old users of landline telephones. Their R&D lab, T Labs, applied a user-driven design process, resulting in a successful landline telephone for elderly people.

Case 2.2.7: Deutsche Telecom

The R&D department of Deutsche Telecom has a unit, called T Labs, which is specialised in applying user-driven design methods on R&D problems.

T Labs engaged 20 people from the target group (50+ years old) to do a self observation, where they documented their calling habits, behaviours, desires and visions. Four people from the target group evaluated information architecture related to a telephone as well as the telephone navigation menu. Based on the user insights, the navigation menu was considered too complicated. The target group appreciated design, requiring the telephone to be a nicely-designed home appliance. The functions of the new telephone were reduced to basic functions with a focus on voice telephony. The data from the study has been used to design specific features which appeal to the 50+ segment. There is direct access to main functions on the first menu level, three quick dial keys for important contacts, a large display with high contrast, a hard key for volume control during a conversation, visual indication of incoming calls by a light-emitting diode, and an elegant design combined with modern energy-efficient technology.

Source: FORA (2009)

The phone was launched in September 2008 and in addition to appealing to the elderly users, became popular among the average family.

Users can also be involved in the innovation process by being an active part of the innovation team – participating in developing innovations for the company. These types of users have first-hand knowledge when it comes to using a product or service and have their own ideas about how to develop or create innovations that are more radical. We refer to these types of users as ‘advanced users’. The users can either be hired by the company to participate in the development of innovation, or the user can voluntarily participate by, for example, virtual participation. Companies often involve groups of users in the form of user communities that exist via the internet.

Digital products such as computer games can be developed via online communities by advanced users. The American software company Valve was among the first companies to involve a community of game players in the strategic development of a new computer game.

In 1998, the American software company Valve wanted to create a popular computer game in a highly competitive market. By sourcing information from advanced game users and letting the users participate in creating a new game, Valve was able to launch a new type of computer game never seen on the market before: Counter Strike.

Case 2.2.8: Valve Software

When Valve released their new computer game Half Life, they also decided to make

80% of the game codes available for modification by users. The code was restricted, requiring the use of the core engine of Half Life, thus making the original game the platform for building modifications and playing new versions of the game. Valve also released a number of tools to the online user communities to match the publication of the game code.

In order to find the most popular modified version of the game, Valve tracked the various communities and identified which modifications were played the most. Valve picked the most popular version of the game, and hired one of the core members of the modification team to continue the development of the game in-house at Valve.

While the original game Half Life is a linear first-person shooter game, the modification Counter Strike is a team-based, multiplayer game taking place in realistic settings.

Source: Associate Professor, Jeppesen, L.B. (2008)

Valve packaged the modification of their original game and released it as a new commercial game, Counter Strike. Contrary to other computer games where sales fall after a year or two, Counter Strike's sales increased year after year. In total, Counter Strike has sold more than 11 million units and made an estimated profit of US\$ 300 million.

Some companies are strategically localising and involving advanced users in their innovation processes when developing new products or services. Eager users are invited in to the companies' innovation departments in order to develop something new together with the company.

In 2006, Lego decided to include advanced users in the creation of the next generation of Mindstorm.

Case 2.2.9: Lego Mindstorm

Lego picked four advanced users of Lego Mindstorm from the active Mindstorms community to work together with Lego on developing the next generation of the product. The advanced users had knowledge and insights which Lego themselves did not have in-house. The users became part of the Lego innovation team, through virtual project room, but gave up their IP rights to Lego and did not receive a salary. During the development of NXT the online user panel (MUP Mindstorms User Panel) expanded to over 110 members. The impact of the collaboration with the advanced users were improved features, a new sensor, blogs, books and a new way of working with the fan community which today are common practise across LEGO and had 50 projects in 2008.

The new version, Mindstorm NXT, has a microprocessor that can be programmed using a PC or a Mac. Users can create a program and download it to their Mindstorm robots, giving the robot a life of its own, autonomous from the computer. Lego Mindstorm received two awards within the first few months after launch.

Source: FORA (2009)

Lego Mindstorm received two awards within the first few months after launch.

While there are examples of companies inviting advanced users to participate in the innovation process and develop ideas together with the company, there are also examples of users who come up with great ideas or inventions without companies being involved. These users are referred to as lead users⁴. They innovate to solve their own problems, not with the prospect of commercialising the idea. However, if a company gets hold of the idea later on, the lead user innovation might be put into mass production (such as in the case of the baby jogger from the US).

At most hospitals, doctors and nurses create new equipment in order to provide their patients with improved medical care. This is also the case at Massachusetts General Hospital, but here the hospital has also created a department where these innovations are gathered and potential producers are pursued if an innovation is thought to have commercial value.

Case 2.2.10: Massachusetts General Hospital

Massachusetts General Hospital has developed an internal R&D lab, which supports ideas from medical staff. They provide the clinicians with help to actualise the idea, and the lab initiates contact with companies who can produce and take the innovation to the broader market.

This is a source of new opportunities for companies: They can reduce their R&D cost by collaborating with lead users, and they can get access to radical innovations, which are based on a real market need. For example, Sigma Pumps has commercialised an intelligent drug infusion pump for anaesthesia, which was developed by one of the hospital's physicians. The pump can dispense the proper dose of medicine to patients. Earlier pumps had been prone to drug-dosing calculation errors –sometimes leading to fatal results.

Source: ReD Associates (2009) & von Hippel (2006) & Associate Professor, Jeppesen, L.B. (2009)

Sigma Pumps saw annual sales increase from \$8 million to \$80 million while another company that also commercialised the pump Alaris, saw the pump bring in \$700 million in sales.

While it seems that companies are rapidly increasing involvement of advanced users in their pre-innovation phase, it remains to be seen how widespread a phenomenon it will be for companies to rely on lead users in early stages of the innovation process, and focus internal resources on the later phases instead.

The Gradual Transition

As more and more companies are able to compete on technology, user-driven innovation is becoming an increasingly important dimension of competition.

Already in the 1980s, some companies started to include methods for understanding user behaviour in their innovation processes. Rank Xerox is probably one of the first companies to employ methods such as user observations in order to understand the problems their users experienced and lever those findings in the development of new products.

The following decade saw more companies including knowledge of user behavior early on in the

4 Von Hippel (1986)

innovation process. Companies such as Electrolux, Coloplast and Procter & Gamble are some of the frontrunners. While it was companies in the electronics industry that took the lead on employing user-driven innovation methods, more and more industries are following.⁵

Visible Consequences

New and different competencies are required for companies to be able to work with user-driven innovation. Staff that know how to work with user-driven innovation methods can either be hired to work in in-house departments, or their services can be purchased through external consultancies.

Some companies are creating new departments focusing on understanding user behaviour and hiring staff that have a background in the social sciences - such as anthropologists, sociologists and ethnologists.

In the mid 1990s, Intel began experiencing that their technological innovations did not result in the expected sales. Intel decided to establish two new departments that would focus on understanding users' unacknowledged and unsatisfied needs.

Case 2.2.11: Intel

Intel established two departments within Intel Research in Portland which focus on understanding users' needs. The purpose of the first department (People and Practices Group) is to participate in forming Intel's long term strategy, while the purpose of the second department (User-Centred Design Group) is to focus on specific product development in the short term. The two departments have expanded within the last decade, and today they employ more than 40 ethnographic researchers, as well as psychologists and designers. The working methods are mainly based on ethnographic practices such as observations of users, in-depth interviews, videos and photography.

Intel's new departments have participated in several new product innovations and platforms. One example is the home PC made for the Chinese market. Based on the ethnographic insights, Intel was able to develop a PC aimed at educating Chinese children which their parents could control. In 2004, the PC was awarded the China Design Excellence Award.

Source: FORA #12 (2005)

The ethnographic researchers are increasingly being recruited from Intel's two user driven innovation departments to the rest of Intel's research departments such as within Digital Homes, Digital Health, Consumer Research/Emerging Markets and Mobility Group.

Other companies hire consultants whose core competencies are to work with methods for understanding user behaviour and unmet needs. This demand has lead to an increase in companies that provide this type of service, also called concept/strategic design companies.⁶

Another trend which can be observed is the change of business focus for traditional management consultancies. McKinsey is taking on projects in the area of strategic design, while Monitor Group bought the innovation strategy company Doblin Group in 2007.

⁵ FORA (2005)

⁶ FORA (2007)

Users' involvement in companies' innovation processes also means that the users permit their ideas to be employed by the company. Most users do not seem to mind that their ideas are used by companies without the user receiving any compensation. There seems to be a trend toward open innovation, where the users share their ideas without considering their intellectual property (IP) rights.

2.3

Global Knowledge Sourcing and Collaborative Networks

As partnerships and collaborations are formed between companies, organisations and the public sector, new innovation ecosystems will emerge. The development of networks is occurring between all types of institutions. Companies are moving away from a traditional supplier base towards supply webs and the creation of nodal firms. Institutions are thereby moving away from being in control of an innovation process, towards influencing it. At the same time, institutions are going from owning knowledge and resources, towards having access and the ability to use globally dispersed knowledge to innovate.

Principle 3. Accessing and Combining Globally Dispersed Knowledge

The principle

No single location can provide all the knowledge required for innovation, in particular for discontinuous innovation in the form of new products and solutions or new business models. The innovation process is becoming global, requiring companies to access and combine knowledge that is available in different locations around the world. Certain knowledge elements are now accessible at a distance (such as explicit knowledge turned into information), but other elements of knowledge of a tacit and context-specific nature remain embedded in their original localities.

The increasingly complex nature of innovation requires companies to tap knowledge, intangible resources and talent from across the world, collaborating across borders and continents, and becoming meta-national innovators with an integrated global “innovation chain”⁷.

Companies must therefore ensure that they are present in one way or another in their relevant lead markets and have local sources of technologies they require to innovate. Companies can do this by setting up local units or subsidiaries, or by forming collaborative arrangements with local companies, universities, or other research institutions. To this end, companies can collaborate with their users, customers, suppliers, or partners to access knowledge globally.

While large companies have had the advantage of their multiple locations, smaller companies today are able to use digital technology and international communities to access certain kinds of knowledge from anywhere in the world, thus enabling them to exploit new knowledge in a way similar to much larger transnational (or multi-national) companies. Indeed, established transnational companies may be hindered by the traditional reliance on their home base for innovative products and business models.

The Previous Period

Companies in the industrial era relied on their national environments and local clusters to source and combine the information, technologies, user knowledge, and business intelligence needed to produce innovative goods and services as well as new processes or business models. Companies became “global” by enjoying the industry leadership that their original countries provided. Being located in the “world capital” of an industry (of which Silicon Valley is a recent example) was half-

⁷ Santos, Doz & Williamson (2004)

way to a competitive advantage in a global market. The industrial era will remain characterized by industry clusters driving innovation and competitive advantage.

However, after decades of internationalisation of company activities and the more recent globalization of markets, intangible resources and the capability to keep a stream of innovations now determines competitive advantage in a growing number of industries. At the same time, knowledge sources became more and more dispersed around the world – one of the more interesting outcomes of globalization.⁸

As competition increases in a global world, firms are not just internationalising all parts of their value chain and taking advantage of local capabilities, costs, and comparative advantage, but also opening-up their innovation processes to a global pool of information, technologies, and user knowledge.

Signs of Change

Companies are increasingly combining elements of global knowledge (that is, elements of knowledge that reside in different locations around the world) and even forming global collaborations in order to create new knowledge and innovations. Since no one location contains all the knowledge that is necessary for innovating in a growing number of businesses, firms must utilise local pockets of technology, user understanding and market intelligence – combining the knowledge to retain or gain a competitive advantage. A leading example is provided by Intel, which relied for a long time on the superior technologies and lead market qualities of its birthplace in the heart of Silicon Valley. However, even Silicon Valley (and the wider US) were no longer enough as the source of innovation for Intel. After a period of slower performance, Intel recently regained its advantage with the Centrino, an innovative product combining its legacy US-based intellectual capital and the different, local worldview and talent of its R&D centre in Israel.

As companies open up their value chain, they will access suppliers, talent, and partners on a global scale. This might sometimes mean that a company is not part of a fixed supply chain, but rather of one where some actors and national origins change over time. These international interactions will create opportunities to access new knowledge that the company may use for further innovating.

A global view on talent recruitment is also needed. The best employees might not necessarily be found within close reach. In today's digital world, talent can be recruited from anywhere in the world, thus possessing a variety of diversified skills and qualities.

Case 2.3.1: Electronic Arts

The American interactive software company Electronic Arts has developed a new recruitment system where they actively pursue candidates globally and build a long-term relationship with them. In that way, Electronic Arts fills their pipeline with talent who can be offered a job as it appears.

Electronic Arts decided to look at the recruitment challenge from a new angle. To fill positions within the company, they decided to actively pursue talent and build long-standing relationships with targeted individuals. Potential employees were found through their network, at conferences and so on. Electronic Arts realised that the relevant

⁸ Doz, Santos, & Williamson (2001). Indeed, several companies (such as Airbus, Nokia, STMicroelectronics, SAP, Logitech, or Shiseido) recently overcame the limitations of their national origin in certain industries by creating new offerings and businesses by using a "meta-national" approach to their innovation processes.

candidates they were in touch with often belonged to other industries than the computer gaming industry. Having contacts to relevant talent in areas where other computer gaming companies might not look increased Electronic Arts' innovative capacity.

Electronic Arts used a customer relationship management software (CRM) to build and maintain long-term online relationships with a pool of talent. The software allows Electronic Arts to make detailed analyses of candidates' skills and preferences, thus being able to offer a candidate a job that is suited to his competencies and interests. If a candidate is not interested in a job at a given time, Electronic Arts will pursue the relationship and keep them interested by offering various forms of incentives.

Electronic Arts has reduced the time it takes to fill a position and has dramatically increased the number of people in its pipeline.

Source: Associate Professor, Jeppesen, L.B. (2009)

Contracting with multiple vendors on a global scale offers the flexibility of scalability and gives access to a variety of resources that can satisfy varying needs. The globalisation of the 1980s and 1990s, which was dominated by the activities of transnational enterprises, is quickly giving way to new forms of globalisation, where millions of small players get involved in complex global networking activities, partnerships, and exchange. One way it can happen is through online communities.

The internet is offering global collaboration platforms which are paving the way for more and better orchestrated knowledge sharing among communities of shared interest, enabling them to digitally combine their knowledge. This is potentially a very important source of innovation with users playing an increasingly more powerful role in stimulating and shaping innovations based on combined and created knowledge.

Companies today can also access talent outside of their own company, thereby taking advantage of the global pool of resources available. By using the knowledge possessed by individuals all over the world, the unique combination will spur new ideas and innovations.

Case 2.3.2: InnoCentive

In 1998, a strategic analysis made by the pharmaceutical company Eli Lilly showed that their internal attempts of generating innovation were hampered by the limited diversity of approaches. Eli Lilly created an online broker company InnoCentive which helps companies with problems they need solved by accessing a global pool of talent with a range of skills. Scientists, engineers and other professionals are thus able to provide solutions to corporate lab's R&D problems via the online broker.

Seekers (companies seeking solutions) submit problems they are not able to solve in their internal R&D labs to the online InnoCentive Marketplace – doing a “broadcasting search”. In the marketplace, there are problems looking for solutions, as well as solutions that might be looking for problems. The problems are mainly technical ones, requiring skills within engineering, life science, maths, chemistry and computer science. On average, 240 individuals glance at a given broadcasted problem – a significantly larger number of people than companies can afford in an internal development process. On average, 10 individuals offer answers, and 30% of the problems are solved.

The open innovation created through InnoCentive gives companies access to a global and diverse pool of knowledge. Problems are considered through different perspectives by professionals that might not usually participate in solving those particular types of problems, and whose skills might not be found within the company broadcasting the problem.

Source: Associate Professor Jeppesen L.B. (2009)

Today 160,000 individuals from 175 countries participate in creating solutions via the InnoCentive marketplace. Other transnationals such as Procter & Gamble are today using InnoCentive to solve R&D challenges and to obtain diversity in the solutions offered.

Companies are also using their users as a source of knowledge sharing and knowledge creation, thus creating new business models and innovating within the value chain.

Propellerhead, the Swedish software development firm in the field of computer-controlled musical instruments, took a new look at the way customer support functions are organised. Propellerhead was looking for a new method to provide their users with sufficient information to take advantage of the software tool for music creation. They created an interactive website which had the role of a communication hub, and included users from all over the world in their customer support team. Thus, the most knowledgeable users could assist users who required help in using the software.

Case 2.3.3: Propellerhead

Propellerhead was the first company to launch a software programme which enables users to compose music on a PC or Mac. Several groups of users hacked into Propellerhead's program, and started to modify the software. This development led to the formation of a user community where users discussed Propellerhead's software and ways to improve it.

Propellerhead realised that the users of the community were providing each other with support on how to use the software. The company decided to take advantage of this community and included them in their web-based team of customer support services. The user community now lives side by side with the official customer support team at Propellerhead.

Source: Associate Professor Jeppesen L.B. (2009)

Through the interactive customer support website, Propellerhead could assist their customers while simultaneously reaping the benefits of any new ideas and innovations which occurred in the interaction between users assisting each other. Propellerhead was also able to reduce its operating costs of maintaining a customer support site.

The existence of local talent inside, as well as high quality relations with local suppliers and customers and other institutions in various locations around the world is crucial to access complex knowledge (that is, the more tacit and location-specific elements of knowledge). This remains a formidable obstacle to many incumbent transnational companies who are used to incorporating the knowledge they acquired in their original clusters or home bases in their offerings and processes, but who lack the mindset and capabilities to source complex knowledge locally.

The European semiconductor supplier ST Microelectronics provides a leading example of how to turn the weakness of being born far away from the capital of semiconductors into a strength. ST achieved a global position in some segments with innovative products, in particular a diversified offering of “system-on-a-chip”.

Case 2.3.4 ST Microelectronics

ST Microelectronics assembled knowledge from several locations around the world by investing in local R&D units in various countries that were able to attract local “silicon talent”, and by actively engaging in new product development for a selected set of lead customers such as American-based Seagate (in the hard disk drive industry) which provided “application know how”. When needed, ST acquired technologies that were owned by other firms and even by competitors around the world. Consequently, ST was able to develop different levels of system-on-a-chip (s-o-c) solutions for different applications and preceded its major (American and Japanese) competitors in the global chip market.

For example, ST became a global leader in chips for HDD, a market segment that didn't even exist in Europe. As with other s-o-c, this required the integration of different functionalities and technologies that simply did not exist in any location in the world. The chips for HDD required analogue technology expertise available in Italy, digital semi-custom technology from France and the US, advanced digital design from the UK, specialised know-how for HDD electronics in the US and in Ireland, additional R&D resources from Singapore (where HDD were manufactured), customer knowledge from the US, and even some digital chip technology from the German competitor Infineon.

As a result, ST's chip set solution for HDD application replaced more than ten chips and over one hundred discrete components in hard disks, contributing to size reduction, quality improvements, and lower cost of manufacturing and usage.

Source: Santos, Doz and Williamson (2004)

The Gradual Transition

As companies become comfortable with this openness to the world and the notion of looking for knowledge in locations outside the original birthplace of the company, the next natural step for them will be to take a global look at their innovation processes. An increasing number of companies will consider adding external knowledge to all departments within their company, not only to R&D departments, while simultaneously looking beyond the cluster in which they are located and towards knowledge hubs in other countries or continents. This will have a remarkable impact on their ability to come up with discontinuous innovations, in particular radically new solutions to latent market needs.

Visible Consequences

As companies globalise their innovation processes, they will start to strategically focus on the value of knowledge that is embedded in different countries and locations around the world, be it inside their local subsidiaries or inside local companies and universities or other knowledge-based institutions. More firms will move towards implementing a process for innovating based on access to global knowledge. In this way, companies will become not only more innovative, but they will also be able to benefit from lower-cost knowledge sources and reduce their cost of innovation and new product development.

As the scope of knowledge is reduced within each firm in each location, such specialisation will contribute to the formation of local hubs of highly specialised knowledge. The increasing specialisation will also lead to a need to form partnerships among companies, working together to provide innovative solutions.

Principle 4. Forming Collaborative Networks and Partnerships

The Principle

No single company has all the elements of knowledge required to innovate on their own. Companies are forming collaborative networks and partnerships for innovation. The increasing complexity related to innovation today calls for a combination of skills which can be obtained by collaboration across different types of companies. No one company possesses the vast amounts of specialist knowledge that is needed to solve today's market challenges and create new and valuable solutions.

The partnerships consist of collaborations between companies' customers or users, or collaboration with other companies or universities and other knowledge-based organisations to access knowledge globally and innovate.

To do this, companies have to combine and create new knowledge together. This calls for reciprocal influence and mutual trust. Companies are moving away from full control over their innovation processes towards shared influence over joint innovation processes. Knowledge is accessed externally and combined by the partners instead of one company alone owning all the elements of knowledge needed.

The Previous Period

In the industrial age, companies competed on the amount of internal knowledge they accumulated, and would gather as much information and know-how as possible internally to develop their innovations. R&D departments competed with each other, and knowledge was guarded from competitors. Companies were often so protective that, in many cases, even employees didn't have access to crucial information.

Companies were closed, and decision-making was done at the top of the hierarchy. In order to manage risks, management would be involved in all strategic decisions that had to be made. If targets were not met, management had the possibility of ending the innovation process.

The relationship between companies and their suppliers was often a traditional buyer-seller relation, where the buyer's main interest lay in obtaining products or services at the lowest possible price from the seller. But as the complexity of the innovation process increases, so does the dependence on suppliers. In some of these cases, the nature of the relationship evolves into a form of partnership, rather than a traditional buyer-seller relationship.

Sharing critical knowledge with other companies is a challenge for companies with organisational and managerial cultures from the industrial era.

Signs of Change

Today it is no longer enough for companies to take advantage of the knowledge held within their own company. Knowledge must be accessed externally in order to remain innovative and thereby

competitive in the future.

More and more companies have opened up and have supplemented their in-house R&D activities with external ideas and knowledge. Open innovation is taking place in all sorts of industries all over the world. Procter & Gamble created a systematised process for using open innovation when developing new products. In 2006, 35 % of their products were based on interactions with other companies and knowledge sharing through electronic marketplaces.⁹

The complexity of the required solutions today can not be solved by one type of firm on its own. Sharing information and skills amongst partner firms as well as customers and users will be one of several paths firms must take in order to remain competitive. Several partnerships in the recent past have been exemplary in showing this new path to new product or new business development. They emerged in industries with very complex products. Examples include the initial Airbus GIE or CFM (the joint-venture between GE and SNECMA). Often, the right solution will require collaboration with firms that possess compatible capabilities, supplementing the skills found within each company. Therefore partnerships and collaborations are increasingly being formed. Many of these innovation partnerships will involve public sector and private sector entities.

Within the partnership, no one company will be in control of the innovation process. The members of the partnership are therefore not able to apply the usual risk minimisation tactics and will in effect have to give up a certain amount of control. This new kind of collaboration between organisations will require trust and the ability to share decision-making. It is a move from a Tayloristic¹⁰ and hierarchical form of pooling resources to an open and collaborative method of partnering.

Partnerships can take on many forms. Some partnerships are based on research projects where companies' R&D departments work together in order to develop new technologies. Other partnerships are formed to create new products or services, by combining existing methods and technologies with other products and services in a new way. While yet other partnerships are formed within the value chain in order to optimise production processes, distribution, sales and so on.

The sharing of information and knowledge does not take place solely on market conditions. Partnerships require trust. Often it is easier to trust someone you already know. Since geographical presence makes it more likely to know each other, many partnerships take place between local partners. But to mix local knowledge alone can be insufficient, so even companies in local 'hotspots' have realised that information and knowledge must also come from outside the local region.

The Danish pump company Grundfos and the Kenyan mobile company Safaricom (a subsidiary of Vodaphone) partnered up in order to create a new product and related services by combining existing methods and technologies in a new way. The outcome was a new payment system to be used via a mobile phone and by using smart cards installed with a chip.

Case 2.3.5: Grundfos

⁹ Huston & Sakkab (2006)

¹⁰ Taylorism is also called Scientific management. It is a theory of management that analyses and synthesises workflows, with the objective of improving labour productivity. The core ideas of the theory were developed by Frederick Winslow Taylor in the 1880s and 1890s, and were first published in his monographs, Shop Management (1905)

Grundfos installed a water system for a community of 400 people in a developing country, providing the community with clean drinking water. The solution consisted of several components. In order to create a water system which was linked to a payment system, Grundfos had to partner up with a variety of different companies.

Grundfos teamed up with local construction companies to complete a lot of the practical work, while local NGOs were chosen to assist with the sales of the water system. To enable the community to buy a water system, Grundfos cooperated with one of Kenya's largest banks for micro financing in order to create terms the local community could take advantage of. In order for each individual member of the community to be able to obtain water, a payment system had to be created. Grundfos worked together with Safaricom, Vodafone's African subsidiary, to develop a new method of payment using mobile phones.

Since Grundfos' business model for providing local communities with water was new and very different to the donations made by various charities, it took a while for the NGOs and banks to see the potential in the proposition. However, all the partners working with Grundfos will profit from the cooperation in one way or another.

By working together, the companies were able to provide an integrated water system with a mobile payment method using water cards (smart cards). By sending a text message from a mobile phone, a user can transfer money onto a water card which in turn can be connected to the pump to pay for using it. When the user arrives at the water station, the water card is inserted into a slot where the credit amount on the card is updated. Thereafter the user can insert the updated water card into a slot next to the water faucet allowing the water to flow.

Source: FORA, (2009)

Grundfos is planning on expanding its business of water systems and has defined its market as 1.5 million people on 3 continents, and expects to achieve revenues of 50 million Euro by 2015.

The Indian wireless telecoms operator, Airtel, included a whole range of different partners in order to reach as many customers as possible in rural India.

Case 2.3.6: Airtel

Airtel is a wireless telecom operator in one of the fastest growing and most intensely competitive markets in the world – India. Airtel is the largest with over 100 million consumers. Their revenues were \$ 5.5 billion in 2008, growing at around 40%. Their goal is 250 million consumers in five years. In January 2009, it had the largest market capitalization of any company in India. It is also one of the most profitable telecom operators in the world. The CEO says this of their success: "we have broken all the paradigms of telecom".

They have partnered with a wide variety of firms - LM Ericsson (for the network), IBM (IT services), retail stores, call centres, and passive infrastructure. They work with large global firms (IBM and Nokia), microfinance institutions, and more than a million local shop owners (small Kirana shops spread across the country). They have thus accessed world-class technology and local distribution and have become the lowest-cost provider of talk time (less than 1 INR or \$0.01- 0.015/minute) in a typically capital-intensive

industry.

By focusing on clear agreements, constant review, creating a “win-win” contract, and making sure all players have “skin in the game”, Airtel has been able to work with a large ecosystem of global and local players and access expertise. Further, they have been able to convert lumpy investments (such as networks) into variable costs by paying a percentage of revenue to the partners. Airtel is creating unique value for customers. The very poor can afford to get connected. They provide the lowest cost, high tech solution to all. They have also reduced their risk in making technology bets. They can continually upgrade their technology solutions because of their partners.

Source: Prahalad & Krishnan (2009)

Airtel is creating unique value for customers. The very poor can afford to get connected. They provide the lowest cost, high tech solution to all. They also have reduced their risk in making technology bets. They can continually upgrade their technology solutions because of their partners.

Partnership structure resembles a network structure in the Castellsian¹¹ sense. A network has no centre. It is made of interconnected nodes, which in this case would be the partners. Those who have influence are those who bring value to the partnership project. Power is exercised by inclusion and exclusion, meaning that it is the only way the network can reward or punish someone. To do partnership innovation, the partners must give up sovereign power and open up.

The Gradual Transition

Partnership innovation requires the opening up of firms. The first step on the way is taking place in the form of open innovation where firms allow external ideas into their R&D departments in order to become innovative.

As firms optimise their value chain and become more specialised, the need for working together with others will occur. The solutions offered in the future will be developed by different types of organisations and companies working together in some type of partnership framework.

Visible Consequences

As companies form partnerships to innovate in the new era, companies' structure and organisation will have to change to allow for the methods of collaboration. Employees will have to learn how to work in teams, while management will have to change their decision-making culture.

New types of firms will appear as there will be a role for facilitating and mediating partnerships. The Japanese online platform, Cuusoo.com works as a type of nodal firm, facilitating a meeting place for inventors with ideas, customers who are interested in having an idea produced, and appropriate producers of the invention.

Cuusoo.com wanted to provide users and inventors with the possibility for producing their own designs. Cuusoo.com finds the ideas from the members of the community and launches products based on these ideas only after a certain number of customers have committed to buy.

Case 2.3.7: Cuusoo.com

¹¹ Castells (2004) describes the nodal society

Cuusoo.com has 20,000 members who post their new inventions on the online platform. The user innovators are helped to actualise their product ideas by several services: Firstly, the site has tools and a service which helps members to visualise their ideas. Secondly, in the community of the site, the user innovator can upload the visualisation and share the design with other members. Thirdly, the concept is evaluated, and improvements are suggested by members. When the idea is ready, it is published. Finally, when enough people have made a commitment to buy, the product is produced by a factory within the network.

As a source of innovations for product designs, the community has proven to be fruitful. But Cuusoo.com realised that they have to access other partners to reach the mass market. Hence Cuusoo.com has formed a joint venture with the Japanese retail store MUJI. Selected products from Cuusoo.com are sold in MUJI stores, as a special product line called 'invented by you'. This product line (of furniture and home appliances) has proven more successful than many of MUJI's regular products.

Source: Associate Professor Jeppesen L.B. (2009)

As partners are involved in creating innovations together, questions of ownership will take on a new perspective. New agreements between companies, customers and users will have to be made in regard to intellectual property rights.

Principle 5. Dynamics between Large Companies and Entrepreneurs

The Principle

Large companies use a range of methods to become more innovative. As companies grow and become big, they tend to lose some of the innovative capacity which was present when they were smaller or newly started. Large companies are therefore creating programmes to foster entrepreneurship internally, or they work together with start-ups to take advantage of the knowledge and innovative culture held within the smaller companies.

By creating programmes to foster intrapreneurship, large companies are creating a culture where ideas can develop and be captured anywhere in the organisation, catalysing innovation among employees.

Large companies are also looking outside of their own organisation and are forming partnerships with start-up companies in order to stay innovative. The smaller companies are seen as frontrunners within their industry, possessing the newest knowledge, which can be combined with that of the larger company. By working together, these two types of companies spur innovation in a joint effort which no one of them could have achieved on their own.

In the future, dynamics between large companies and entrepreneurs will be an important source of innovation, taking place in multiple locations across regions and continents.

The Previous Period

Previously, large companies mainly saw start-ups as a way of filling technology gaps. As a result, start-ups were viewed as an acquisition opportunity. Large companies wanting to expand into another market or develop a new product line could buy up existing companies which were suitable, in addition to growing organically. Few benefits were seen in collaborating with small

companies.

Today, interactions with start-ups usually belong under the departments for new business development, signalling a new way of viewing start-ups in terms of cooperation and not purely in terms of acquisition. This change of focus is a result of the increasing importance put on innovation as a means of competitiveness for large companies.

Signs of Change

One way of becoming more innovative is to develop ways in which entrepreneurial employees can be used as a source of generating innovation and new business ideas. For example, Google has created a rule that employees must work 20 percent of their time on a new project they are passionate about. Once a week, employees have the possibility of presenting their ideas to the top management of the company, who decides if the project should continue or not.

Other companies such as Hewlett-Packard and Danfoss (a Danish industrial transnational working within green tech) use several methods to develop an entrepreneurial culture and become more innovative. Business plan competitions are introduced to encourage intrapreneurship among employees, while a surrounding culture of entrepreneurship is created by hosting incubators.

Case 2.3.8: Developing an Entrepreneurial Culture in Hewlett-Packard and in Danfoss

Companies such as Hewlett-Packard and Danfoss use several methods to develop an entrepreneurial culture and become more innovative. Business plan competitions are introduced to encourage intrapreneurship among employees, while a surrounding culture of entrepreneurship is created by hosting incubators.

In order to leverage entrepreneurial techniques to drive corporate innovation, Hewlett-Packard has introduced a business plan competition called Flashpoint. Within the second year of the competition, 150 teams consisting of 4-5 people from 23 countries competed on developing the best business idea. Each team is given a wikipedia page where the entire HP community is able to contribute through web 2.0 tools. The semi-finalists are chosen through a judging panel combined with a popular vote before the final vote by the board of directors.

In addition, Hewlett-Packard has created an incubation hub in their research facility in Corvallis, Oregon, where entrepreneurs and research institutions have been given free access to a building which is managed by the state of Oregon and the local technological university. This type of environment fosters an entrepreneurial mindset while creating innovation spill-overs. On an experimental basis, engineers have also been stationed in small start-ups companies in California to work on solving a specific problem and create a prototype in order to develop an entrepreneurial mindset of their own.

A very similar approach has been developed by Danfoss, within a very different sector. The company has created a comprehensive venture and incubator programme, "The Danfoss Golden Gate", which helps develop new ideas from Danfoss employees globally. The program is part of a wider effort to change the culture of the company towards an entrepreneurial mindset and foster innovation. The program includes close collaboration with start-ups and a new reward program for entrepreneurial managers and employees within the company.

Source: FORA (2009)

The companies use intrapreneurship as a way of changing the company culture towards opportunity recognition, a “go ahead and try it”-mentality and an acceptance of failure. These are key capabilities when competing on innovation.

Another driver for innovation in transnational companies is to interact with research institutions. Previously, large companies such as Hewlett-Packard and Intel located research and production facilities near universities to gain access to talent. Also today, transnational companies locate research and innovation labs in close proximity to knowledge institutions in order to gain access to specific knowledge. For instance, the German telecommunications company Deutsche Telekom has recently established its central research and development unit in connection with the Technical University of Berlin.

Case 2.3.9: T-Labs at the Technical University of Berlin

In 2005, Deutsche Telekom established its central research and development unit called T-Labs (Telekom Laboratories) at the campus of Technische Universität Berlin. The mission was to refocus Deutsche Telekom’s research and development activities by promoting interaction between science and enterprise through the establishment of a novel lab.

Today, more than 300 experts and researchers within telecommunication, design and ethnography work in the labs. These experts include 125 Deutsche Telekom employees, 65 postdoctoral staff and around 80 postgraduates, research students and students from all over the world. Furthermore, 700 other experts are hired on an ad-hoc basis for short periods at a time. And most projects involve close collaboration with partner universities, international research establishments and business in order to engineer innovative solutions for simpler, faster and better communications. In 2006, T-labs established its first subsidiary institute at the Ben-Gurion University in Israel.

Organizationally, T-labs belongs to Deutsche Telekom, but is simultaneously a scientific institute organized under private law and associated with the university.

Source: FORA (2009)

The innovations Deutsche Telekom is developing by interacting closely with experts, researchers and students at the lab are superior to the innovations the company had previously been able to develop at its own research facilities.

These new ways of developing innovation is changing the approach transnational companies have towards start-ups. Instead of viewing start-ups as a way of filling technology gaps, large companies are beginning to view them as a source of innovation. In the future, companies will strive to find new ways of forming symbiotic relationships with start-ups because they will often be the frontrunners within a specific technology.

An additional advantage for transnational companies is that they will see more spinoffs in related fields from former employees and collaborators. In Berlin, Deutsche Telekom’s close interaction with researchers and students at the Technical University of Berlin has spurred four start-up companies.

Collaborations between large companies and start-ups will increasingly occur across borders and continents, where the participating companies will lever specialised knowledge from their own local knowledge hub.

Intel has begun working with start-up companies globally in developing the next generation of wireless internet and additional services.

Case 2.3.10: Intel developing Wimax together with Clearwire

In 2004, Intel invested 1 billion dollars in Clearwire as part of an agreement to jointly develop WiMax and related products using global wireless broadband internet. Clearwire was started in 1998 as a spinoff from Sierra Technologies, and started to offer wireless internet service in Dallas in 1999. In 2004, the company was acquired by serial entrepreneur Craig McCaw, and by the end of 2004 the company launched wireless internet to multiple cities. Today, the company has 400.000 subscribers in Europe and the US.

According to Intel, the aim of working together with Clearwire is to leverage an ecosystem around Wimax that in turn will make Intel's own products more innovative and attractive. Therefore, Intel invests in other entrepreneurs who develop unique services for the WiMax standard, which Intel does not have the innovation capacity to develop on their own.

Source: FORA (2009)

Intel uses start-up companies as a way of staying ahead and innovating within industries that emerge. Today, Intel works with more then 400 companies in 20 countries.

The Gradual Transition

In the future, more large companies will encourage intrapreneurship in order to foster innovation. Various internal programmes will be established as large companies change their behaviour and take a new view on how to remain innovative.

As a consequence of the new ways large companies work with becoming more innovative, they will change their approach towards start-ups. Dynamics between large companies and entrepreneurs will gradually become a more important source of innovation.

Visible Consequences

Knowledge institutions, large companies and start-ups are locating themselves in proximity to each in order to obtain the same knowledge which exists within the same industry. The increasingly complex nature of innovation is leading to the formation of specialised knowledge hubs. To be at the forefront of an industry development, it will be necessary to be located in such a hub. While partnerships within these hubs will lead to cutting-edge knowledge within specific fields, these partnerships on their own will not spur innovation. Innovation will occur by accessing and combining the knowledge from different hubs around the world.

From a regional or national perspective, the changing nature of clusters which are developing into more specialised knowledge hubs has important implications for wealth and prosperity. The more knowledge hubs that emerge within a region, the more wealth and prosperity will be created. This seems to have interesting policy implications.

2.4

Global Challenges as a Driver of Innovation

If growth is to continue in the same linear way as previously, the strain on the planet in the form of pollution and sustainability will be too large. There are 4 billion people that will be joining the global economy in the years to come. How will it be possible to create growth for this group of people? It will not be possible to use the same amount of resources used to create growth for the developed world. The other 2 billion people will require the same level of living standards that they uphold today. How will it be possible to maintain growth for this group of people? It will be necessary to produce and create more, for fewer resources and for more people.

Principle 6. Environmental Concerns Create New Business Opportunities

The Principle

New markets are being formed in response to the environmental challenges we face. Increased awareness of the global challenges is creating demand for environmentally-friendly products.

Companies are increasingly realising that there is an economic perspective to participating in solving environmental problems. The companies see these problems as opportunities for creating new business concepts. Companies are therefore rethinking their business models in order to create new business opportunities for developing environmentally-friendly products while simultaneously creating profits.

Companies are also considering what effect their behaviour has on the environment, and are reconsidering their production processes, energy and water efficiency, materials and pesticide usage, and so on. Their focus is thus moving towards environmental responsibility – how can companies continue to operate while simultaneously causing as little harm as possible to their surroundings.

The Previous Period

In the industrial era, the need for environmental concerns did not seem relevant. Commercial innovation focused mainly on solving the problems faced by companies, without considering the consequences. Today many of those innovations are considered unsustainable in environmental terms.

Acid rain, polluted water and melting glaciers are all thought to be side effects of the manufacturing era where companies' main focus was the product or service being created. Companies did not innovate in response to environmental challenges.

This reflects the attitude which has been common until recently - that it is government's job, not that of companies or scientists, to determine the ethical consequences of the discoveries they make. Today companies' behaviour is changing as they become involved in solving challenges which previously were thought as the responsibility of government. There is an increasingly visible blurring in the sharing of responsibilities between companies and governments.

Signs of Change

Consumers and shareholders are increasingly becoming aware of environmental side effects

related to products and services, thereby creating a new demand for responsible products and services (e.g. organic products). Increasing awareness among company CEOs is leading to the development of new products and services which are demanded by conscious business customers and individual consumers.

New markets related to issues such as cleaner energy and less pollution from transport are appearing, creating a demand for new products and services focusing on environmental responsibility. The American transport company UPS is involved in several partnerships to create trucks that pollute as little as possible, and already has a large fleet of alternative fuel vehicles¹².

The rising prices of natural resources such as oil and gas are making it profitable for companies to develop new forms of energy, while the scarcity and polluting side effects of fossil fuels are forcing the discovery of alternative and cleaner energy solutions. The increasing possibilities created by new technology and the accumulated pool of available technology pave the way for innovation.

The Danish/American company Better Place Denmark is at the forefront of capturing a new market. The Danish utility company DONG Energy has created a new company together with the American company Better Place in order to create a new market for battery-powered electrical cars in Denmark.

Faced with an economic and environmental challenge, DONG Energy has found a profitable solution that responds both to resolving their surplus energy production as well as an alternative entry into the transportation business – the sale of electricity to battery-powered cars. For this new market to become established, Better Place Denmark will have to provide the needed infrastructure for electrical cars.

Case 2.4.1: Project Better Place Denmark - Electric cars

The Danish/American company Better Place Denmark is at the forefront of capturing a new market. The Danish utility company DONG Energy has created a new company together with the American company Better Place in order to create a new market for battery-powered electrical cars in Denmark. Faced with an economic and environmental challenge, DONG Energy has found a profitable solution that responds both to resolving their surplus energy production as well as an alternative entry into the transportation business – the sale of electricity to battery-powered cars. For this new market to become established, Better Place Denmark will have to provide the needed infrastructure for electrical cars.

20% of Denmark's electricity is provided by windmills. However, electricity produced by windmills is rather unreliable since it is not possible to predict when the wind will blow, and since electricity produced cannot be stored. In the case of the windmills, electricity is also produced at night, when electricity consumption is low, resulting in wasted electricity.

By using a battery-powered electrical car which needs to be charged during the night, the surplus electricity created by windmills can be put to use. However, this requires a new infrastructure of charging stations to be put in place, as well as the development of electrical cars and powerful batteries. The first step in developing the large infrastructure is expected to be in place by 2011, while electrical cars powered by batteries already exist and are ready to be rolled out on the Danish roads.

12 <http://www.pressroom.ups.com/pressreleases/current/0,1088,5092,00.html>

Source: Social Action (2008)

Better Place Denmark's vision is that 20% of the total Danish car fleet (400.000) will consist of electrically driven vehicles by 2020. Better Place Denmark has the potential to contribute to the environment by replacing petrol driven cars with zero-emission cars.

Firms' behaviour today is also changing due to the visible consequence of previous company behaviour that can be seen on the planet. The increasing awareness of companies' environmental responsibilities culminated in 2007 after the IPCC¹³ was awarded the Nobel Peace Prize. Now no one can claim it is not an important problem that requires attention in order to be solved.

Large companies known to have caused an adverse effect on the environment (e.g. by creating large amounts of pollution) are changing their behaviour and focus, creating long term strategies where environmental concerns become an important part of their future vision.

The American conglomerate General Electric saw the huge potential in the new market for environmental goods and services, and changed the firm's business focus towards "green" solutions. In addition, they took a look at their own production, and realised that could change their own company into a greener one by reducing the amount of CO2 emissions.

General Electric started to look at the issues their customers would be facing in the coming years and realised that green technology would be important in meeting the challenges of the future. General Electric unveiled a new strategy in 2006 that would drive the company's future growth and development on the back of green technologies.

Case 2.4.2: General Electric

The American conglomerate General Electric saw a huge potential in the new market for environmental goods and services and changed the firm's business focus toward "green" solutions. In addition, they evaluated their own production, and realised that they could change their own company into a greener one by reducing the amount of CO2 emissions.

General Electric started to look at the issues their customers would be facing in the coming years and realised that green technology would be important in meeting the challenges of the future. In 2006, General Electric unveiled a new strategy that would drive the company's future growth and development on the back of green technologies.

General Electric spent 18 months speaking to leaders from various industries which they supplied. General Electric invited them to take part in a two-day session where the business leaders were asked to imagine life in 2015 and the products and services they would need.

The results from the sessions indicated that the business leaders foresaw rising fuel costs, insecurity in energy supplies, and growing consumer expectations for green technologies. These issues were all seen to hold a large market potential for General Electric.

¹³ The IPCC is a scientific intergovernmental body set up by the World Meteorological Organization (WMO) and by the United Nations Environment Programme (UNEP).

General Electric created a new strategy aimed at addressing the key concerns indicated by the business leaders at the session. Ecomagination was presented in January 2006 with 4 key points:

1. Double investments in clean R&D
2. Increase revenues based on green products
3. Reduce greenhouse gas emission and improve energy efficiency of General Electric's operations
4. Keep the public informed about the new strategy

A range of new products and services were developed for airlines, lighting, power utility and home appliances, where the main focus is to reduce emissions and energy consumption while reducing costs.

Source: ReD Associates (2009)

Since its launch, Ecomagination has led to a \$17 billion business in new and reformulated products. Today General Electric has 70 certified products, four times the size of its 2005 portfolio.

The Gradual Transition

Companies from all industries are slowly realising that they can do their part for the environment by doing their daily business in a responsible manner. It is not only companies creating pollution or using pesticides that are changing their business models in order to reduce the harmful effects on the environment. Any company using resources in any way is becoming aware of methods that change their business models towards more responsible environmental behaviour.

The Danish branch of the American computer services company IBM wanted to be able to offer their customers a new way of looking at IT equipment – a product thought to be high-energy consuming and thereby not very environmentally friendly. They created a new service for their customers which focused on reducing the amount of electricity used on large servers and IT equipment.

Case 2.4.3: IBM Denmark Big Green

IBM in Denmark started by evaluating their own performance. How could they reduce the amount of electricity spending? After scrutinising their own IT operations, they realised they could reduce their energy usage by 80%. IBM realised there was a great potential for them to develop a new business area.

The reduction in energy usage can be achieved by either re-programming the current systems, or replacing old wires and hardware with electricity optimising equipment, or a combination of both.

IBM has created a consultancy service which advises firms that use large computer systems and servers, and therefore consume a lot of electricity, on how to reduce their energy usage. In addition to selling IT equipment, IBM now analyses their customers' needs and provides specific equipment. They have educated their employees to be energy consultants – re-defining their business model with regards to the products and services they sell.

Source: Social Action (2008)

The focus on energy-efficient solutions at IBM Denmark is redefining how they consider their products. IBM Denmark now develops “climate technologies”, not only IT. Today, IBM has various clients from all industries buying the products that the new “green IT” strategy has developed.

Visible Consequences

Parts of the business community have been increasingly vocal about the urgency of responding to climate change in particular, and have sometimes been more progressive than many governments and politicians in calling for radical action as soon as possible. Interesting and unexpected coalitions are forming between some business leaders, lobbyists and NGOs, and politicians in order to raise the profile of the issue.

An increasing number of companies will recognise the long-term opportunities presented by the need to move to a more environmentally-sustainable future. Cleaner energy, more sustainable production, construction, retailing and waste management are all obvious areas for growth. Beyond this, there will be new types of service markets that will emerge, for example, helping more individuals, companies and organisations to live and operate in more sustainable ways. In response to this demand, a new market for sustainable consulting services is evolving where the cradle to cradle principle developed by William McDonough and Michael Braungart¹⁴ is being embraced by companies as well as regions and countries all over the world.

Principle 7. Needs in Developing Countries Drive Innovation

The Principle

New products and services are being developed to meet the needs of consumers in emerging markets. In order to deliver goods and services to markets in developing countries, firms must rethink their traditional business models. New ways of selling and distributing products are used; new types of partners are necessary; and new types of competencies must be included in innovation teams.

In many cases, innovations produced for developing countries also have a market value in the developed world. The insights gained from developing products and services for consumers in developing countries drive innovation everywhere.

The Previous Period

Until recently, companies have mainly identified their profitable markets as consumers with a certain amount of purchasing power. Consumers with low income were not considered interesting since any low value product they would require would not yield a high enough profit margin.

Consumers in developing countries were hardly even considered as customers since their needs were not understood by companies. The poorest part of the population was overlooked as a consumer group. Their demands seemed so different from the demands of customers in developed countries, and it was questioned whether a company could provide anything that these consumers would want to purchase.

Today, companies are increasingly seeing the opportunities held in developing countries and are

¹⁴ Founders of a new production principle where a company's waste is reused, thereby minimising the amount of pollution created – where the optimal goal is zero harmful pollution. Authors of the book *Cradle to Cradle: Remaking the way we make things*, (2002)

adapting and creating new products aimed at these markets.

Signs of Change

Markets in developing countries or in newly industrialised countries are often termed the Bottom of the Pyramid (BOP)¹⁵. People living on very low incomes might not be able to afford the types of products or services offered in the western society, but that is not equivalent to having no demands. More and more companies are seeing business opportunities in the large number of consumers with low income – what these people lack in income, they can make up for in numbers. This has opened up to possibilities of rethinking products, services, processes, distribution channels and so on, and designing them in new ways that are targeted at this group of people - creating business opportunities not previously seen.

By understanding the everyday lives of consumers in developing countries, companies are creating new products and services. Some companies are making simpler versions of their products in order to make them affordable for markets in developing countries, while adding functions that are relevant for that particular group of consumers.

The Finnish mobile phone provider Nokia wanted to develop a phone for consumers in less developed countries. They created a handset which only included the most basic features.

Case 2.4.4: Nokia

Nokia created a handset which only included the most basic features. Based on field studies of interactions between individuals in developing countries, Nokia gained insights into how consumers use mobile phones.

One of the obstacles to owning a mobile phone in these markets was the difficulty of accessing dependable electricity outlets. Nokia also found that communities often share mobile phones among family members or entire villages.

Nokia developed a mobile phone which has a battery life of 400 hours to overcome the problem of finding electricity. To meet the needs of customers who share mobile phones, Nokia introduced an advanced call-time tracking application and multiple phone books which can be made unique for each user. Nokia also incorporated a seamless keypad to protect the phone from dust.

Nokia continues to lower the price of its entry-level phone. In 2007, they introduced their cheapest mobile phone to date, set at just 25 Euro. Nokia's largest market in 2008 was China, followed by India. Within the last four years, Nokia has risen from the 70th most trusted brand in India to the number 1 most trusted brand in 2008.

Source: ReD Associates (2009)

Other companies are developing new products specifically targeting the market at the bottom of the pyramid. These products are often simple and of lower quality than products made for developed countries, in order to keep production costs and selling price as low as possible. Given the size of the markets in developing countries, a product or service is likely to sell in large quantities if it is found useful and demanded by the customers. A low priced and low margin item can still be profitable if the quantity sold is large enough.

¹⁵ Prahalad (2006)

In order to provide appropriate products and services for users in developing countries, companies must understand the societal context in which these inhabitants live their lives. The loss of light has major societal and economic consequences for rural communities in developing countries. Shops, kiosks and street vendors cannot light their merchandise at night, children and adults cannot study in the evenings without eyestrain, and fishermen are not able to work after dark.

In 2004, the Dutch electronics company Philips decided to target the emerging middle class consumers in developing countries as well as consumers belonging to the bottom of the pyramid, and created solutions to improve their quality of life after dark. Several product concepts were developed, and two new lighting products were produced and sold. Their quality was lower than lighting products sold in developed countries in order to minimise costs, but sufficient to provide lighting to rural areas in developing countries.

Case 2.4.5: Philips SMILE

The SMILE (Sustainable Model In Lighting Everywhere) project was initiated to examine the potential of developing new lighting solutions for rural communities in developing countries. Philips is using new business models in order to reach out to customers in rural areas. They include partnering up with local NGOs to distribute and sell their products, as well as using women's self help groups for door to door sales.

The core of the SMILE Project consists of two lighting solutions:

- 1) Kiran, a hand-cranked flashlight which uses long-lasting light emitting diodes (LEDs), is aimed at users with no access to electricity.
- 2) Uday, a rechargeable portable lantern, is aimed at middle-class users with erratic power supplies.

During the 3 months that the commercial pilot project lasted, several hundred families were involved.

Source: Social Action (2009)

In 2008, Philips launched the SMILE Project in Ghana in collaboration with the Dutch government, international development organization World Vision, and local Ghanaian NGOs. The goal for this SMILE collaboration is to make sure that 10 million people in 14 Sub-Sahara African countries have access to renewable energy lighting solutions by 2015.

Google has excelled at both creating and sustaining a culture within the organization that thrives on innovation. They champion leveraging digitization to foster innovation in both connecting with individuals and leveraging global resources. Empowering their employees to work on new areas of their choice for 20% of their time unleashes enormous intellectual power to attempt innovative solutions to existing problems.

Case 2.4.6: Google India

While location-based services such as GPS are very useful in developed countries, the developing world does not even have a documented map to build a GPS

system. Engineers in Google India developed a “map maker platform” with a wiki like architecture to leverage the local knowledge of citizens of these countries to create the entire digital road map of their respective countries.

The system works as follows: A clean map sheet of a city is loaded on the web, and a wiki-like architecture is enabled for every citizen to draw and shape the map of their local areas (including street names and numbers, curves in the streets and major landmarks). The specific changes by each individual are governed by groups of lead users based on their expertise and contribution on specific local areas of the city. The user community built the entire digital map of Islamabad in Pakistan with details on street names and addresses in around 90 days. The traditional approach to creating a digital map of this city would have taken significantly longer time. In addition, the wiki map is always current.

This example illustrates how web 2.0 and related technologies can help firms leverage global resources to solve unique problems.

Source: Prahalad & Krishnan (2009)

Google approached their market in a very different way, customising it towards the capabilities and possibilities of a developing country. A product previously only available for customers in developed countries now became available for customers in a developing country.

While products might be developed for customers in developing countries, the innovations can also have value for consumers in developed countries.

Case 2.4.7: GE Electrocardiogram

GE Medical Systems Group has been working on an affordable, mobile EKG machine for rural India. The work started in 2007. Using Indian engineers, they created a small (7 lbs.) machine (MAC 400) with a built-in printer that can be sold for \$2,500. It operates on batteries so that it can be used anywhere, even in places where there is no electricity. This compares with a large 65 lb. machine that sells in the USA for over \$10,000.

The Chinese engineers in the GE system heard of it and added SMS messaging to the machine so that the digital data can be uploaded and sent to any remote location. Now this Chinese version (MAC 800) is being marketed in the USA. They call it “diagnosis meeting messaging”.

Source: Prahalad & Krishnan (2009)

This is a classic case of innovations focused on BOP coming back to the developed world at a fraction of the cost and with better functionality.

Case 2.4.8: Netbook

Similarly, Microsoft and Intel focused on getting the poor to work with computing by developing a version of Microsoft operating system and a computer configuration that resulted in the Netbook. Netbook sells for \$250 and makes no compromises in the functionality of the machine. They have sold 2 million netbooks in developed markets.

Source: Prahalad & Krishnan (2009)

The Gradual Transition

The impact of developing countries and emerging markets on innovation will be tremendous in the years to come. This is gradually changing as finding new solutions to challenges faced by consumers in developing countries seems to be both profitable and also an inspiration for new solutions adaptable to consumers in developed countries.

Companies are starting with small-scale projects and are expanding as they gain experience and expertise.

Visible Consequences

In order to deliver products to consumers in developing countries, companies are rethinking their business models. The new markets often require knowledge and skills found outside the company, resulting in the formation of partnerships. These partnerships can be between companies that possess different competencies, or between companies and NGOs that have different responsibilities.

Within the value chain, it can be seen that companies are innovating together in order to develop new solutions. NGOs are taking on a new role and are working together with companies when it comes to sales and distribution.

2.5

Public Sector Challenges as a Driver of Innovation

Public services are services that are either provided directly by the public sector and public sector employees, or public services which are paid for by the public sector and delivered by the private and third sectors.

In many advanced economies, the demand for public services is growing faster than the rest of the economy¹⁶. In addition, demanding users are requiring more personalised services, adding to the budgetary constraints. The public sector is faced with challenges of how to deliver high quality public services that provide the best value for taxpayers.

More and more companies are becoming involved in different types of partnerships with the public sector in order to provide public services. There are already successful stories that can prove the benefits of involving companies in providing public services. But the future of companies' participation in solving public services lies in the hands of governments. There is an enormous potential for the government to take advantage of companies' innovative capabilities when it comes to delivering public services. If opened up, public services could become a large market for private companies and a potential driver of company innovation.

Principle 8. Welfare System Concerns Drive Innovation

The Principle

Companies have started seeing the public sector as a market. Instead of merely supplying the public sector with products and services demanded, companies have started working together with the public sector to deliver new innovative solutions. The mix of public and private collaboration is spurring innovation in new areas.

Companies are also seeing public services as an area where a multitude of opportunities exist for creating new solutions or delivering new products and services. In some cases, companies are better-equipped at offering a solution to a public sector problem. If companies will participate in shaping the public services of the future, public services will increasingly become a source of innovation.

The Previous

Companies have always provided the public sector with products. Some companies' main focus was to provide the public sector with specific goods demanded by the public sector. The same goods were seldom demanded by any other sectors or industries.

Services in the public sector were provided by government employees. Private companies would not be involved in delivering services such as health care or general public services. Today, this is changing as the public sector is realising that they do not have all the solutions to the problems that they are facing. The private sector is increasingly involved in delivering public services at both local and government levels.

Signs of Change

In most advanced economies, the biggest sectors today are healthcare and education. Care, both

¹⁶ Public Services Industry Review, BERR, UK, 2008

for children and the elderly, is growing fast and already constitutes some five per cent of GDP in a number of economies. These areas represent significant potential markets for private suppliers.

The public sector today is faced with users who are demanding individualised services, while decreased human and financial resources create a need for the public sector to increase its efficiency and the quality of the services offered. The public sector will have to start focusing on how innovation can be created in order to improve their services while using fewer resources.

The set up of most public sector services today is not created to foster innovation. By including private companies in the development of products and services and creating a competitive market for these products and services, innovation will grow and benefit the future development of the public sector.

There is an increasing interest in how private companies might better anticipate and respond to the needs that public services have to meet, and how they might seek to develop new technologies, processes and services that respond to these challenges. This need has, in some cases, led to new forms of partnerships between the state and private companies. Companies can innovate for the public sector, while the public sector continues to have the responsibilities of the services offered.

Sometimes the public sector faces challenges that they are not able to solve on their own. The changing behaviour among citizens has resulted in new types of problems which the public sector has to solve. In response, private companies are being hired to provide solutions.

In the UK, engaging private companies in the development of public services is ahead of other countries. Within several areas of the public services, private companies have played a role in designing new solutions of how services should be delivered to the public. Other countries are following suit and including private companies in the delivery of public services. Examples include Finland (where telemedicine is being provided to patients) and Denmark (where schools and children's day care services are being designed in new ways). Companies are participating in developing and improving services offered to the general public.

In some families in the UK, the third generation might still be unemployed. This has created a new culture within families. The hard to reach unemployed do not volunteer for government employment programmes and are therefore not offered any job training or employment opportunities.

Case 2.5.1: Make it Work

Sunderland City Council was not able to get the unemployed to work by using the existing procedures. They hired a service design company to take a different perspective on the problem and use service design methods and skills to reach and support individuals to get jobs.

The service design company was able to understand the cultural problems, and designed a new solution for how the long-term unemployed could interact with employment services. The long-term unemployed need to be engaged in their local communities by people who understand their situations. By bringing together a coordinated approach involving a number of specialist community organisations covering mental health, drug rehabilitation and careers, the unemployed felt they were being understood and served properly. Once the unemployed feel well and socially

stable, they are promoted into job training and then into jobs.

Source: <http://www.livework.co.uk/our-work/Sunderland-City-Council>

To date, the scheme has provided support to over 800 people, 200 of whom have already found employment. On average, it costs £62,000 to get a person on incapacity benefit into the world of work, while the average cost per individual of the Make it Work pilot is less than £5,000.

Public services are seen as a market opportunity among companies that are developing new products and services which are offered to the public sector.

In The City of Copenhagen, a private consulting company, Copenhagen Living Lab saw the potential for improving the quality of life for elderly people in a nursing home. Copenhagen Living Lab acted as a mediator between the nursing home and companies that were interested in participating in finding ways to improve life in the nursing home.

Case 2.5.2: Improved Quality of Life for the Elderly

The private consulting company, Copenhagen Living Lab, approached the City of Copenhagen with the suggestion of starting a process to uncover how the quality of elderly people in nursing homes can be improved.

The project was divided into two phases. First, factors that influence the quality of life for elderly people would be uncovered by using ethnographic methods. Secondly, private companies were invited to collaborate on developing new products and services which could improve the elderly people's quality of life. The first phase is completed, and the findings were presented at a conference where 36 private companies and organisations participated. Eight areas related to improving everyday life for the elderly were identified.

The City of Copenhagen has recognised that there is an actual interest from the private sector to take part in solving social needs.

Presently, five companies are developing new aids for elderly people. It is expected that several new products and services will be presented during 2009.

Source: Copenhagen Living Lab (2009)

The public sector is also taking advantage of private companies' expertise when it comes to designing new schools and related teaching facilities. In the UK, the government opened up for the opportunity to look at schools from a different perspective.

A highly challenged school was renovated in more than one way. In addition to improving the quality of the building, the internal spaces were designed to cater for modern teaching and preparation for a professional life

In 1998, the British government announced a large investment in improving school buildings. Several private companies are involved in various stages of the project. While architects are involved in designing the physical school building and related buildings, a service design company was involved in designing how the building should function on a day-to-day basis. New methods of how to renew a public institution were embraced by the public sector.

Case 2.5.3: Building Schools for the Future

In the next decade, 'Building Schools for the Future' (a British governmental programme) aims to see every secondary school in the country refurbished or replaced. Kingsdale School was chosen as the first school to be renewed.

An interdisciplinary team of educational experts, psychologists, artists and architects worked with the management team, teacher and pupils to identify the scope of the problems, what and how to improve the school. Pupils and staff were at heart of the creative process and the decision making.

The students' and staff's social behaviour was central to improving the conditions at the school. Focus should be on much more than just the physical facilities. The traditional scope of renewal was totally changed. For example, new kinds of spaces that support collaborative interaction and which give the students a feeling of belonging have been built.

Source: www.participate.net; www.school-works.org

Kingsdale School has improved its ranking on the list of schools in the UK, and more students are passing their exams after the school was renovated. Pupils aggregate average test results have increased by 80 percent from 2003 to 2006.

The Gradual Transition

Within some sectors, it has not been unusual to involve private companies. These types of collaboration are increasing as more focus is put on public-private partnerships which actively seek to involve both parties. Within more sectors, companies are realising that their products or services can be offered to customers in the public sector as well as in the private sector.

Visible Consequences

As the needs and challenges faced by public services continue to increase in scope, demand and complexity, more companies will recognise the long-term commercial opportunities presented by these markets. In areas such as healthcare and education, for example, companies already will continue to develop, and should move towards developing more innovative products and services rather than merely supplying existing goods in greater volumes. This is to say, the real growth markets will be in innovative solutions – or at least helpful responses – to the longer-term challenges faced by public services. This should also attract new market entrants, both new companies established to exploit these opportunities, and existing companies from other sectors that recognise that they have transferable technologies, knowledge and skills that could be successfully applied to public service demands and challenges. New types of companies should emerge: privately-owned, highly innovative, but closely aligned and responsive to the needs of public services, now and in the future.

2.6

Technology's new role

Technology has always played an important role in driving innovation, and it will continue to do so in the future, but for many companies, technology will gradually move from being a driver of innovation to being an enabler of innovation.

Therefore, the 9th principle of innovation cannot be considered a new principle in itself. What is new is the role technology will have in the future.

Principle 9. Technology's Role as an Enabler of Innovation

The Principle

In the new era of innovation, technology will become an indispensable enabler of company innovation, but new technology will be less and less the driver of company innovation. Already, digital technology is an indispensable element in nearly all innovation, and the internet will enable companies to innovate in new ways. Service innovation and new business models will play a major role.

While new technology as the driver of innovation is decreasing at the company level, other forces are taking over. Companies are looking for new business opportunities to unsolved problems of individual consumers and citizens, or global challenges such as climate change, clean water or social needs. Sometimes, new and better solutions are created with existing technologies or new combinations of existing technologies. Every so often, new technologies need to be developed to create satisfactory solutions, but even when new technology is needed, the technology is not necessarily the driver of innovation but an enabler.

The declining importance of technology as a driver of company innovation does not mean that new technology will be less important at macro or national level. For societies, new technology will still be a crucial factor in creating higher living standards and solving critical challenges related to enormous global challenges.

The Previous Period

In the industrial age, new technology was often the starting point of the innovation process. In that sense, new technology was the driver of innovation. In R&D departments and laboratories, engineers and other natural scientists developed new technologies, which formed the basis for completely new products and services or radically improved the functionality of existing products or services.

Of course, new technology was not always a success. Sometimes the work done in R&D departments failed because the expected outcome did not materialise, or the costs were too high. But often, new technology paved the way for bright new products, considerably improving the standard of living.

For this reason, many companies built great and successful R&D departments. Their innovation relied heavily on the development of new technology, and this was seen as the dominating driver of innovation. However, new technology was not the only driver of innovation in the old regime;

contact with users was important as well, though it was seldom seen as the dominant driver of more radical innovation. Rather, user involvement was viewed as more crucial for incremental innovation and the final adjustment of new products and services. Hence, users were normally involved towards the end of the innovation process, when prototypes were tested on different consumer segments.

The mobile phone industry is an illustration of technology-driven innovation. When the industry developed in the 1980s, new technology was the driver of innovation. The industry started with heavy phones with limited usability, and developed into smaller, slimmer and faster phones with each generation of new technology.

There are signs that this will not be the case in the future. According to the Swedish-based mobile communication company, Sony-Ericsson, the future drivers of innovation in the mobile phone industry will be a deeper understanding of users' needs for new applications and users' experiences with new solutions.

The mobile phone industry is not exceptional in this regard. Nearly everywhere, one sees that new technology is no longer the driver of innovation.

Signs of Change

In the future, competition on innovative new technology will seldom be sufficient. Instead, it will be necessary to add further value to products or services to succeed. Companies need to see the entire value chain as an object for innovation; they need to introduce new organizational structures and new innovation processes. Often, brand new business models will be needed to succeed in future competition on innovation. Innovation is taking place in production methods, processes, distribution channels, networks and other areas within firms' value chains.

The dominant source for innovation will be related to finding new solutions to unsolved problems or better solutions to known problems, where today's solutions are insufficient. Companies of today - and even more so companies of the future - will search for unsolved problems, where they can see new solutions as new business opportunities. The new solutions could be aimed at individual consumers, or at creating increasingly individual public welfare solutions. New business opportunities are being found in global challenges such as climate change, lack of clean water and poverty. Corporate social innovation is already an important factor and will be even more so in the future.

Companies need to pay much more attention to individual users' needs and understand individual users' acknowledged and unacknowledged needs as an important source of innovation. 'Users' are both end users (consumers), but also other companies and institutions.

The Dutch multinational Philips has, for decades, been seen as a dominating electronic company, whose success has depended on its advanced technology and good design. This is not the case anymore. In the future, Philips will also be known for advanced technology and design, but this is not enough to succeed in the new global competition.

Philips is one of the big companies which experiment with identifying unsolved problems as an important driver of innovation.

Philips realised that hospital staff had to repeat many of the scanning procedures on patients. In order to reduce the amount of repeated examinations, Philips created a scanner where patients could create a relaxing ambience during the scanning procedure.

Case 2.6.1: Philips

Philips used ethnographic methods to explore and understand the emotional experiences of patients – adults as well as children –who were being scanned. Patients, their family members as well as medical staff were included in the qualitative and cooperative research which examined needs, values and experiences throughout the care cycle.

The researchers discovered that the users experienced high levels of discomfort and anxiety while being scanned. Users felt that they had no control over the cold clinical environment, and the machinery was loud and intimidating, making it difficult for them to relax.

Philips created the Ambient Experience Suite which allows patients to personalise their environment during the scanning procedure and wrap themselves up in a relaxing ambience using integrated architecture, design and enabling technologies such as sound and lighting. The combination of these sensory stimuli makes the room with the scanning equipment appear bigger, reducing sensations of claustrophobia, and potentially reducing the need for sedation and repeat examinations.

The new scanner helps procedures progress more smoothly, making the clinician's job easier, and increases the patient throughput. Since 2005, 50 hospitals worldwide have installed the Philips Ambient Experience.

Source: ReD Associates (2009)

In this case, Philips succeeded in creating a new solution without the use of new technology. This will often be the case in the future. However, even though new solutions will sometimes demand new technology, the technology may not be innovative in itself or the driver of innovation. The technology will be an enabler of new solutions or new applications that can be used for better solutions.

ICICI, one of the largest retail banks in India, is a pioneer in Internet banking in India. 20% of all customers primarily bank through the Internet. However, India has about 50 million with access to ISP and over 300 million people with cell phones. ICICI launched a service on the phone that would instantaneously inform the customers, through SMS, of any transactions made through ATM or credit card allowing the customer to know the credit or balance on the account. More than a million people subscribed to this service in less than four years. However, customers' needs were not yet fulfilled. They wanted to be able to initiate the transactions themselves.

Case 2.6.2: ICICI Mobile

In 2008, ICICI introduced the IMobile service where a customer could download an application that allowed them to transact with the bank. This included a wide range of services. The service was popular, and more than one million customers subscribed to the service in six months.

While the service was very popular, many did not have a GPRS phone. They could download the application with a cable from a PC onto the cell phone. This was cumbersome. ICICI found that by using Unstructured Supplementary Service Data

(USSD), the application could be downloaded by just dialling a number. The product is very robust. The company decided to push the application through collaboration with telecom carriers such as Idea Fresh, Airtel Live, VodafoneLive and others. Currently, the regulators are working on new regulations for the bank to work with telecom providers and expand the scope of the service.

Source: Prahalad & Krishnan (2009)

The transition from branch banking to internet (PC) banking was the first step - recognizing that the power of cell phones permitted the passive, yet personalized application of information about transactions made in your account. Development is now moving to the next stage of co-created, personalised banking using a cell phone, PC or an ATM and a branch. This exemplifies the use of rapid adaptation of technologies to move towards personalized service, as well as the expansion of the ecosystem of partners.

While the technology within the telecoms industry has enabled unique solutions, it was customers' needs that were the main driver of the innovation. Technology's role was to enable the best solutions.

The Gradual Transition

The transition of technology being an innovation in itself - or driver of innovation - to being an enabler of innovation will take place gradually. No one can say for sure how widespread it will be.

In the future, we will also see important examples where new technologies are innovative in themselves, and companies do not need to add further value to succeed with them. In some cases, new technology will result in higher consumer value, and careful tests of prototypes will be enough to realize their market potential.

One obvious example where new technology still will be an important driver of innovation is the pharmaceutical and biotech industry. If R&D efforts in the pharmaceutical industry lead to new drugs or treatments which obtain approvals, it will immediately have a high market value and be innovation in itself. That's how it is to day, and it will also be the case in the future.

Also in the pharmaceutical industry, one might expect that sources other than technology will be important drivers of innovation.

The Indian pharmaceuticals firm ICICI-Prudential¹⁷ offers a service package for diabetes patients which can result in lower life insurance premiums. If health checks can verify that diabetes patients have a healthy lifestyle and use the drug in the prescribed way, they pay a lower insurance premium.

Prevention of chronicle illnesses can be treated through new forms of health care programmes.

Case 2.6.3: ICICI Prudential

Together with pharmaceutical firms, diagnostic firms, testing firms, gyms and fitness clubs, ICICI Prudential is able to offer a new form of health care program. For example, diabetes patients are encouraged to live healthily and stay fit. If they follow the programme designed for them, patients will obtain a lower premium on their health insurance.

¹⁷ Prahalad & Krishnan (2008)

Data on customers' behaviour and lifestyle gets collected through a web-based monitoring system by testing patients periodically in diagnostic clinics. The patients get access to a web site, where they can get access through a log in to recent data on their personal health condition. This can help them to stay motivated on maintaining their activities. Through the collected data, ICICI Prudential can measure the risk on each customer individually and offer the customer individual pricing.

Source: Prahalad & Krishnan (2008)

This solution does not rely on new biotechnology, but it does rely on the latest IT as an enabler of a new solution at reasonable cost.

Also in 'green tech' we will see important examples where new technology is so valuable that it is innovation in itself and a major driver of innovation; yet there are other examples in green tech where new, very valuable solutions can be created using existing technology.

Visible Consequences

This will lead to a new way of organising R&D departments.

Several of the world's largest companies have realized that increasing outputs from their R&D departments is no longer so relevant for the company's innovation. According to Philips, only 20% of the outcome from Philips' R&D department has recently formed the basis for innovation in the company.

Hence, it is not surprising that the future role of R&D departments is under evaluation. Some companies have already separated the R&D department from the rest of the company. Sometimes the R&D department continues within the mother company. At other times, the R&D department continues as an independent company, selling technology to an emerging global market for technology.

This restructuring of R&D departments is part of a greater transformation which probably will result in a new global market for technology. In Principle 7 on global knowledge sourcing, one of the business cases describes a new company, InnoCentive, who acts as an online technology broker. Similar companies are emerging which will contribute to shape a global market for technology.

If this happens and becomes efficient, it will be hard to see how technology can be a primary driver of innovation – which may have consequences on science and technology policy.

Companies' innovation is, to an increasing extent, affecting the whole value chain, often requiring new business models and leading companies to change their organizational structures so the entire company becomes more innovative.

Chapter 3

Shaping New Innovation Policies

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3.1

Understanding the Innovation Policy Environment

In this chapter, policy implications of new forms of innovation are discussed, and important new policies are proposed. The policy recommendations are based on insights and policy cases gathered from seven OECD countries as well as international roundtable discussions with policymakers and experts.

In Chapter 2 it was shown that the centrality of the individual is both a threat and a possibility for businesses. When individuals are connected and act together, companies have to rethink their business models and the nature of their innovation. And when a new interdependence of companies takes place where no single company can act alone, companies have to learn to engage in symbiotic partnerships.

The centrality and connectivity of individuals and the interdependence of institutions will have an important, perhaps even a dramatic, impact on public institutions and public policy. Governments must be more responsive and react in new ways because of these changes and the emergence of a new nature of innovation.

In Chapter 2, four new drivers of innovation and nine related principles are identified. The four drivers are:

- Co-creating value with customers and tapping knowledge about users
- Global knowledge sourcing and collaborative networks
- Global challenges
- Public sector challenges

All four drivers may have important policy implications.

Companies become more and more open and transparent and need to engage in a dialogue with their customers; provide them with access to more information and share risks with them; and accomplish this through co-creation with individual customers and by involving users in the innovation process. To work with customers and users in entirely new ways necessitates changes in business culture and company skills, which of course is a responsibility for the business world. But across all countries, governments are involved in research and education; hence a need for new knowledge and new business skills will also have to involve governments. All governments will have to find ways to meet this challenge.

Companies form collaborative networks and engage more and more in symbiotic partnerships with other companies and public institutions. This also impacts company culture and requires new business and public institution skills; hence it will affect the role of the public sector.

Global challenges require new solutions. To come up with sustainable solutions to global challenges will be a huge business opportunity and one of the most important drivers of

innovation. But new solutions to global challenges such as climate change, access to clean water, epidemics and other social needs will often involve public standards, government regulations or public demands. Government activities can therefore be a barrier to social innovation, but governments also have a possibility to foster company innovation. It requires smarter regulation and more intelligent public demand. How to do that in practical terms remains a challenge for governments at all levels.

The welfare system is under intense pressure. To come up with new, individualised and affordable solutions is a challenging task and could be a new driver of company innovation. Government is involved in most, if not all welfare areas. Hence, government activities may be a barrier to company involvement in welfare service innovation. But governments can also pave the way for a revolution of the welfare system by forming innovation partnerships between public institutions and private companies. How to do that will be another huge challenge for governments at all levels.

It seems obvious that a new nature of innovation inevitably calls for changes in innovation policies and the national framework conditions for innovation. However, it should be stressed that science and technology still remain crucial to innovation. The existing and well-functioning national innovation systems designed to support S&T-based innovation should therefore be further developed to meet new challenges from emerging global markets for technology and new forms of global knowledge sharing.

This study focuses on the new role of innovation policy, but the policy implications of a new nature of innovation remain undefined and may benefit from policy experiments. The new areas of innovation policy identified in this study include smarter regulations to foster innovation and intelligent public demand to enhance companies' field of innovation. Governments must also play an important role in building the knowledge and skills needed to deal with co-creation and user involvement in innovation.

Governments may take a leading role in the transformation of old S&T innovation policies to new innovation policies required by the changing nature of innovation. Governments have the position to set a new agenda for societies by creating the necessary awareness of the new challenges and possibilities. This requires a deep understanding across governments of the new nature of innovation and a commitment and willingness to lead the way.

3.2

Visiting seven OECD countries

Although there may be fundamental policy implications related to a new nature of innovation, the practical implications remain less obvious. By examining recent experience in formulating and implementing broad-based innovation policies across different countries, an attempt will be made to gain a better understanding of the possible and more practical policy implications of a new nature of innovation.

When selecting countries, focus has been on countries where new national broad-based innovation strategies have recently been announced or implemented, and where countries expressed an interest in sharing knowledge regarding their policy experience.

The selected OECD countries are: Australia, Canada, Denmark, Finland, Germany, the United Kingdom and the United States. Appendix 1 offers a brief introduction to the countries' recent work in broad-based innovation policies and initiatives.

Leading innovation policymakers and experts from each of the selected countries have contemplated the innovation principles and have contributed with significant input in terms of possible policy implications. Each country was asked to report on any concrete policy initiative which addressed the new nature of innovation. 27 policy cases were collected and will be outlined below.

The interviewed policymakers and experts are listed in Box 3.2.1 below.

Box 3.2.1: Key Policymakers in Policy Innovative Countries

Australia

Tricia Berman, Innovation Policy Department of Innovation, Industry, Science and Research

Canada

Ian Stewart, Science and Innovation Sector, Industry Canada
Shane Williamson, Policy Branch, Science and Innovation Sector
Dr. Peter Nicholson, Council of Canadian Academies

Finland

Petri Lehto, Ministry of Employment and the Economy
Petri Peltonen, Ministry of Employment and the Economy
Mikko Martikainen, Ministry of Employment and the Economy
Timo J. Hämäläinen, SITRA
Petri Rouvinen, ETLA
Pekka Ylä-Anttila, ETLA
Janica Ylikarjula, Confederation of Finnish Industries and Employers, EK

Germany

Wolfgang Crasemann, Ministry of Economics and Technology.

United Kingdom

Peter Davidson, Government's Senior Innovation Advisor
Ken Warwick, BERR Department for Business
Mark Beatson, Department for Innovation, Universities and Skills

United States

Jane Corwin, U.S Department of Commerce
Rob Atkinson, Information Technology and Information Foundation
Dr. Auerswald, George Mason University
Jack Yadvish, Andrew Petro, Minoo Dastoor, Doug Comstock, Innovative Partnership Program, NASA
Stephen Merrill, National Academies of Science
Greg Tassey, National Institute for Standards and Technology
Elaine Kamack, JFK School of Government, Harvard University
Robert J. Shapiro, Founder and Director, Sonecon, LLC, Former Clinton advisor

Based on discussions with policymakers in the seven OECD countries, some possible policy implications were developed and then further discussed at an international roundtable meeting in Copenhagen. Representatives from public and private sectors, as well as leading international innovation experts, were invited to critically review and discuss the suggested policy implications (see Box 3.2.2).

Box 3.2.2: Participants at the International Roundtable Meeting

Denmark

Finn Lauritzen, Director General, the Danish Enterprise and Construction Authority
Anders Hoffmann, Vice-Director, the Danish Enterprise and Construction Authority
Jørgen Rosted, Director, FORA
Paal Smith-Meyer, Head of new Business Group, LEGO
Frederik Wiedemann, Partner and co-founder of ReD Associates

Finland

Antti Eskola, Commercial Counsellor, Ministry of Employment and the Economy
Ossi Kuittinen, Chief Technology Officer, Sitra
Jari Kuusisto, Director of European Touch Ltd

UK

Peter Davidson, Senior Innovation Adviser, BERR and DIUS
Ken Warwick, Chair, CII. Deputy Chief Economic Adviser

Innovation Experts

CK Prahalad, Professor of Corporate Strategy, University of Michigan Ross School of Business
Jose Santos, Professor of Practice in Global Management – INSEAD (Fontainebleau)

Based on the country interviews and the roundtable discussions, it can be concluded that there is widespread acceptance of the innovation drivers and related innovation principles that are formulated in the study. It was also concluded that these principles might have important policy implications – reported in the next section.

3.3. Policy Implications

Several countries have begun to reformulate their innovation strategies in light of the new trends. No country has formulated a comprehensive new strategy to meet the new challenges. However, a few countries have taken the first steps or announced that they are working on reformulating their innovation strategy cf. Annex 1.

Based on the new drivers of innovation and related innovation principles, and on the policy cases collected by the country visits, three policy areas have been identified:

1. Creating new knowledge
2. Smart regulation
3. Intelligent demand

New knowledge is required to deal with new forms of innovation. Knowledge about co-creation of value and exploring user understanding are necessary, and skills for working in multidisciplinary innovation teams will be crucial. If governments can design and implement standards and regulation in smarter ways, smart regulation can be an engine for innovation. And if public demand can be used more intelligently it can be another strong engine for new forms of innovation.

3.3.1. Creating new knowledge

As new types and sources of innovation appear, new knowledge and competencies are required. Natural sciences and technology have for decades been the dominating knowledge base of innovation, and science and technology will still be crucial but far from sufficient. There is a need for deep and specialised knowledge to understand markets and user behaviour as sources of innovation. New technologies can enable companies to develop entirely new business models, which opens up possibilities for co-creation and exploration of unsolved user needs. This can be an important source of innovation.

Access to high levels of knowledge is fundamental to the innovation capacity of companies. On the one hand, knowledge needs to be specialised. On the other hand, radical insights can be gained by combining different disciplines. Multidisciplinary approaches to solving new needs will become more and more essential to developing innovative solutions.

Successful co-creation and involvement of users in new and more scientific and systematic ways will require more specific knowledge about consumer behaviour.

Undoubtedly, companies have enormous amounts of information available about their customers, including data on who they are and how they react to different versions of certain products and services. This kind of information is crucial to marketing and branding. However, evidence shows that companies often know very little about the reasons behind certain consumer behaviour. Questions such as why there sometimes is a great discrepancy between articulated consumer wishes and actual choices may be difficult to answer. The answers to such questions can be crucial knowledge for those wanting to create new business concepts or platforms.

New mindsets, skills and competencies may be needed in order to engage in co-creation and development of unique solutions. These types of skills and competencies are usually related to professionals with a background in social science, human science and arts such as architects and designers. Evidence illustrates that it can be difficult for companies to recruit professionals with these skills and competencies at the same time as they have sufficient skills in business understanding and experience in multidisciplinary innovation teams.

It could therefore be argued that there is a need for more research and education related to understanding users' behaviour and how to create new tools for tapping into relevant, tacit user knowledge.¹⁸

The following more detailed description of policy initiatives on creation of new knowledge will be separated in 4 policy areas: new or transformed institutions, research, education and facilitating knowledge sharing.

¹⁸ It is difficult to say how important explorative consumer research and user competencies will be in the future. Still, it has been predicted that a majority of future companies will invest more in user knowledge than in traditional R&D. See Innovative America.

3.3.1.1. New knowledge institutions or transformed institutions

In order to enhance the creation of new knowledge, the following policy actions are suggested.

Government should:

- Provide financial support to research-based universities and other educational institutions;
- Encourage the establishment of new multidisciplinary research and educational institutions and collaboration between existing institutions; and
- Prioritize professions with social science, human science and arts such as architects and designers which earlier were not crucial to innovation but very much will be in the future.

Public and private universities and research institutions are increasingly aware of the need for creating new scientific skills and competencies through new types of research and multidisciplinary education.

Countries are introducing initiatives aimed at improving access to new types of research and multidisciplinary education that draws on knowledge from areas previously viewed as not directly related to innovation.

In Finland, a major merger of three different universities into one new university is currently taking place. The three universities are the Helsinki University of Technology, Helsinki School of Economics and Helsinki University of Art and Design. The new set-up combines strong research skills in technology, business and design studies, and is turning innovation thinking into more human-centric thinking (see Box 3.3.1.1.1).

Box 3.3.1.1.1: The Aalto University

Countries are introducing initiatives aimed at improving access to new types of research and multidisciplinary education, drawing on knowledge from areas which have previously been considered as not directly related to innovation.

In Finland, a major merger of three different universities into one new university is currently taking place. The three universities are the Helsinki University of Technology, Helsinki School of Economics and Helsinki University of Art and Design. The new university combines strong research skills in technology, business and design studies and is turning innovation thinking into more human-centric thinking.

“The Aalto University is an answer to the ‘big picture problems’ which defy single discipline approaches...design is one of the key assets of the new user-centric and need-driven innovation strategy and of course to the Aalto University” (Initiator of the Aalto University, Yrjö Sotamaa).

The Aalto University in Finland was created in 2008. It is named in honour of the Finnish architect Alvar Aalto, who was known for his ability to combine technology, industry

and design. The goal of the Aalto University is, by 2020, to become one of the leading institutions in the world in terms of combining business, technology and design. Intercultural learning platforms and design factories are set up to facilitate cooperation between students, researchers, entrepreneurs and business professionals from design, technology and business skill sets.

A joint public-private endowment of €700 million will be made to the project, while the combined budget will be increased by €100 million.

Source: Sotamaa, Yrjö, University of Art and Design Helsinki, Finland

There are also examples of institutions being created with the aim of creating and transferring new types of knowledge in new ways. In Sweden, companies and government are collaborating to establish a new multidisciplinary institute focusing on knowledge about ICT and future mobile phone users. The aim is to combine specialised digital technology research, business understanding and explorative user research, and to transfer relevant and research-based knowledge from local knowledge institutions to companies in the mobile phone industry (see Box 3.3.1.1.2).

Box 3.3.1.1.2: The Cluster Initiative Mobile Heights

In Sweden, companies and regional government are collaborating to establish a new multidisciplinary institute focusing on knowledge about ICT and future cell phone users. The aim is to combine specialised digital technology research, business understanding and explorative user research, and to transfer relevant and research-based knowledge from local knowledge institutions to companies in the mobile phone industry.

Mobile Heights is a public-private partnership. The initiative was founded in 2007 by Ericsson Mobile Platforms (EMP), SonyEricsson, Lund Technical University and Region Skåne. The founding members have initiated an industrial excellence centre on service innovation in order to find new ways for transferring knowledge between knowledge institutions and the business sector. This centre will deal specifically with exploring and developing new methods for working in an open and interdisciplinary value network, which integrates technology, user value, and business knowledge bases between academia and industry. The centre is planned to operate for a period of ten years.

Overall funding of Mobile Heights amounts to approximately 600.000 EUR in 2009 and is comprised of financing from EU structural funds for regional development, company's membership fees and additional financing.

Read more: www.mobileheights.org/

Source: Emily Wise (2009)

In Denmark, companies and the government are working together on a similar project in the food processing industry to create a multidisciplinary institute focusing on food technology and understanding of users' future food behaviour. The aim is to transfer relevant knowledge from local related knowledge institutions to the leading Danish food processing industry (see box 3.3.1.1.3).

Box 3.3.1.1.3: Innovation and Knowledge Centre for Food Processing

In Denmark, companies and the government are working together on a similar project in the food processing industry to create a multidisciplinary institute focusing on food technology and understanding of users' future food behaviour. The aim is to transfer relevant knowledge from local related knowledge institutions to the leading Danish food processing industry.

Understanding user needs and habits for food is important for commercial success in the Danish food processing industry. The Danish Government has had a blueprint prepared on how to construct a new user-oriented innovation and knowledge centre in the area of food processing. Such a centre would fill in the gap which currently exists with research and innovation in the area. Core activities are planned to include interdisciplinary innovation projects composed of researchers, staff from the centre and employees from food processing companies. The plan is also to facilitate research stays for students and PhDs which are in the process of finishing their theses. Over time, the centre's income should consist of payments from enterprises participating in projects.

Currently, the project is in the phase of getting funds and finding a proper location. The costs of establishing the centre are estimated to approximately 800.000 EUR in the first two years. Ideally, the centre should be economically-sustainable and privately-financed after five years.

Source: Blueprint (2009); ReD Associates.

Design knowledge is more and more recognised as an important contributor to innovation. It is not only the importance of classical material design that matters, but in particular the importance of immaterial design such as strategic and conceptual design that is important. Service design is also growing in importance for innovation, as most new solutions combine new services, new products and new business models.

A new institute for strategic interactive design and service design has recently been established at the Danish Design School in 2008 (see Box 3.3.1.1.4).

Box 3.3.1.1.4: Copenhagen Institute of Interaction Design

Design knowledge is more and more recognised as an important contributor to innovation. It is not only the importance of classical material design that matters, but in particular the importance of immaterial design such as strategic and conceptual design that is important. Service design is also growing in importance for innovation, as most new solutions combine new services, new products and new business models.

A new institute for strategic interactive design and service design has recently been established at the Danish Design School in 2008. The Copenhagen Institute of Interaction Design (CIID) incorporates education, research and consultancy.

Internationally, there is a high demand for interaction design and service design - both disciplines are viewed to be key innovation drivers, and an educational programme that interfaces with academia and industry is required to reflect this.

In joint collaboration with the Danish Design School, CIID launched the Interaction

Design Pilot Year in September 2008. CIID encourages a multi-cultural and multi-disciplinary environment, and 21 students from all over the world have been chosen to participate in this intensive full-time pilot. The Danish Government, Novo Nordisk and the JL Business Foundation have all awarded financial funding for the planning and implementation of the pilot year.

Source: <http://ciid.dkds.dk>

3.3.1.2. Research

In order to strengthen the research, the following policy actions are suggested.

Government should:

- Support research and activities in specialised areas important for dealing with new forms of innovation;
- Prioritize investment in various research disciplines to strengthen the emergence of specialized regional knowledge hubs in the global knowledge economy;
- Facilitate global partnership and network activities and consider loosening the national restrictions applied on government-funded research programmes, for instance introducing collaborative R&D credits across borders; and
- Re-design the assistance provided to domestic firms looking to expand abroad from mainly export and sales support to more network, knowledge sharing activities with a wide range of players in other countries.

In the industrial age, where technology was the main source of innovation, every country built a national innovation system based on science and technology. A number of research institutions and technology transfer institutions emerged, and every country has a program for stimulating and sharing knowledge on new technology. It is important that these institutions and programs continue and are further developed.

But there is also a real need for a better understanding of how innovation takes place today and in the future. In the USA, the National Science Foundation (NSF) has taken a very interesting initiative to improve the understanding of how networks operate and their importance for innovation. The initiative is labelled The Science of Science Policy – A Federal Research Roadmap (Box 3.3.1.2.1).

Box 3.3.1.2.1: The U.S Science of Science & Innovation Policy

The U.S. National Science Foundation has initiated a programme the Science of Science & Innovation Policy (SciSIP). The program supports interdisciplinary and multidisciplinary research aimed at developing theoretical models and empirical evidence to advance understanding of the scientific, research and innovation process. The goal is to provide a scientifically rigorous, quantitative basis upon which policymakers and researchers can assess the impacts of scientific and engineering enterprise, improve their understanding of its dynamics, and assess the likely outcomes. The NSF also co-chairs a National

Science and Technology (NSTC) council interagency group that developed a roadmap for federal science investments in science policy.

Read more: The SciSIP solicitation:
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501084

The Science of Science Policy - A Federal Research Roadmap", NSTC Report on the Science of Science Policy, November 2008.¹⁹
Source: http://www.ostp.gov/nstc/html/NSTC_Home.html

As illustrated in Chapter 2, some companies already innovate in entirely new ways and use knowledge, skills and competencies which are not usually employed in innovation processes. Often when companies innovate in new ways, they are muddling through in a trial and error process with weak scientific backing. There is a need for a better understanding of the new forms of innovation and therefore a need for more research in the new nature of innovation.

Until now, there have been only a few examples of research projects which have focused on new ways of innovation. In accordance with the multidisciplinary thinking, design processes are gaining ground in the new innovation arena. In particular, the role of immaterial design such as service design is becoming key to the innovation process. Skills in understanding and communicating immaterial design could become a key competence required when designing new business solutions.

Recognizing the growing importance of immaterial design and service design in particular, the National Academies of Science (NAS) in the USA considers launching a new study addressing the role of service design for innovation (see box 3.3.1.2.2).

Box 3.3.1.2.2: Service Design at the National Academies of Science

Recognizing the growing importance of immaterial design and service design in particular, the National Academies of Science (NAS) in the USA is considering launching a new study addressing the role of service design for innovation.

The National Academy of Sciences (NAS) is a private, government-supported organisation which plays a central role in the American innovation system. It provides advice to the federal government on issues related to science and technology and innovation.

In more recent years, NAS has been gradually changing perspective from R&D-focused innovation to a more broad innovation perspective. NAS is currently exploring the possibility for a study addressing the role of service design.

Source: Stephen Merrill, NAS (2009)

Global knowledge sourcing will become even more important in the future when innovation often will take place within global innovation alliances. It is therefore important that public programs for supporting research also have a global perspective. However, the financing is usually limited to national companies and research institutions, whereas foreign companies and institutions are excluded.

¹⁹ Read more: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501084

However, as global networks are expected to play a more important role to innovation in the future, the pros and cons of national restrictions in government-supported activities could be subject to further analysis. In the USA, the National Institutes of Health, which is part of the U.S. Department of Commerce, has had a long tradition of applying a global perspective in its public-funded research activities (Box 3.3.1.2.3).

Box 3.3.1.2.3: Public-supported collaboration around the world

In the USA, the National Institutes of Health (NIH) provides grants to basic biomedical research and research partnerships anywhere in the world. It also engages in licensing activities internationally.

The reason for funding research globally is that the NIH addresses global challenges; operates within a very limited area with rare diseases that private companies do not wish to fund; and aims at funding the best basic research independent of borders.

For improving the ways researchers can collaborate across countries, the NIH has developed a system which allows researchers located around the world to connect to other researchers and see who they potentially could collaborate with according to topics. So far, the initiative covers only the researchers funded by NIH.

Source: www.nih.gov

In the future, strong regional knowledge hubs will be crucial to innovation and wealth. However, unlike the industrial age, innovation will rarely take place only from combining and creating knowledge inside the regional hub. Companies and knowledge institutions in specialised regional knowledge hubs will also be engaged in global knowledge creation and innovation in global alliances.

In Canada, the government is working to create a strong regional knowledge hub with certain prioritised areas and global perspectives (Box 3.3.1.2.4).

Box 3.3.1.2.4: Canada Excellence Research Chairs (CERC)

In Canada, the government is working to create a strong regional knowledge hub with certain prioritised areas and global perspectives.

CERC program will establish 20 prestigious research chairs, at \$10 million each over seven years, in universities across the country. The program aims to attract and retain the world's most accomplished and promising minds and help Canada build a critical mass of expertise in priority research areas. The program will invest \$28 million per year when fully ramped up in 2011-12.

CERC is a tri-agency initiative of the three granting councils, administered by the Canada Research Chairs Secretariat.

Source: www.industrycanada.ca

3.3.1.3. Education

In order to adapt education, the following policy actions are suggested.

Government should:

- Provide new research-based educational programmes targeting competencies needed in new forms of innovation.

Universities and educational institutions will of course react to a growing demand for new skills, but the reaction time could be rather long. It is complicated to read the demand for new skills, and it takes time to create in particular new research-based education. There are very few examples of universities which have already reacted and offered new educational programs as a response to the demand from new ways of innovating. One example is San Jose State University in California, USA (see Box 3.3.1.3.1)

Box 3.3.1.3.1: Masters program in Applied Anthropology at San Jose State University

Universities and educational institutions will of course react to a growing demand for new skills, but the reaction time could be rather long. It is complicated to read the demand for new skills, and it takes time to create new and, in particular, new research-based education. There are very few examples of universities which have already reacted and offered new educational programs as a response to the demand from new ways of innovating. One university who has reacted is San Jose State University in California, USA.

In 2006, the San Jose State University (SJSU) Masters program in applied anthropology was designed to help students develop skills in applying anthropology when working with business and industry development.

The program is organized around a set of multidisciplinary skills in the (1) analysis of social systems and their environments, (2) evaluation, and (3) planning, policy and design. The first eight students were admitted to the program during the fall semester 2006. Initially, the plan was to accept students only in even-numbered years due to minimizing costs. However, a great interest in the program meant that the university immediately switched to annual admissions. The first three students graduated in the spring of 2008, and about the same number are expected to graduate in 2009.

Read more: <http://www.sjsu.edu/>

Source: Chuck Darrah, Department Chair, San José State University.

A similar public initiative was implemented in Denmark. In 2006, the Danish Government introduced a national program for user-driven innovation. As part of the program, the Ministry for Research, Technology and Development gave universities possibilities for obtaining funding for new research and education programs with relevance for consumer knowledge and user competencies. As a result, Copenhagen University proposed a new master in Business Anthropology (see box 3.3.1.3.2).

Box 3.3.1.3.2: Masters in Anthropology and People-Centred Business at the University of Copenhagen

In 2006, the Danish Government introduced a national program for user-driven innovation. As part of the program, the Ministry for Research, Technology and Development gave universities possibilities for obtaining funding for new research and education programs with relevance for consumer knowledge and user competencies. As a result, the University of Copenhagen proposed a new masters in Business Anthropology.

In response to requests from the business world for anthropological competencies, the Department of Anthropology at Copenhagen University is developing the two-year Masters programme on Anthropology and People-Centred Business. The participants in the programme will be trained to be an academic part of business relations, where they develop and use anthropological methods, abilities and knowledge.

The first class is expected to begin in September 2009. The programme is foreseen to consist of 8 courses, a 16-week field study or internship, and a Master's thesis. A maximum of 15 students will be admitted to the programme annually.

Read more:

<http://antropologi.ku.dk/uddannelser/nuvstuderende/erhvervskandidat/>

Source: Department of Anthropology, University of Copenhagen.

3.3.1.4. Facilitating knowledge sharing

In order to facilitate knowledge sharing, the following policy actions are suggested.

Government should:

- Establish new multidisciplinary knowledge transfer initiatives, which can serve as a bridge uniting research institutes and private companies;
- Provide services and guidelines to firms and users in order to enhance user involvement in the innovation process;
- Develop the IPR system to better serve the increasing importance of partnerships and collaboration. There is a need for new and better possibilities for agreements on mutual understanding in the beginning of a partnership innovation process. Governments could also take initiatives to unify universities and public labs procedures and habits in IPR behaviour to strengthen partnerships and collaborations between the public and private sector. It could also be discussed if there are areas where there is a need for strengthening the possibility of obtaining protection and areas where moving towards open source would encourage innovation;
- Continue to strongly support entrepreneurial activities in order to strengthen the dynamism between innovative start-ups and transnational companies in knowledge hubs in the global knowledge economy;

- Facilitate the creation of ecosystems around knowledge hubs by encouraging and strengthening corporate entrepreneurship activities, through activities such as partnership agreements between large and small firms; and
- Diffuse knowledge on excellent innovation management.

Collaborative networks and symbiotic partnerships will be crucial for future innovation. The individual company will rarely have the knowledge and resources to innovate alone. This occurred from time to time in the industrial age, and there are important experiences from government-facilitated research networks that were important to innovation.

In Canada, the government has played a key role in facilitating the creation of national research partnerships between firms and research institutions through the Business-led Networks of Centres of Excellence program (Box 3.3.1.4.3).

Box 3.3.1.4.3: Government Facilitated Business-led Networks of Centres of Excellence

In Canada, the government through the Networks of Centres of Excellence Secretariat has played a key role in facilitating the creation of national research partnerships between firms and research institutions through the business-led Networks of Centres of Excellence program.

In Canada, the business-led Networks of Centres of Excellence (BL-NCE) program supports four new collaborative networks consisting of consortia of Canadian firms and academic and government researchers. The four networks represent the health, environmental, and energy and natural resources priorities of the federal government's S&T Strategy.

The BL-NCEs differ from existing NCEs in that they will be for a shorter term, business-led and focused on business research needs identified by the private sector, potentially leading to new business solutions. The Canadian government plays a key role in facilitating the networks and providing third-party assistance to the private sector parties.

It seems that neutral leadership, high quality secretariat services and facilitation of partnership activities are key factors for successful partnership models.

In the new age of innovation, there could be a need for facilitating knowledge sharing on new ways of innovation. The Danish government has, as part of its program for user driven innovation, opened a possibility for government to co-fund projects in user-driven innovation, where companies can learn about new methods for user-driven innovation (see Box 3.3.1.4.4).

Box 3.3.1.4.4: Programme for User-driven Innovation: Developing a Lead-User Based Innovation Model

In the new age of innovation, there could be a need for facilitating knowledge sharing on new ways of innovation. The Danish government has, as part of its program for user-driven innovation, opened a possibility for government to co-fund projects in user-driven innovation, where companies can learn about new methods for user-driven innovation.

In this project for user-driven innovation, the Danish company Grundfos - one of the world's leading pump manufacturers – and knowledge institutions collaborate in an open environment to identify lead users and get access to their innovation potential. The lead or advanced user approach is a theory in the area of user-driven innovation. However, there are no specific instructions on how companies can use the theory in practise. The partners in the project will deal with this puzzle and develop an innovation model that will help integrate advanced users in companies' innovation projects.

This public-private partnership is comprised of Grundfos, the Massachusetts Institute of Technology, Copenhagen Business School and Aarhus School of Business. The project started in November 2007 and will last for 2 years and 8 months. It has received a grant of approximately 400.000 EUR from the Danish programme for user-driven innovation.

Source: <http://www.ebst.dk/brugerdreveninnovation.dk/>

The trend towards more open innovation serves to put the IPR issue on the current political agenda. Some governments have addressed the IPR issue. In Finland, the Research and Innovation Council (RIC) has introduced a number of Strategic Centres for Science, Technology and Innovation. The idea is to provide a high degree of openness in new international research partnerships, which is reflected in the general IPR guidelines (Box 3.3.1.4.5).

Box 3.3.1.4.5: Strategic Centres for Science, Technology and Innovation - SHOKs

The Finnish SHOKs organize global research partnerships between multiple international players such as academia and industry. The aim is to achieve world-class expertise and internationally-important innovations and discoveries within a given sector or industry. Moreover, SHOKs are expected to boost and introduce internationality into the Finnish innovation system.

First, companies, universities, research institutes and other partners in the SHOK agree on a joint strategic research agenda. Then, this agenda is jointly operationalized into several long-term research projects. In these projects, the partners develop shared know-how, technology and service platforms and utilize joint research environments and research tools.

Finally, in case an invention emerges out of the innovations or discoveries in the joint research partnership, all participants in the given SHOKs are provided with the right to use it without having to provide any compensation to the original inventor of the IPR.

The first SHOK was established in the forestry industry by Tekes and the Academy of Finland in 2007.

Read more: http://www.etla.fi/files/2261_Dp1182.pdf

Source: Antti Tahvanainen, ETLA

In Chapter 2, Principle 5 discusses the trend toward a new dynamism between multinationals and entrepreneurs, leading to more innovative activities. In Denmark, innovation partnerships between large and small firms have been actively supported and encouraged. The corporate entrepreneurship agreement is an example of government facilitated collaboration between firms (Box 3.3.1.4.6).

Box 3.3.1.4.6: Corporate Entrepreneurship Agreement

Chapter 2 discusses Principle 5 and illustrates that there are signs of a new dynamism between multinationals and entrepreneurs, and that this dynamism will help both multinationals and entrepreneurs to become more innovative. In Denmark, innovation partnerships between large and small firms have been actively-supported and encouraged. The corporate entrepreneurship agreement is an example of government-facilitated collaboration between firms.

A new corporate entrepreneurship initiative has been launched in Denmark in 2008. Some of the largest Danish companies working within cleantech have signed a partnership agreement with the aim of working more with small innovative start-ups.

This partnership specifies how the large companies will aid Danish entrepreneurs by, for instance, making key staff available or helping to facilitate contact to customers and subcontractors in overseas markets. Only entrepreneurs with a high growth potential are matched with existing firms.

Source: The Danish Enterprise and Construction Authority.

In the 1980s, the European Commission took a surprising initiative to create a model for excellent leadership and promote the model to the European industry. Today, the UK government is working on a similar project for excellent innovation leadership. The Department for Innovation, Universities & Skills (DIUS), the Department for Business, Enterprise & Regulatory Reform (BERR) and several private companies are in the process of developing a new model for excellence in innovation leadership. The measurement tool would support new and good practice in global innovation management. This will help organisations review their practice across the spread of people, skills, culture, systems and resources in order to understand and thereby improve their innovation capacity (Box 3.3.1.4.7).

Box 3.3.1.4.7: Innovation Assessment Toolkit – Supporting Businesses and Public Organisations to Develop their Innovation Capacity

In the 1980s, the European Commission took a surprising initiative to create a model for excellent leadership and promote the model to European industry. Today the UK government is working on a similar project for excellent innovation leadership. The Department for Innovation, Universities & Skills (DIUS), the Department for Business, Enterprise & Regulatory Reform (BERR) and several private companies are in the process of developing a new model for excellence in innovation leadership. The measurement tool would support new and good practice in global innovation management. This will help organisations review their practice across the spectrum of people, skills, culture, systems and resources in order to understand and thereby improve their innovation capacity.

The new Innovation Assessment Toolkit allows organisations to review their strategy, management processes, networking, culture, delivery and learning within innovation by a series of one-on-one interviews with knowledgeable assessors using a framework of thirty questions.

A pre-prototype was tested on 29 financial services' organisations in early 2008 using MBA students as assessors. This was met with a warm response with most participants declaring the exercise worthwhile. After further development, a prototype is completing a proof of concept trial with ten organisations. These include corporations such as a large aerospace company, an agrochemicals company, various SME's, a continued education college, a leading university department, a primary health trust, and parts of DIUS and BERR.

Agreement has been reached to proceed to the next phase. Further product and market development work is being planned from April to August with 150 organisations.

Source: Davidson, Peter. Senior Innovation BERR, UK

3.3.1.5. Global perspective

In the new nature of innovation the global aspect will become even more important, and access to talent will be crucial to success.

In order to enhance the global perspective, the following policy actions are suggested.

Government should:

- Identify ways to support the free movement of knowledge workers; and
- Consider introducing programmes that increase ethnical diversity in company boards.

3.3.2. Smart regulation

Smart regulation could be an important engine for future innovation, but using regulation as a tool to strengthen innovation is not simple. There are several severe barriers which must be overcome.

Regulation is usually based on a delicate political balance between several important considerations and can therefore rarely be revised simply to promote private sector innovation. On the other hand, if there is broad support and a political willingness to obtain certain societal transformation, new regulation is possible. The idea of smart regulation is to use private innovation to obtain a faster and more radical transformation of a certain area of political interest and at the same time stimulate private innovation and wealth. Smart regulation can be used when governments collaborate broadly with industry and non-government organisations to formulate a new regulation, and when regulation is formed to encourage a certain innovative behaviour.

In principle, smart regulation can be used in all areas; however, the focus now seems to be on environmental regulation and, perhaps, welfare services.

In order to enhance the use of smart regulation, the following policy actions are suggested.

Government could:

- Apply smart regulation to encourage innovative solutions provided by the private sector;
- Consider how they can facilitate new innovation business-led public private partnerships bringing together businesses, universities and regulatory authorities, e.g. in the area of green tech;
- Put in place the required systems and infrastructure in order to implement innovative environmentally-friendly solutions. It is necessary that the providers of the solutions have access to appropriate systems and infrastructure.

As environmental concerns have gained higher public and political priority, it seems more justified to promote private sector development along with addressing environmental concerns. Therefore, we see examples of smart regulation to stimulate green-tech innovation and the environment.

In Germany, the government has used smart regulation to encourage a certain behavioural change. It is acting as “novel firm” by using innovative renewable-energy solutions in the public sector, while also rewarding those who apply innovative technological solutions themselves (Box 3.3.2.1).

Box 3.3.2.1: Act on the Promotion of Renewable Energies Heat Act in Germany

In Germany, the government has used smart regulation to encourage a certain behavioural change. It is acting as “novel firm” by using innovative renewable-energy solutions in the public sector, while also rewarding those who apply innovative technological solutions themselves.

On 6 June 2008, the parliamentary groups of the German government coalition agreed on a new instrument to raise the share of renewable energies in heat supply to 14% by 2020. The act entered into force the 1st January 2009. The goal should be achieved through regulations with the government as a frontrunner in the usage of renewable energies. The regulations stipulate that owners of newly-erected buildings must use renewable energies, whether private individuals, the state or businesses. They are free to decide which source of energy they wish to use. Depending on local conditions, it may be more appropriate to use solar thermal or geothermal energy, biomass or ambient heat.

Since its launch, the programme has provided financial support amounting to €27 million. The government will continue to support the use of renewable energies financially, increasing funding for this to as much as €500 million.

However, in the future there will be a restriction on support: people who are required to use renewable energies under the regulations will not receive support. Only those who do more will be eligible for support. And building owners who use innovative technologies that are particularly efficient, or that have particularly low emissions figures will continue to receive money from the state.

Source: <http://www.erneuerbare-energien.de/en>

The reduction of greenhouse gasses has gained widespread support in Germany and regulation has been one government tool to promote this along with innovation. There is a strong political will to tighten regulation in certain areas. Hence, Germany could be regarded as a lead market

spurring green-tech innovation. It is expected that a tighter regulation of CO₂-emissions from buildings will lead to a more innovative activity in the building and construction sector (see Box 3.3.2.2).

Box 3.3.2.2: Regulations Encourage Reduced CO₂ emissions from buildings in Germany

The reduction of greenhouse gasses has gained widespread support in Germany, and regulation has been one government tool to promote this. There is a strong political will to tighten regulation in certain areas. Hence, Germany could be regarded as a lead market, catalyzing greentech innovation. It is expected that a tighter regulation of CO₂-emissions from buildings will lead to more innovative activity in the building and construction sectors.

In Germany, the Federal Government and the KfW development bank has initiated a new regulated refurbishment programme aimed at reducing CO₂ from buildings in the housing sector. The new regulations call for renovation/replacement of windows and heating systems combined with thermal insulation of the outer walls.

To ensure good quality on the technical level, all work must be carried out by professional companies. In effect, the German building and construction sectors are becoming experts in the CO₂ area, and Germany is turning into a lead market. Assistance comes in the form of federal government loans of up to €50,000 per housing unit with very low interest rates. From 2006 to 2009, a total of €6 billion of federal funding is destined for energy-conserving refurbishment of the housing sector, including investments of €200 million a year earmarked for the building refurbishment programme to reduce CO₂-emissions.

Source: <http://www.bmvbs.de/en>

It might be that smart regulation will be much more widespread in the future and that we will see governments setting new standards. To fulfil them, private companies need to be more innovative. The US government recently set a new emission-standard for cars in USA which will force car makers to innovate if they plan to deliver to the US car market.

There are severe barriers to smart regulation. One of the most important barriers could be the need for knowledge. The regulation authority must have advanced knowledge on various technological possibilities to design successful smart regulation. Often authorities will not have access to sufficient knowledge on technology possibilities, and often this knowledge does not exist but may only be created by private companies and research institutions. Smart regulation can therefore easily run into a “chicken and egg” dilemma. To start innovative processes, you will need new standards; to set obtainable new standards, you have to know the result of the innovation process.

A trustful partnership between regulatory authorities, private companies and research institutions might give the regulatory authority the necessary information and at the same time create the necessary transparency and trust so that a successful smart regulation can take place.

The Danish government has facilitated a business-led partnership to promote environmentally-friendly technologies. The purpose is to develop a binding partnership pooling the various skills from the private sector to develop new solutions in areas with a significant environmental and commercial perspective. One of the innovation partnerships addresses the manure challenges

from meat production in highly-inhabited areas (see Box 3.3.2.3).

Box 3.3.2.3: Government-facilitated business-led partnership on industrial biotechnology

The Danish government has facilitated a business-led partnership to promote environmentally-friendly technologies. The purpose is to develop a binding partnership, pooling the various skills from the private sector to develop new solutions in areas with a significant environmental and commercial perspective. One of the innovation partnerships addresses the manure challenges from meat production in highly inhabited areas.

With the action plan for the promotion of environmentally-effective technologies, the Danish government has taken the initiative to build partnerships involving companies, knowledge institutions and government institutions in five selected areas. Industrial biotechnology is one of the five areas.

In 2006, a range of leading Danish companies (e.g. Novozymes, Kemira, Grundfos, Xergi and Samson Bismatech) entered into an innovative industrial biotechnology partnership with the aim of making manure a commercially-attractive product, i.e. that manure is not perceived as a waste product but a raw material.

Central for the project is that the partnership would likely never have been realised had it not been for the facilitating role of the Danish government. Key government authorities have been involved in setting up the partnership by inviting the private sector to collaborate and act as secretariat for the partnership.

For new manure technology to be profitable, the regulation must be changed from standards based on the relation between the number of animals and square meters of land, to standards based on discharge from animals. In a new plan for green agricultural and food production, the Danish government has announced a new regulation based on standards of discharge. Part of the knowledge for such a new regulation comes from the work in the innovation partnership, which serves to illustrate how the regulating authority may obtain necessary knowledge for smart regulation from dialogue with the private sector.

Source: FORA (2009)

3.3.3. Intelligent demand

Driving the provision of innovative solutions through intelligent public demand is another way for governments to stimulate innovation. In most countries, public consumption accounts for approximately 20 percent of total domestic demand, so there is a huge potential for stimulating innovation through intelligent demand.

Usually public procurement is subject to restrictions to guarantee fair competition. Obviously, such restrictions are useful and necessary. But the question is if the public sector could use its purchasing power more intelligently to create more innovation and innovative solutions to the

challenges facing society?

Traditionally the private sector has provided the public sector with new ideas and products requested by the public sector. Today, this is changing. The public and private sectors are increasingly developing innovative solutions in close collaboration, often initiated by the public sector and with the involvement of users. It is a political reality in many countries that the balance between public or private influence on the production of welfare services is a complicated issue. On the one hand, private sector and private companies' innovation capacity is welcomed as a new way of renewing welfare services. On the other hand, there is a fear that continuous privatisation of the welfare system will result in unacceptable social imbalances.

This cross pressure on the welfare system has to some extent blocked innovation of public services even if there is a noticeable need for experiments. Working intensively with users and gaining access to a sufficient number of users can be difficult. Often, systems for doing so are not in place, or it will be extremely costly for companies to establish them.

The following more detailed description of policy initiatives on intelligent demand will be separated in two policy areas: public procurement and platforms and systems.

3.3.3.1 Public procurement

In order to enhance use of public procurement, the following policy actions are suggested.

Government should

- Use public procurement to stimulate private innovation and innovative solutions where the government acts as a novel firm.

In the UK, the Government is driving innovation through public procurement. The Innovation Nation White Paper highlights the key role that public procurement plays in encouraging the development of new technologies and providing innovative solutions that provide better public services and respond to societal challenges. According to the new innovation procurement plan, all public procurement activities should take into account how innovation can be used to solve a given problem (Box 3.3.3.1).

Box 3.3.3.1: New Plans for Innovation in Public Procurement

In the UK, the Government is driving innovation through public procurement. The Innovation Nation White Paper highlights the key role that public procurement plays in encouraging the development of new technologies and providing innovative solutions that provide better public services and respond to societal challenges. According to the new innovation procurement plan, all public procurement activities should take into account how innovation can be used to solve a given problem.

In the UK, all government departments are required to publish an innovation procurement plan (IPP) setting out how they will drive innovation through public procurement activities. In order to address societal challenges, public institutions must ensure that public procurement is undertaken by professionals taking a broad

perspective on cooperating with other public sector purchasers and procurement bodies outside the department. As a result, departments need to be much more conscious and strategic in their thinking about public procurement and how the private sector can be involved in providing solutions. It is expected that the new initiative will spur more innovation through public procurement activities.

Source: www.innovateuk.org.

In Finland, the role of public procurement has also been important both to create the demand for innovation and to ensure that innovation is sustainable (Box 3.3.3.2).

Box 3.3.3.2: Finland Promotes Sustainability Through Public Procurement

In Finland, the role of public procurement has also been important both to create demand for innovation and to ensure that innovation is sustainable.

During the last two years, the Finnish government has been promoting environmental sustainability through regulations in the area of public procurement.

The new initiatives include new market regulations that foster demand for innovation, innovation-focused public procurement, and a better understanding of the relationship between innovation and sustainability.

Extensive discussion on promoting innovative sustainability through regulations started during Finland's EU Presidency in 2006. At that time, an expert group drew up a report for the European Commission on how European innovation policy should be revised. The main focus of this report was a pan-European policy regarding regulations and public procurement as tools for promoting innovation in the EU.

Source: www.tem.fi

The necessary rules for public demand to secure fair and efficient competition can be an obstacle to using intelligent demand as an engine for innovation - in particular for more radical innovations of the welfare system. On the other hand, there might be a huge potential for involving the private sector in a reformation of the welfare system.

To overcome these barriers, governments have begun to experiment with new types of meeting places between governments who need changes in the welfare system and private partners with interests in welfare innovation.

3.3.3.2. Platform and system

In order to create platforms and systems, the following policy actions are suggested.

Government should:

- Initiate well-organized experiments where private companies are invited to provide innovative solutions to societal challenges such as welfare in the public sector;

- Provide new research-based educational programmes targeting public institutions and civil servants to raise innovation readiness in public institutions and endow employees with better skills to collaborate with the private sector in finding new innovative solutions to welfare challenges; and
- Assist in creating new types of physical or digital platforms and infrastructure, where consumers, users and companies could meet and interact.

The National Aeronautics and Space Administration (NASA) in the USA is probably the institution with the longest tradition for strategic innovative use of public demand to stimulate and diffuse technology and promote innovation.

Box 3.3.3.2.1: Government-driven innovation through Innovative Partnership Programme at NASA

The National Aeronautics and Space Administration (NASA) in the USA is probably the institution with the longest tradition for strategic innovative use of public demand to stimulate and diffuse technology and promote innovation.

Through the Innovative Partnership Program (IPP) at the National Aeronautics and Space Administration (NASA), the U.S. federal government drives innovation by matching innovative technology needs and capabilities.

The program seeks to create partnerships and cooperative activities with U.S. enterprises to develop technology that is applicable to NASA's mission technology needs, which contributes to commercial competitiveness in global markets. The Innovative Partnership Program provides needed technology and capabilities for NASA's Mission Directorates, Programs and Projects through investments and partnerships with industry, academia, government agencies and national laboratories. Through a number of federal and NASA investment schemes such as Small Business Innovation Research (SBIR) and Small Business Technology Transfer STTR, SMEs are encouraged to provide innovative technological solutions to the NASA programme.

In addition to leveraged technology investments, dual-use technology-related partnerships, and technology solutions for NASA, IPP enables cost avoidance, and accelerates technology maturation. IPP also seeks to be a facilitator and catalyst for innovation in technology transfer—or spinoffs—to provide solutions to the private sector or other government agencies with NASA-developed technology resulting in public benefit. IPP achieves these mission objectives through a network of offices at each of NASA's 10 field centers.

The Innovative Partnership Program is open to enterprises around the world. The program receives \$180 million annually from the federal budget.

Source: <http://ipp.nasa.gov/>

The UK is probably the OECD country with the most far-reaching experience in terms of renewing the welfare system by welcoming private companies to take part in the innovation of welfare services. In the UK, the need for unique and individualised solutions in care, health, safety and education is growing. In the private sector, the interactive, two-way Internet, known as Web 2.0, is

used to generate unique and individualized solutions (Box 3.3.3.2.2).

Box 3.3.3.2.2: Public Services 2.0 in the UK

The UK is probably the OECD country with the most far-reaching experience in terms of renewing the welfare system by welcoming private companies to take part in the innovation of welfare services. In the UK, the need for unique and individualised solutions in care, health, safety and education is growing. In the private sector, the interactive, two-way internet, known as web 2.0, is used to generate unique and individualized solutions.

The idea of Public Services 2.0 platform is originated in the tools of web 2.0, used in the private sector and originally developed by a government advisor on innovation.

The initiative should enhance both the collaboration and the sourcing of knowledge between the public sector and the private sector by drawing on each other's experiences with innovative tools. The platform is a community-based public service aimed at meeting more unique and individualized demands for welfare services.

Public Services 2.0 should be a digital tool in the public sector, using web 2.0 and open-source software to make citizens and residents more participative in public services. It should create an interactive community, where citizens can interact with the public sector on public services solutions. Thus, it should make public services more participative, communal and collective as the best of what is emerging from the new digital and collaborative culture.

Public Services 2.0 has not yet been implemented by the government.

Source: www.charlesleadbeater.net/archieve/public-services-20

The Department for Innovation, Universities and Skills (DIUS) in the UK has set up a Technology Strategy Board, which has opened various platforms as drivers for innovation of welfare services with the focus on how new technology can be an enabler of welfare innovation. The Technology Strategy Board has launched several projects with the aim of getting especially SMEs involved in providing solutions to welfare challenges. One of the projects launched by the Technology Strategy Board is the Assisted Living Innovation Platform.

The Department of Health (DH), the Technology Strategy Board (TSB), the Engineering and Physical Sciences Research Council (EPSRC) and the Economic and Social Research Council (ESRC) have agreed to fund a number of activities in the area of Assisted Living under the umbrella of the Assisted Living Innovation Platform (ALIP) (Box 3.3.3.2.3).

Box 3.3.3.2.3: The Assisted Living Innovation Platform

The Department for Innovation, Universities and Skills (DIUS) in the UK has set up a Technology Strategy Board, which has opened various platforms as drivers for innovation of welfare services with the focus on how new technology can be an enabler of welfare innovation. The Technology Strategy Board has launched several projects with the aim of getting especially SMEs involved in providing solutions to welfare challenges. One of the projects launched by the Technology Strategy Board is the Assisted Living

Innovation Platform.

The Department of Health (DH), the Technology Strategy Board (TSB), the Engineering and Physical Sciences Research Council (EPSRC) and the Economic and Social Research Council (ESRC) have agreed to fund a number of activities in the area of Assisted Living under the umbrella of the Assisted Living Innovation Platform (ALIP).

The aim of the Assisted Living Innovation Platform is to develop new technologies which could find new ways to help people suffering from chronic long-term illnesses to live more independently. The new platform brings together partners from industry, the health care professions and academia.

At the moment, the platform is exploring how digital communication technologies could enable assisted living by creating assisted living devices and services.

To solve this activity, a competition for funding is set up. To facilitate SME's participation in the projects, the TSB funds the preparation of applications. Furthermore, the winner of the competition will receive funding for the execution of the project. £5 Million has been allocated to this activity, which would support between five and ten projects.

The Assisted Living Innovation Platform was launched at Innovate07, 8 November 2007.

Source: www.innovateuk.org

There are other examples where the public sector provides the infrastructure to enable users and companies to innovate together e.g. Living Labs (see Box 3.3.3.2.4).

Box 3.3.3.2.4: Living Laboratory Providing Platform for Uncovering User Needs

Established in 2006, the Copenhagen Living Lab (CLL) is a "living laboratory" where the business sector can obtain better insights into everyday life of users. The aim is to improve the cultural and social basis for product innovation and sales opportunities.

In the project, People Involvement & Innovations Platform (PIIPL) initiated in July 2007, the CLL is engaged in developing a digital platform which makes it possible for enterprises and institutions to reduce costs and resources by uncovering user needs in a systematic way. The platform is built on a picture and video-based web service that allows for communication between users, communities and producers regarding needs and solutions.

The platform will be developed and tested in several pilot projects in public institutions and enterprises, for instance in Danisco. The government-supported project will last for 2 years and has received a grant of approximately 550.000 EUR from the Danish programme for user-driven innovation. Other partners in the project are Symbion Science Park and Treogtyve aps.

As of 2009, CLL does not receive any more public funding and is now a private company.

Source: <http://www.ebst.dk/brugerdreveninnovation.dk/>

Box 3.3.3.2.5: Public Services by Design

Service design will become an important element in private sector innovation and could be a considerable tool for innovating welfare services. The UK seems to be a pioneer in this area. Over the last four years, the UK Design Council has piloted a range of on-line public sector projects, with the aim of developing practical design solutions to some of the most complex problems. In the 2008 Innovation Nation White Paper, the Department for Innovation, Universities and Skills (DIUS) recognised the role of design in public sector innovation.

Public Services by Design is being set up in order to turn new innovative ideas into cost-effective and efficient outcomes, which deliver the right experience for the public.

Other experiments involving private companies' in innovating welfare services have probably taken place in many countries, but it has been difficult to identify them.

Public Services by Design is being set up by a Design Council to help the British government create services that are not only cost effective, but also innovative as they re-design and re-build the way the public sector delivers services to its citizens.

Working closely with designers, providers, front-line staff and users of public services, the Design Council intends to co-design a useable, relevant and widely-applicable design programme making public services more personalized.

The design programme will be co-developed over the next two years with a programme available from autumn 2010.

Source: <http://www.designcouncil.org.uk>

Design methodologies are gaining importance in providing new innovative solutions to welfare services. With growing ratios of elderly people, the need for innovative services is increasing in order for service providers to remain competitive and meet the ever-growing demand for new solutions to social needs. The design of services draws on design processes and methodologies giving the design discipline an immaterial form.

Another example of finding innovative solutions through public private partnership is from Denmark (Box 3.3.3.2.6).

Box 3.3.3.2.6: Methods for Involving Disabled People in the Innovation Process

Design methodologies are gaining importance in providing new innovative solutions to welfare services. With growing ratios of elderly people, the need for innovative services is increasing. In order for service providers to remain competitive and meet the ever-growing demand for new solutions to social needs, the design of services should draw on design processes and methodologies giving the design discipline an immaterial form.

In 2008, a smart public-private partnership evolved in the Central Denmark Region, where the public sector has engaged private companies in identifying and solving needs for social care among disabled people. The companies were involved at an early stage, and developed (together with the Central DK region) new tools and products for

disabled people. In addition, the public-private partnership is developing tools which will ease the involvement of disabled people in a user-driven innovation process. The Danish Government has provided support with funds of approximately 800.000 EUR from the Danish programme for user-driven innovation. Some results are expected in 2009.

Source: <http://www.ebst.dk/brugerdreveninnovation.dk/>

The reported examples of private companies involvement in innovating welfare services is limited in the sense that they focus on innovation within a particular welfare service, but not in the institutional or systematic set up, which often could be a barrier for innovating the public services.

In Finland, the government is applying a holistic view on finding new innovative solutions to public welfare challenges. SITRA, the Finnish Innovation Fund is a publicly-owned venture fund. SITRA's venture activities have been contracted out to private venture companies, and SITRA now works in areas that make Finland more innovative and competitive. One of SITRA's activities is to promote systemic innovation in Finnish society. A challenge related to systemic innovation is to identify the barriers to applying "smart government" in the public sector (Box 3.3.3.2.7).

Box 3.3.3.2.7: Finland Focuses on Systemic Innovation

Due to systemic interdependencies and complementarities, societies that are able to renew their various subsystems rapidly and coherently will gain increasing returns and higher productivity growth associated with the new technologies, organizational solutions and institutional arrangements.

Finland has embraced the systemic innovation challenge with its new comprehensive national innovation strategy. SITRA, the Finnish Innovation Fund was an active participant in the strategy development process. Its activities are guided by a vision of Finland as the global forerunner of well-being enhancing systemic innovations. SITRA facilitates systemic innovations in the Finnish society by developing foresight and insight on the required changes and by facilitating them through practical programs, strategy processes and new business development. SITRA's activities bring together all relevant private, public and third sector stakeholders in a particular area.

Systemic changes address various market failures, which may call for government intervention. However, systemic interventions require "smart government", which carefully considers various private, public and third sector solutions to a particular problem before choosing what to do, if anything.

Source: SITRA (2009)

Appendix 1

Appendix 1. National innovation strategies in seven OECD countries

In order to identify the leading policy innovative countries, four criteria for broad-based innovation formulation have been developed.

The four criteria for broad-based innovation are:

1. The country should perform well according to innovation indicator systems ²⁰
2. The country should recently have introduced (or plan to introduce) a national innovation strategy
3. The innovation strategy is implemented broadly across several ministries and at high political level
4. The national innovation strategy should be broad-based and include dimensions from a new nature of innovation.

One way to scan the horizon for interesting innovation policy approaches and developments based on the four broad-based innovation criteria was to develop a survey questionnaire. The questionnaire was presented to the national delegations in the OECD Committee on Industry, Innovation and Entrepreneurship (CIIE).

Approximately half of the CIIE-members replied to the survey (see Appendix 2 for the full questionnaire). According to the survey, we found that some governments are increasingly aware of and responding to the changing nature of innovation in the private sector. They respond by placing new elements such as co-creation, user involvement and partnership at the centre of new innovation policy.

Finally, further policy discussion about the most recent innovation policy work was carried out in seven OECD countries:

- Australia
- Canada
- Denmark
- Finland
- Germany
- UK
- USA

During meetings with key policymakers in the capitals, possible policy implications of a new nature of innovation were discussed. The most recent innovation policy experience was discussed based mainly on three questions:

²⁰ The latest Nordic Innovation Monitor was used as innovation indicator system as it applies a broad-based innovation understanding. Read more about the Nordic Innovation Monitor on www.foranet.dk

1. To what extent do the nine innovation principles describe the newest and most important emerging trends in the innovation landscape in your country?
2. How much does the present innovation policy in your country address a new nature of innovation? And could you mention concrete examples of policy initiatives which could illustrate this?
3. What are your expectations to the future/planned innovation policy? Are new policy initiatives coming up? Will policy priorities change?

Based on discussions with policymakers, the policy implications were elaborated at an international roundtable meeting in Copenhagen in March 2009. At this meeting, both public and private sector representatives were invited to discuss a new nature of innovation (see Box 3.2.2). Also, leading international innovation experts who have provided analytical input to the business case studies were invited.

Australia

The Australian Government first published *Venturous Australia* as a review of the Australian Innovation System (Green Paper) in 2008. It examines the national innovation system and puts forward recommendations and thoughts. Based on this work, the Minister of Innovation, Industry, Science and Research launched a National Innovation Strategy White Paper in May 2009. It reflects a broad-based innovation understanding, and other new sources of innovation are clearly a target in the strategy.²¹

Canada

The Canadian government published their latest national innovation strategy *Mobilizing Science and Technology to Canada's Advantage* in 2007. The strategy is initiated by the Prime Minister and cuts across a number of ministries. The science and technology strategy is the one that the Government uses to shape the country's innovation policies. Even though S&T and innovation are two different concepts, the S&T strategy is really focused on the business sector, and therefore also viewed as their innovation strategy. The S&T Strategy is built around three "advantages" Canada has to nurture including: entrepreneurial, knowledge, and people advantages and four core principles including: promoting world-class excellence, focusing on priorities, fostering partnership, and enhancing accountability.²²

Denmark

The Danish Government published their latest national innovation strategy named *Progress, Innovation and Cohesion Strategy for Denmark in the Global Economy* in 2006. The strategy was the result of an open process where all interested in global challenges and innovation could participate with analyses and suggestions. The Danish Prime minister chaired a working group with representatives from important stakeholders, and all documents discussed in the group were published on the web. The resulting strategy covers several ministries and included both important conditions (such as legislation of competition, bankruptcy etc.) and the framework environment for important innovation drivers (such as human resources, knowledge and technology and entrepreneurship). The strategy contained a number of concrete proposals, which have been implemented in the following years.²³

Finland

The Finnish Government decided to prepare a new national innovation strategy based on evaluations of the current S&T strategy. A proposal for Finland's National Innovation Strategy was

²¹ Read more: <http://www.innovation.gov.au/innovationreview/Pages/home.aspx>

²² Read more: <http://www.ic.gc.ca/s&tstrategy>

²³ Read more: http://www.globalisering.dk/multimedia/Pixi_UK_web_endelig1.pdf

prepared in an open and participatory process under a steering group chaired by the former Prime Minister, Mr. Esko Aho. The proposal was a frontrunner for the later Innovation Policy White Paper. The White Paper, which presents the Government's key innovation policy lines was approved by the Finnish government in October 2008.

Finland has a long tradition of comprehensive strategies for science and technology. However, the latest initiative from the Finnish government should be viewed as a clear political willingness to provide new strategies, as it defines innovation broadly and has more highly prioritised the consequences of a changing nature of innovation.²⁴

Germany

The German Government published The High-Tech Strategy for Germany in 2006, and for the first time ever the German Government has developed a comprehensive national innovation strategy. The strategy has been initiated by the Chancellor and involves all ministries. As indicated in the title, the focus is on technology, but the strategy contains the first step of a broader strategy for innovation. According to the strategy, 17 cutting-edge fields (technology areas) will receive special attention. In addition, education and labour training, innovation financing, SMEs and start-ups, collaboration between research/academia and firms (such as excellent clusters) will also be further developed.²⁵

United Kingdom

The UK Government published its latest innovation strategy, Innovation Nation in March 2008. The Secretary of State for Innovation, Universities and Skills, the Chancellor of the Exchequer and the Secretary of State for Business Enterprise and Regulatory Reform (BERR) have prepared the strategy. The strategy stresses the importance of UK's strength in scientific research and its importance for innovation. However, it also gives high priority to other important drivers of innovation and discusses the consequences of The Changing Face of Innovation (as the new innovation trend is labelled in the UK innovation strategy). Hidden innovation, lead markets and open innovation systems characterise the UK innovation approach. On December 4 2008, an annual innovation progress report was released. The annual innovation report reviews the progress of the national innovation strategy.²⁶

United States

Whereas the six above-mentioned countries have recently prepared a national innovation strategy at high political level addressing some broad-based innovation perspectives, the USA does not have an innovation strategy at federal level. However, as the USA performs well according to international innovation indicator systems, it was decided to include the USA in the survey.

The Federal Government of United States of America has many entities in the federal government who are involved in various innovation strategies in their respective domains. The country has a large, diversified and long evolved national innovation system comprised by many private and public actors, policies and programs arguably since the 1970s, if not earlier. For the most, this large constellation of components is not centrally coordinated. There are several significant examples of comprehensive strategies for science, technology and innovation at state-level, and the USA is also rich on third-sector institutions and foundations with a strong participation in the country's economic development.

In 2005, the Competitiveness Council in Washington published Innovative America,²⁷ which is

²⁴ Read more: <http://www.innovaatiostrategia.fi/en/overview>

²⁵ Read more: <http://www.bmbf.de/en/6616.php>

²⁶ Read more: <http://www.dius.gov.uk/docs/home/ScienceInnovation.pdf>

²⁷ Read more: <http://www.compete.org/publications/detail/202/innovate-america/>

one of the first publications to address the changing nature of innovation and possible policy implications. The ground-breaking agenda includes more than 60 detailed recommendations grouped under three major platforms for action: talent, investment and infrastructure. In August 2007, the COMPETES Act was signed into law, which finds its roots in Innovate America and in the work of the Council's National Innovation Initiative. This policy initiative was directed at incremental improvements in the U.S.' existing national innovation system.

It is increasingly recognized that dispersed and unconnected initiatives will be insufficient to close the growing gap between the U.S. and peer countries in creating a coherent and coordinated national innovation strategy. The National Academy of Sciences (NAS) will release a report (funded by the America Competes Act) documenting barriers to innovation in the United States. It will be the first NAS report addressing innovation as distinct from technology and research and development.²⁸

Moreover, to address the innovation challenges, it has been suggested that the U.S. federal government should establish a National Innovation Foundation, whose sole mission would be to promote innovation (including new types of innovation) throughout the existing U.S. innovation system.²⁹

Other recent and significant initiatives working towards adding a kind of new nature of innovation on the political agenda in the USA include the Athena Alliance. The Athena Alliance is a non-profit organisation undertaking outreach activities to help members of Congress, the Administration, constituency groups and the media better understand the issues related to the new types of innovation and craft policies and programs, which reflect this new thinking.³⁰

To conclude, governments in the seven countries increasingly seem to respond to changes in the private sector by providing innovation strategies, policies or recommendations, which reflect somewhat new policy aspects such as creating knowledge, involving users, enhancing human resources and encouraging new types of partnerships and entrepreneurship. Moreover, the innovation strategies seem to be broad-based, as most of them are cross-ministerial initiatives with high political priority.

28 Read more: <http://www.issues.org/24.1/wessner.html>

29 Read more: http://www.brookings.edu/reports/2008/04_federal_role_atkinson_wial.aspx

30 Read more: <http://www.athenaalliance.org/>

Appendix 2. National Innovation Strategy Questionnaire

If available, please attach your country's latest national innovation strategy.

Return the completed questionnaire to Glenda Napier on email: gna@ebst.dk

Thank you for your collaboration!

Q. 01

Has your Government recently implemented a National Innovation Strategy?
If yes, please indicate when (year)?

Yes

No

Q. 02

At which political level has the Innovation Strategy been initiated (Prime Minister, Minister)?
If Minister level, please indicate which ministry.

Yes

No

Q. 03

Please list the Ministries involved in implementing the policy actions outlined in the National Innovation Strategy?

Yes

No

Please fill in your contact information

Name:

Organisation:

Country:

Email:

References



Case descriptions can be found at the project webpage www.newnatureofinnovation.org.

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