Innovation and Knowledge-Intensive Service Activities

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Foreword

As part of its efforts to improve innovation policy making, the OECD Working Party on Innovation and Technology Policy (TIP) initiated a project to examine national innovation systems at the sectoral level. This work recognises that national innovation systems and policy needs vary across technological fields and industry sectors and includes three major studies that focus on pharmaceutical biotechnology, energy technology and knowledge-intensive service activities (KISA).

This report presents a synthesis of the results of the KISA case study, which intended to better understand how KISA – research and development, information and communication services, human resource management, tax services and other activities related to legal compliances, accounting and marketing – contribute to the acquisition and growth of innovation capabilities in firms and public sector organisations. Most businesses and public sector organisations make use of KISA in their daily operations, whether producing them internally or sourcing them from external suppliers. The KISA study focuses on their role as carriers and sources of knowledge that influence the performance of individual organisations, value chains and industry clusters across sectors.

Eleven countries participated in the KISA project. Nine of them – Australia, Denmark, Finland, Ireland, Japan, Korea, New Zealand, Norway and Spain – prepared detailed case studies that examine the role of KISA in specific industry sectors: software, health care, tourism and leisure, and resource-based industries (mining technology services, aquaculture and forestry). The Czech Republic and United Kingdom contributed national data to the project and actively supported the KISA group. Australia and Finland served as co-leaders. The diverse range of industrial and national settings analysed in the case studies provided a rich set of information to examine and better understand the role of KISA in innovation.[1] These underlying reports were based on research by a network of experts nominated by the participating countries.

- **Research on the software industry** was undertaken in Australia by Jane Marceau, Cristina Martinez-Fernandez, Claudine Soosay, Krishna Venni Venkata, Tim Turpin and Merete Bjørkli from the Australian Expert Group in Industry Studies at the University of Western Sydney, and Lyndal Thorburn from Innovation Dynamics Pty Ltd; in Finland by Jari Kuusisto and Soile Kotala from SC Research, Minna-Kaarinna Forssén, Matti Heikonnen, Juhana Hietala, Olli Hänninen, Jyrki Kontio from Helsinki University of Technology, and Risto Rajala, Mika Westerlund, Arto Rajala, Seppo Leminen, Kristian Möller, Mervi Rajahonka from LTT Research Ltd, Helsinki School of Economics; in Ireland by Laura E. Martinez-Solano, Majella Giblin and Edel Walshe from the Centre for Innovation & Structural Change; in Korea by Kong-rae Lee and Jung-tae Hwang from the Science & Technology Policy Institute, Sang-wan Shim from Sung-Kong-Hoe University and Byung-Seon

1. The full-length country studies are available at *www.oecd.org/sti/innovation* under the heading "Sectoral Case Studies in Innovation". A complete list of the studies prepared by national experts can be found in the Annex.

Jeong from the Ministry of Science and Technology and OECD; in New Zealand by Julian Williams from the Ministry of Research, Science and Technology; and in Norway by Marianne Broch and Arne Isaksen from the STEP Centre for Innovation Research.

- **Research on the role of KISA in health care** was undertaken in Finland by Sirkku Kivisaari, Niilo Saranummi from VTT, and Erja Väyrynen, Hannele Hyppönen, Ulla Saalasti-Koskinen, Marja-Leena Perälä and Kristiina Saarikalle from Stakes; in Norway by Marianne Broch from the STEP Centre for Innovation Research; in Spain by P. Garcia-Santesmases and J.L. Monteagudo from the Institute of Health Carlos III; in Japan by Y. Saitoh and S. Kobayashi from the University of Tsukuba; and in Denmark by H. Vondeling from the University of Southern Denmark.
- **Research on the role of KISA in leisure and tourism industries** was undertaken in Australia by Jane Marceau, Cristina Martinez-Fernandez, Claudine Soosay, Krishna Venni Venkata, Phillip Toner, Tim Turpin, Merete Bjørkli and Navin Doloswala from the Australian Expert Group in Industry Studies at the University of Western Sydney, and Lyndal Thorburn from Innovation Dynamics Pty Ltd.; in Finland by Tanja Kotro, Päivi Timonen, Mika Pantzar and Eva Heiskanen from the National Consumer Research Centre; and in Spain by Juan Carlos Collado from the Centro de Estudios Económicos Tomillo.
- **Research on the role of KISA in resource-based industries** was undertaken in Australia by Lyndal Thorburn from Innovation Dynamics Pty Ltd (mining technology services); in Finland by Jari Kuusisto and Arja Juntunen from SC Research, Hannu Hernesniemi and Marjut Lindström from ETLA, and Jukka Hyvönen from VTT (forest industry-related services); and in Norway by Heidi Wiig Aslesen from the STEP Centre for Innovation Research (aquaculture industry).

Co-ordination and editing of the publication was undertaken primarily by Jari Kuusisto (Finland) and Anne Holmes (Australia). Individual chapters were prepared by Jari Kuusisto, Anne Holmes, Arne Isaksen, Niilo Saranummi and Heidi Wiig Aslesen, based on the country studies. Tricia Berman and Alpo Kuparinen, TIP delegates from Australia and Finland, respectively, played a key supporting and co-ordinating role in the overall development and finalisation of the project. National experts met regularly to discuss research methods and results, exchange information and ensure the overall consistency of the project. Support was provided by Cristina Martinez-Fernandez from AEGIS in Australia, and in Finland by Pentti Vuorinen from the Ministry of Trade and Industry, Tiina Tanninen-Ahonen from Tekes, Jari Kuusisto from SC Research, Niilo Saranummi from VTT, and Marja Toivonen from the Employment and Economic Development Centre for Uusimaa.

From the OECD Secretariat, support was provided by Jerry Sheehan, Catalina Martinez and Gernot Hutschenreiter. Emmanuel Hassan also contributed to the development of the project at its early stages.

This report is divided into two parts. The first synthesises the findings of the KISA project. Chapter 1 defines knowledge-intensive service activities, reviews lessons learned from the country case studies, and identifies policy implications. Chapter 2 reviews the approach taken to conduct the country case studies. The second part presents more detailed summaries of the sectoral case studies conducted as part of the project. Chapters 3 to 6 summarise the key themes emerging from the country studies conducted of the software, health care services, tourism and leisure, and resource-based industries.

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Executive Summary

The study of knowledge-intensive service activities (KISA) is a case study in innovation that forms part of the OECD's continuing work on national innovation systems. The project examines the value of KISA in facilitating the growth of innovation capacity within recipient organisations by focusing not on service sector industries *per se*, but on the role of knowledge-intensive services as carriers and sources of knowledge that influence the performance of individual organisations, value chains and clusters across industries. From this perspective, the impact of services on innovation performance is understood through their specific functional role rather than as a set of distinct industry sectors.

As defined in this study, KISA refers to the production and integration of service activities undertaken by firms or public sector actors in the context of manufacturing or services, in combination with manufactured outputs or as stand-alone services. Typical examples of KISA include research and development (R&D), management consulting, information and communications services, human resource management and employment services, legal services (including those related to intellectual property rights) accounting, financing, and marketing-related service activities. Most businesses and public sector organisations make use of such KISA in their daily operations, whether they provide them internally or source them from external suppliers in the private or public sectors.

The KISA project was a major research undertaking that involved 11 countries. Australia, Denmark, Finland, Ireland, Japan, Korea, New Zealand, Norway and Spain produced a total of more than 20 case studies, 230 personal interviews and survey data from over 1 000 respondents examining KISA in four broad industry groups: *1)* software services, *2)* health care, *3)* tourism and leisure, and *4)* resource-based industries. The Czech Republic and United Kingdom provided national data for the project. Together these contributions provide a diverse range of industrial settings in which to examine and better understand the role of KISA in innovation. They provide considerable insight into KISA-related processes that underlie innovation capabilities and performance of firms and organisations – subtle processes do not lend themselves to traditional statistical analysis.

The objective of the KISA project was to generate a comparative analysis of different kinds of service inputs to the management of innovation in firms. As an exploratory effort, the study followed an open approach that aimed to further develop key analytical concepts and allow an understanding of the processes related to KISA. There were two original research questions: *1)* What kinds of KISA occur in different countries and industries? *2)* How do KISA work? The first question was the target of survey research, while the second was examined by firm-level case studies of firms. This report identifies key lessons from the case studies, highlighting the importance of KISA to innovation policy and offering insight into ways to build the KISA perspective into innovation policy.

KISA in innovation

The study confirms that knowledge-intensive service activities play several important roles in innovation processes. They serve as *sources* of innovation when they play a role in initiating and developing innovation activities in client organisations. They serve as *facilitators* of innovation when they support an organisation in the innovation process. Similarly, they serve as *carriers* of innovation when they aid in transferring existing knowledge among or within organisations, industries or networks so that it can be applied in a new context. These different roles depend partly on the response of the user (or client) organisation: how it engages with the supplier of the service, how it retains learning from the service, and how it manages knowledge throughout the organisation. All these features are part of the interactive nature of KISA.

KISA affects innovation processes in different ways

The case studies indicate that different types of KISA contribute in different ways to innovation (Table 0.1). Some KISA, such as R&D and strategic management, aid in firm renewal. Such *renewal services* are closely linked to innovation, but are relevant and accessible to a limited number of highly capable recipient organisations equipped with sufficient resources. Other, more *routine services*, such as accounting help maintain and improve existing systems and activities within organisations. Their significance for performance enhancement is highly important for most organisations. *Compliance services*, such as auditing and some legal services are not obviously linked with innovation, except to the extent that compliance with regulations related to health, safety, environment, etc., can stimulate innovation. Such KISA also offer an access route by which a wide range of organisations, among them the bulk of small businesses, can recognise the importance of KISA to their firm's performance and begin to engage a broader set of KISA providers. *Network services* provide an important platform for knowledge exchange within formal and informal networks. They also represent a flexible resource base for the members of the network.

Table 0.1. Types of KISA and their role in innovation

Renewal services	Directly related to innovation, for instance R&D and strategic management consulting
Routine services	Contribute to improvement of maintenance and management of various subsystems within organisations, *e.g.* accounting
Compliance services	Help organisations to work within the legal framework and various other regulatory regimes, *e.g.* auditing and some legal services
Network services	Facilitate communication, knowledge exchange and flexible resource allocation, *e.g.* informal personal networks and production related networks

Use of KISA varies across industries and across time

Reflecting their different roles, KISA are used to different degrees at different points in the innovation process. In the case studies, the type of KISA needed within a firm, irrespective of sector, was found to be closely related to the stage of the innovation life cycle. Services related to R&D are important in early stages of innovation, while those related to intellectual property rights, commercialisation, marketing and production processes tend to be more important during later stages of the innovation life cycle. In the *software* sector, for example, most firms reported that they specify, design and implement

new products using internal resources; the first service they typically seek outside is strategy formulation and finance, followed by legal services. Examples of other important KISA used at different points in the innovation process are consulting and research services related to strategy, business development, engineering ICT, marketing, and financing (Box 0.1). The role of KISA in innovation, therefore, depends on a number of dimensions, including the nature of the organisation, characteristics of the value chain, the type of the industry and the life cycle of the innovation process.

Box 0.1. Lessons from the study of KISA in software

The innovation capabilities of software firms show strong correlations with their use of knowledge intensive services. The influence of externally sourced services on learning and innovation depends, however, on the motivations and absorptive capacity of the user. As illustrated by the Norwegian case study, management training, sales training and public relations activities that are supplied by external sources typically contribute the development of working methods in customer firms. In other cases, client firms use externally provided KISA as additional, complementary resources, without development/innovation objectives.

Software firms integrate information and knowledge from various sources into their innovation processes. R&D in software firms is typically solution-oriented, based on identifying industry problems and developing technical solutions that can be easily customised. New product ideas are often obtained from engineering and marketing departments, as well as directly from customers. As seen in the Irish case study, improvements are based on feedback from engineers working with clients. Business service providers and research technology organisations are often used to support business management and development functions, and they appear to be especially important for firms that are expanding into international markets (see the Finnish case study). Relationships with large firms, such as telecommunications, automotive companies and major commodity producers also have an important role in product development and in building international customer and knowledge networks. Such networks are especially important in strategic areas such as the development of future business and new solutions. Hence, an environment that encourages co-operation and joint ventures between large firms and small service firms is an important element of the innovation system (as seen in the case studies of Korea and New Zealand). Books, trade journals, conferences and shows also appear to be important sources of new ideas for software businesses (New Zealand case study).

Use and demand for knowledge-intensive services changes during the product and business life cycle. As seen in the Australian and Finnish studies, the use of externally sourced services typically increases at more mature stages of the product life cycle. Many software firms specify, design and implement new products using internal resources, and then seek outside assistance with business strategy formulation and finance, followed by legal services. While some software firms argue that the use of external services stifles creativity, others consider fresh input from outsiders useful. Nevertheless, in research undertaken for this project, most firms using outside services aspire to develop the competences in-house as they grow in size and become more successful. Continued reliance on external services was foreseen for ensuring compliance with regulations and other administrative requirements, such as those related to taxation and patenting (Australian study).

Source: Case studies contained in Chapter 3 of this report.

Innovation is a collective process that requires access to multiple skill sets

The KISA study illustrates the degree to which innovation is an interactive process among various participants. KISA influence innovation via collective or collaborative problem-solving processes in which organisations work together to meet a market need or opportunity. Since innovation tends to be increasingly complex, a wide set of skills is an ever more crucial element of success. For instance, the development of a new type of printing paper brings together a diverse range of KISA including expertise in fibre research, biotechnology, chemistry, electronics, engineering, business management, marketing, logistics, key clients, software development and printing technology. Such examples highlight the multidimensional nature of innovation and the diverse range of knowledge needed to bring new products, processes and services to fruition. Innovative firms must mobilise a wide set of skills, often extending beyond their internal capabilities. These skills include not just technical skills, but market analysis, logistics and behavioural sciences. As shown in the *leisure and tourism* study, three central challenges in innovation include the integration of expertise in product development, the integration of style and technology, and the role of the customer/user and the importance of understanding emerging lifestyles. All of these involve knowledge-intensive service activities.

Users and customers are important drivers of innovation

The KISA study highlights the importance of users and customers in the innovation process. Customers are important partners for learning: new knowledge is often developed from the interaction between a firm and its customers. In the *software* study, for example, ideas for new software products were most often found to come from interaction between software suppliers and customers. Interaction with users also helped suppliers to develop their internal skills as users participated in joint problem solving and product development. Overall, users had a significant role in networks, which were very important KISA actors in the software sector. In the *leisure industry* innovation revolves around consumers' leisure pursuits and needs to be based on an understanding of consumer lifestyles and everyday practices. In *resource-based industries*, too, the increasingly customer-driven nature of innovation is shifting the strategic focus towards the customer end of the value chain.

Even in resource-based industries, the analysis of consumer behaviour, market segments, evolving demand patterns, logistics, markets and marketing are increasingly important KISA as organisations link their innovation activities more closely to the needs of customers and end users. Close interaction with customers is seen as a strategic asset for securing the competitive position of the organisation. For production-driven firms this means that a wide range of new types of skills needs to be developed with the assistance of internal and external KISA. The Finnish case study of the Forenel forest industry cluster found that as such businesses continue to transition toward offering solutions that contain service content, the interaction of internal and external KISA will play a growing role in building businesses capabilities and in shifting the focus of innovation from technological innovations to non-technological ones.

Related to the importance of users is the importance of marketing services as a driver of innovation in some industries. The *tourism and leisure* report emphasises the importance of marketing services as builders of internal innovation capacity in tourist businesses (Box 0.2). A new set of marketing-related services provided tourism businesses with information about customers' evolving lifestyles that create demand for new types of services. The

tourism case studies highlighted some alignment between innovation policies and service industries.

Box 0.2. External services in tourism and leisure

Tourism and leisure are different sectors, but with a number of similaries that influence their use of KISA. Both have expanded as a consequence of increased affluence, education and leisure time; both are dependent on an intimate understanding of cultural trends and preferences; and both contribute to the emergence of KISA that produce this kind of knowledge. Studies of tourism and leisure show that firms in these sectors have similar reasons for relying on external providers of key services: they not only provide capabilities that may be lacking internally, but also provide a creative, fresh outside view or independent compliance certification.

Whereas tourism has its share of fashions and fads and is affected by technological change, the appeal of many tourist destinations relies on their ability to remain – or appear to remain – unchanged. This is true both of established resorts offering old-fashioned service and a relaxed pace and of newer trends, such as environmental tourism. Many tourism experiences – though by no means all – are first and foremost experiences of rest and relaxation. Often consumers buy packages put together for them by tourist agencies, with minimal effort or input on the consumer's part. In addition, tourism relies heavily on physical and human infrastructure: a destination, transport systems, accommodation, and a supply of trained staff.

The tourism case studies of Australia and Spain highlight the role of intermediaries that circulate between firms, spreading good practice and linking firms with common interests. Service providers play a further role in explaining government programmes, new technology, and economic developments to firms; in turn they collect information that they use to represent the concerns of tourism firms to government, research institutions and suppliers. They help to build networks that are important sources of innovation. While the tourism industry may be less innovative than the leisure industries, external service providers help build innovativeness into the culture.

The manufactured leisure industries depend on novelty almost to the point of gimmickry for their competitive advantage. Many manufactured leisure products are objects that are owned and used by individuals rather than groups (although groups of users do emerge and rely on communications infrastructure). Marketing depends on being ahead of the trend. Many elements of the leisure industries demand a good deal of active input from the consumer, in terms of learning how to do things and also disciplined application. These industries are very sensitive to changes in consumer tastes. The Finnish case study demonstrates that the most important resources for innovation in leisure industries are aesthetic knowledge and alertness, contextual knowledge, and communication with clients.

External service providers are important in the leisure industry, supplying specialized knowledge related to design, advertising and market research. These services are used alongside and integrated into the companies' own product development and market research activities. In leisure industries, innovation is a continuing, reflective process, not a chronological one, and the knowledge and skills of a variety of experts must be integrated during innovation projects. This has to be done from the beginning and throughout the process. As illustrated by the Finnish study, design is not a one-time contribution, but a continuous, consultative process. Suppliers of the knowledge-intensive services and associated activities play the role of cultural intermediaries, explaining customer needs to firms, and new products to customers.

In both tourism and leisure, reliance on external services offers flexibility: services can be used when needed. This motivation is stronger in Spain, where the labour market is more rigid than in Australia, where casual employment is common. Also more important to the Spanish industry is the possibility of selecting from a wide range of providers, including international ones. This may reflects the larger size of Spanish firms and the greater presence of multinational corporations in the industry. In the Australian survey, no firm reported the use of a service from an international provider.

Source: Case studies contained in Chapter 5 of this report.

Box 0.3. Creating demand for KISA: Lessons from health care services

Health care represents a highly important service, and its rising costs are putting existing systems under pressure. The need to contain health care costs, combined with continuous innovation in medical practice, pharmaceuticals and medical devices, drives change in health care services that demands constant upgrading of knowledge, skills and organisational structures. KISA plays an essential role in enabling health care organisations to respond to these pressures. Nevertheless, the role of KISA in innovation in the health care sector is conditioned by the prevailing innovation environment, which itself depends on factors at the national and local levels. Policies regarding the provision and payment of health care operate at the national level and influence the structure of the industry. At the local level, conditions are influenced by individual service providers, who must adjust their operations to meet the various, and sometimes conflicting demands and regulations (as shown in the Finnish and Norwegian studies).

Demand for external KISA in health care varies considerably, depending on a number of specific issues. The Norwegian case study found that even in the introduction and implementation of a purchaser-provider model, external KISA played a small role. Expertise related to development, legal, administrative and management activities, which constituted the heart of the transition, were sourced internally. Internal and external KISA were used in combination for training and information activities. The Japanese study of a company providing health care-related consultation, training, R&D and management services found that the company made use of external KISA from universities, private companies, and individual experts in R&D and management. ICT is one of the types of KISA most often sourced externally, as health care organisations tend to lack the needed expertise in-house. The same applies for education and training services. More difficult categories of KISA relate to strategy formulation and implementation and development of management practices.

Overall, the structure, organisation and relationships among health care providers have a significant effect on the diffusion of innovation. Adoption of innovative practices often means altering the beliefs, norms, and values embedded in traditional organisation of a particular services provision in a particular place under long cultural roots. Staff members have to think differently about their roles, their goals, and their relationships with other departments and disciplines – and more importantly with patients. Barriers are higher when the implemented services require co-ordination and re-organisation across disciplines, departments or organisation s or challenge the automony of actors in an organisation. In Finland, for example, quality management principles are embraced as good practice for continuous improvement, but they are not fully accepted as they improve organisation al capabilities at the cost of limiting the autonomy that experts enjoy in health care. Furthermore, expert organisations, such as those in health care, tend to favour an approach of learning-by-doing rather than adopting existing practices from others.

To date, market conditions have not been sufficient for expert services to be created outside health care organisations. Health care organisations themselves tend to be more capable than outside services. It appears that significant innovation potential within the health care systems could be realised through more effective sharing of knowledge and good practices. One way to address this problem would be for organisations to make their expertise available to the outside, but few incentives exist for doing so. In the public sector reaching agreement can be surprisingly difficult both internally and externally. As a result external KISA providers have to be very close to their customers in order to create the required trust conditions. Network-KISA plays a central role in the diffusion of new medical technologies. After initial introduction the diffusion speed depends on a number of factors all mediated by network-KISA. The use of the new technology creates new information which is communicated in workshops, conferences and publications. This in turn gives inputs to developers to improve the technology and to other users to improve the ways the technology is applied (Spain).

Source: Case studies contained in Chapter 4 of this report.

Emergence of supplies of KISA is contingent on demand

Development of external supplies of KISA depends on the emergence of demand for such services. Most firms provide KISA internally, with decisions to seek external sources of KISA depending on many factors, including the size of the firm, lifecycle of the innovation process, and nature of the particular service. In the case studies, lack of awareness of KISA was seen as an impediment to their development. This was observed most frequently among small firms, many of which viewed KISA as luxuries they cannot afford or tended to see them as secondary to technological innovation. Use of KISA was found to be higher among firms with more resources and better-developed innovation capabilities. In the case of the Norwegian aquaculture industry, for example, the ability of firms to effectively make use of KISA was found to depend on factors such as the size of the business, division of labour within the firm, the existing knowledge base and resources available for knowledge development.

While many of the KISA needed to make firms more innovative exist in the private sector, governments were also found to play an important role, especially where individual firms lack needed skills for innovation and market demand for stimulating their creation is either insufficient or too diffuse. Most firms regard KISA as essential to implementing innovation, highlighting a possible link between innovative capacity and willingness to use KISA. Hence, factors that effect the environment for innovation can have a strong influence on demand for KISA. Such factors include those that operate at the level of individual organisations or that characterise particular industries, as is illustrated by the health care services sector (Box 0.3).

Integrating internal and external capabilities is increasingly important

As KISA becomes more important to the innovation activities of firms and as the number of external suppliers of KISA grows, firms face a growing challenge of integrating internal capabilities with external expertise. As illustrated by the case study of resource-based industries, this can take place in a number of ways, including:

- **Effective management of human resources**, such as employing experts who can build up their knowledge base and absorptive capacity; forming multi-disciplinary research teams that broaden the knowledge base required in selling solutions; and making use of personal connections with industry and other experts.
- **Establishment of appropriate organisational structures**, such as setting up dedicated business units that scan the environment and develop new expertise and business; acquiring firms that can bring in new knowledge and innovative thinking; and establishing joint ventures that typically (*e.g.* with industrial service firms) institutionalise co-operation and integration of KISA with other firms.
- **Forging effective networks and linkages**, such as by participating in networks which offer opportunities for incorporating internal and external knowledge; engaging in close co-operation with suppliers and setting up joint development projects; working closely with customers in new solutions development; and establishing joint projects with research.
- **Employing market-based transactions**, such as buying integrated product-service bundles that bring external KISA within the firm; using outsourcing as a way to integrate former internal KISA with the external expertise; and purchasing services from service providers businesses and working with them.

Firms need to develop competences in each of these areas to make effective use of KISA.

Building the KISA perspective into innovation policy

Continued expansion of the knowledge economy and increased economic globalisation are likely to raise the importance of KISA in contributing to innovation. The evolving division of labour and the volume of knowledge are strong drivers of KISA. The challenge will be for innovation policies to foster the supply, demand and quality of KISA to improve innovation performance. Policies can target KISA actors directly or indirectly through intermediary organisations, or through wider framework conditions including government regulation, education and skills development, and procurement practices. Also, the public sector itself is a significant provider and user of KISA, and hence a target for innovation policies. Table 0.2 presents some key dimensions that need attention when developing balanced innovation policy portfolios around KISA.

Table 0.2. Types of policy that can facilitate KISA-based innovation

Policy-related dimension	Examples of innovation policy measures
Direct policy intervention targeting businesses/organisations	• Securing service development related private and public financing, grants and tax credits for businesses • Transfer of enabling technologies that can support the role of KISA in innovation
Indirect policy intervention targeting non-business actors within the innovation system	• Securing the skills base needed by service innovators • Widening the focus of RTOs towards non-technological innovations
Development of framework conditions facilitating the role of KISA in innovation	• Opening up of new markets for service providers • Cutting down the regulatory burden • Financing for the use of external KISA • Good practice development, standards for service quality • Cultivating services related to innovation culture
Development of existing innovation policies, more service-friendly	• Adopting the broad innovation concept, acknowledging the value of process innovations (technological and organisational), and product innovations (goods and services) • Adapting financing and assistance criteria so that services-related innovation projects get better access to existing policies • Training and skills development in service-related innovation for actors executing the innovation policy
Development of new policy measures targeting issues that are central to the development of KISA and services-related innovation	• Networks and customer interaction as innovation platforms • Developing organisations that are more capable of using internal & external KISA

Research-based knowledge and a highly skilled labour force are basic requirements for many kinds of KISA. KISA plays a crucial role in the generation and diffusion of knowledge as it applies and re-packages research-based knowledge for practical purposes. Governments can play a critical role in this process through support for fundamental, basic research. Much of the basic knowledge derives from education and training systems, which are responsible for developing a skilled labour force. Strong links to public and private sector organisations can help ensure that that education and training institution are sensitive to evolving demands for skilled labour.

At the same time, **innovation policy frameworks need to respond to the non-technological aspects of KISA** and their impact on innovation capability. The KISA study has identified the importance of non-technological contributions to the innovation capability of firms. This suggests that the traditional R&D-based approach to innovation is too narrow and that innovation policies need to recognise the various types of knowledge-intensive services activities that have different roles in the innovation processes. Policy needs to focus more on the interactive people-centred activities, less on the individual firm and more on developing the collective strength of the sector or network. Since typical KISA is mainly based on intangible assets, policies ought to secure sufficient supply of private and public financing for growth oriented KISA. Better understanding of the non-technological elements of innovation and the user contribution to innovation needs to be further developed.

A key challenge is improving access to KISA. This challenge is highlighted by intangibility, complexity and difficulties in assessing the quality and suitability of the services offered prior to engaging with them. Financial assistance is only a partial solution. Awareness of KISA needs to be developed first and knowledge asymmetries between KISA suppliers and users need to be addressed, for instance, by certification of services and through publicly funded demonstration projects.

Overall, policies that stimulate the demand for KISA can also trigger enhanced supply and quality of KISA. Policies should be neutral towards internal and external sources of knowledge-intensive services until there is further research on the wider impacts of outsourcing on innovativeness and skills development. Existing innovation policies should be examined and where necessary developed to ensure that they encourage capacity building and interaction within organisations. Policies that can improve firms' absorptive capacity for knowledge can have a significant impact on the firm's ability to use available KISA. Regulatory issues must also be considered. In the health care sector, innovation and the use of KISA is influenced by health care policies and incentives, as health care services are provided by a mix of public, private and third-party actors in a highly regulated setting. Pressure to contain costs, together with continuous innovation in medical practice, pharmaceuticals and medical devices, are key drivers of change in health care services. Adaptation to these drivers requires constant upgrading of the knowledge and skills within health care systems, often through training, education and various other types of KISA.

Policy must adapt to changing needs for KISA. The need for KISA evolves as industries, organisations and innovations mature. The life cycle of the innovating organisation and of the innovation process itself can be used to determine which type of KISA best facilitates further development. At different stages of the innovation life cycle, the balance between internal and external KISA may also change, implying a need for different types of policy measures.

Of course, policies must aim to facilitate sensitive, trust-based interactive innovation processes without interfering with them. Subtler understanding of the appropriateness of different kinds of policy measures can be achieved through close interaction between policy design and programme delivery and attention to the needs and reactions of the beneficiaries of policy. Demand side policies that stimulate the demand for KISA are equally important as those seeking to stimulate supply and quality of KISA. Policy co-ordination has an essential role here, but further research will be necessary to more fully explore the most effective role of public policy in stimulating supply and demand of KISA.

Box 0.4. KISA in resource-based industries

The resource-based industry case studies illustrate a number of important general themes regarding the use of KISA in innovation. The Australian case study of mining technology service firms and the Finnish case study of firms in forest-related industries, for example, show that awareness of the significance of KISA is an important starting point for business use of knowledge intensive services. Mining technology service firms are service providers themselves, so they have a good understanding of how interaction with the provider of a knowledge intensive service can enhance business operations. Their work force is highly educated, so they understand how to learn and to build on their existing skills and knowledge. The above description fits very well also the forest cluster, which has manufacturing as its core activity, but in which support and development services play a key part in boosting productivity and product quality. Large forestry firms are striving to develop more business around integrated product-service solutions.

These case studies also provide examples of the relationship between manufacturing and services, which further emphasizes the need for KISA. Several firms in the Australian mining technology service sector have developed tools for particular tasks and subsequently commercialised them as stand alone units, or they realised that the way they do something in-house has value that can be packaged and sold to others. Forest cluster firms have realised the value of knowledge development on the business and cluster levels. Businesses are making extensive use of automation and building-up their knowledge bases on complex production processes. Businesses are re-organising their research efforts to form more effective cross-disciplinary research units that seek to combine both technological and non-technologal (*e.g.* organisational) types of innovations. Such changes elevate the importance of close links to customers, as those firms that control the end-user interface, may exercise control over the entire value chain.

Consumer behaviour, market segments, evolving demand patterns, logistics, markets and marketing are increasingly important KISA as organisations move downstream in the value chain closer to customers and end users. There are at least two key drivers that give impetus for innovation activities at the customer end of the value chain. First, interaction with customers, clients and user communities provides organisations with knowledge that is invaluable for R&D processes. In turn, businesses provide customers their specialised knowledge that can solve their problems. Secondly, close interaction with customers is seen as a strategic asset; it can provide a power base that can help to secure the future competitiveness of the organisation. As seen in the Finnish case study, those who control the end user interface can exercise control over the entire value chain.

The Norwegian aquaculture study illustrates how the ability to make use of KISA varies among different types of firms. Key dimensions influencing firms' absorptive capacity include: the size of the business, division of labour within the firm, knowledge base and resources available for knowledge development. Small firms in particular appear not to realise the importance of KISA, and there appears to be a general scepticism of external KISA as a source of innovation. Nevertheless, external providers are being used to a greater degree than before, especially for development activities linked to product and process innovation, ICT projects and banking and financial assistance (often linked to mergers and acquisitions). Such external actors typically come from other parts of the business group, networks of suppliers and competitors and experts in regulatory and tax issues. Only for science-based entrepreneurs in the Norwegian aquaculture industry were publicly funded research and technology organisations a source of specific innovation.

Source: Case studies contained in Chapter 6 of this report.

Résumé

Le projet sur les activités de service à forte intensité de savoir (KISA) est une étude de cas sur l'innovation qui s'inscrit dans des travaux de longue haleine menés par l'OCDE sur les systèmes nationaux d'innovation. Ce projet examine l'utilité des services à forte intensité de savoir pour le développement de la capacité d'innovation des organisations qui en bénéficient : pour ce faire, il axe la réflexion non pas sur les industries du secteur des services en elles-mêmes, mais sur le rôle des services à forte intensité de savoir en tant que vecteurs et sources de connaissances qui influent sur la performance des organisations, des chaînes de valeur et des grappes d'activités dans l'ensemble des secteurs. C'est ainsi que l'impact des services sur les performances en matière d'innovation est appréhendé, non pas du point de vue d'une série de secteurs industriels, mais sous l'angle du rôle fonctionnel spécifique que jouent ces services.

Aux termes de la définition utilisée dans cette étude, les services à forte intensité de savoir désignent les activités de service produites ou intégrées par des entreprises ou par des acteurs du secteur public, dans le cadre d'activités manufacturières ou de services, parallèlement à la production manufacturière, ou en tant que services autonomes. Parmi les services à forte intensité de savoir figurent les services de recherche-développement (R-D), de conseil en gestion, d'information et de communications, les services d'emploi et de gestion des ressources humaines, les services juridiques (dont ceux liés aux droits de propriété intellectuelle), les services comptables et financiers, et les services de marketing. La plupart des organisations du secteur public et des entreprises ont recours à des services à forte intensité de savoir dans leur fonctionnement quotidien, services qu'elles se procurent soit en interne soit auprès de fournisseurs externes appartenant aux secteurs privé ou public.

Le projet KISA est une initiative de recherche de grande envergure impliquant 11 pays. L'Australie, la Corée, le Danemark, l'Espagne, la Finlande, l'Irlande, le Japon, la Norvège et la Nouvelle-Zélande ont produit au total plus de 20 études de cas, réalisé 230 entretiens individuels et recueilli des données d'enquête auprès de plus de 1 000 répondants dans le cadre d'une étude des services à forte intensité de savoir dans quatre grands secteurs industriels : *1)* logiciel, *2)* tourisme et loisirs, *3)* santé, et *4)* industries de ressources. La République tchèque et le Royaume-Uni ont fourni des données nationales pour le projet. Globalement, ces contributions offrent un éventail diversifié de contextes industriels pour examiner et mieux cerner le rôle des services à forte intensité de savoir dans l'innovation. Elles apportent des informations précieuses sur les processus associés à ces services qui sous-tendent les capacités et les performances des entreprises et des organisations en matière d'innovation – en effet, ces processus complexes ne se prêtent pas à une analyse statistique traditionnelle.

Le projet KISA avait pour objectif de produire une analyse comparative des différents types de services intermédiaires fournis pour la gestion de l'innovation dans les entreprises. Dans le cadre des travaux préliminaires, l'étude a adopté une approche ouverte pour affiner les principaux concepts d'analyse et mieux appréhender les processus liés aux services à forte intensité de savoir. Au départ, la réflexion s'articulait autour de deux grandes questions : *1)* Quels types de services à forte intensité de savoir rencontre-t-on dans les différents pays et secteurs ? *2)* Comment fonctionnent les services à forte intensité de savoir ? La première question a servi de thématique à la recherche par enquête, tandis que la seconde a été examinée dans le cadre d'études de cas au niveau de l'entreprise. Le présent rapport recense les principaux enseignements tirés de ces études de cas, et met en lumière l'importance des services à forte intensité de savoir pour les politiques de l'innovation, tout en fournissant des indications sur les moyens de mieux en tenir compte dans l'élaboration de ces politiques.

Le rôle des services à forte intensité de savoir dans l'innovation

L'étude confirme que les services à forte intensité de savoir exercent plusieurs fonctions majeures dans les processus d'innovation. Ils servent de *sources* d'innovation quand ils interviennent dans le lancement et le développement d'activités d'innovation dans des organisations clientes. Ce sont des *facilitateurs* de l'innovation quand ils aident une organisation dans son processus d'innovation. Enfin, ils servent de *vecteurs* de l'innovation quand ils contribuent à transférer des connaissances existantes entre organisations, industries ou réseaux, ou à l'intérieur de ceux-ci, en vue de les appliquer dans un nouveau contexte. Ces différentes fonctions dépendent en partie de la réaction de l'organisation utilisatrice (ou cliente) et des modalités selon lesquelles elle recourt aux services du prestataire, conserve le savoir acquis, et gère les connaissances à tous les niveaux de sa structure. Tous ces aspects participent du caractère interactif des services à forte intensité de savoir.

Les services à forte intensité de savoir influent sur les processus d'innovation de diverses manières

Il ressort des études de cas que les différents types de services à forte intensité de savoir contribuent de manière différente à l'innovation (tableau 0.1). Certains services à forte intensité de savoir, comme la R-D et la gestion stratégique, contribuent au renouvellement de l'entreprise. Ces *services de renouvellement* sont étroitement liés à l'innovation, mais ils ne s'appliquent et ne sont accessibles qu'à un nombre limité d'organisations bénéficiaires dotées de fortes capacités et de ressources suffisantes. D'autres *services* plus *courants*, tels que la comptabilité, contribuent à entretenir et améliorer les systèmes et activités en place dans les organisations. Ils jouent un rôle très important pour la plupart des organisations sur le plan de l'amélioration des performances. Les *services de contrôle*, comme les services d'audit et certains services juridiques, ne sont pas liés de façon visible à l'innovation, sauf si le respect des réglementations relatives à la santé, la sécurité, l'environnement, etc., peut dans une certaine mesure stimuler l'innovation. Ce type de services à forte intensité de savoir offre à un large éventail d'organisations – notamment à la majorité des petites entreprises – la possibilité de prendre conscience de l'importance de ces services pour leurs performances et de commencer à faire appel plus largement à ce type de prestataires. Les *services de réseaux* constituent une plate-forme utile d'échange de connaissances au sein des réseaux formels et informels. Ils offrent aussi une base de ressources souple aux membres du réseau.

Tableau 0.1. Les types de services à forte intensité de savoir et leur rôle en matière d'innovation

Services de renouvellement	Directement liés à l'innovation, tels que la R-D et le conseil en gestion stratégique.
Services courants	Contribuent à améliorer l'entretien et la gestion des divers sous-systèmes au sein des organisations : la comptabilité, par exemple.
Services de contrôle	Aident les organisations à travailler dans le respect du cadre juridique et des différents autres régimes réglementaires : les services d'audit et certains services juridiques, par exemple.
Services de réseaux	Facilitent la communication, les échanges de connaissances et une allocation souple des ressources : réseaux personnels informels, et réseaux liés à la production, par exemple.

Le recours aux services à forte intensité de savoir varie selon les industries et le stade du processus d'innovation

Compte tenu de leurs rôles différenciés, c'est à des degrés différents et à des stades différents du processus d'innovation que l'on recourt à des services à forte intensité de savoir. Il ressort des études de cas que le type de services à forte intensité de savoir dont a besoin une entreprise, quel que soit le secteur auquel elle appartient, est étroitement lié au stade du cycle de vie de l'innovation. Les services touchant à la R-D sont importants aux tout premiers stades du cycle, tandis que ceux liés aux droits de propriété intellectuelle, à la commercialisation, au marketing et au processus de production sont en général plus importants vers la fin du cycle de vie de l'innovation. Dans le secteur du *logiciel*, par exemple, la plupart des entreprises indiquent procéder à la spécification, la conception et la réalisation de nouveaux produits à l'aide de leurs ressources internes ; les premiers services qu'elles se procurent le plus souvent à l'extérieur concernent la formulation de la stratégie et la finance, ainsi que les affaires juridiques. Parmi les autres grandes activités de service à forte intensité de savoir qui sont utilisées à différents stades du processus d'innovation figurent les services de conseil et de recherche liés à la stratégie, le développement de l'entreprise, le génie informatique, et le marketing (encadré 0.1). Le rôle des services à forte intensité de savoir dans le processus d'innovation dépend donc d'un certain nombre de paramètres, dont la nature de l'organisation, les caractéristiques de la chaîne de valeur, le type d'industrie, et le cycle de vie du processus d'innovation.

Encadré 0.1. Enseignements tirés de l'étude des services à forte intensité de savoir dans le secteur du logiciel

Les capacités d'innovation des entreprises du logiciel sont étroitement corrélées à leur recours aux services à forte intensité de savoir. Toutefois, l'influence des services d'origine externe sur l'acquisition de connaissances et l'innovation dépend des motivations et de la capacité d'absorption de l'utilisateur. Il ressort de l'étude de cas sur la Norvège que, lorsqu'elles sont assurées par des sources externes, les activités de formation des cadres, de formation dans le domaine de la vente, et de relations publiques contribuent en règle générale au développement de méthodes de travail dans les entreprises clientes. Dans d'autres cas, les entreprises clientes qui s'adressent à l'extérieur pour s'assurer des services à forte intensité de savoir s'en servent comme d'un apport de ressources complémentaires, sans poursuivre d'objectifs de développement et/ou d'innovation.

Encadré 0.1. Enseignements tirés de l'étude des services à forte intensité de savoir dans le secteur du logiciel *(suite)*

Les entreprises du secteur du logiciel intègrent dans leur processus d'innovation des informations et des connaissances issues de diverses sources. Dans les entreprises du logiciel, la R-D est le plus souvent axée sur les solutions, et procède par l'identification des problèmes des industries et la mise au point de solutions techniques faciles à adapter. Les idées de nouveaux produits viennent souvent du bureau d'études ou du service de marketing, mais aussi directement des clients. Comme on le voit dans l'étude de cas sur l'Irlande, les perfectionnements découlent des informations fournies en retour par les ingénieurs qui travaillent avec les clients. Les prestataires de services aux entreprises et les organismes de technologie et de recherche sont souvent utilisés pour appuyer les fonctions de gestion et de développement de l'entreprise, et ils semblent particulièrement utiles pour les entreprises qui cherchent à se développer sur les marchés internationaux (voir l'étude de cas sur la Finlande). Les relations avec les grandes entreprises, par exemple dans les télécommunications, l'automobile ou d'autres grands secteurs industriels, jouent aussi un rôle significatif dans la mise au point des produits et dans la constitution de réseaux internationaux de clients et de connaissances. Ces réseaux sont particulièrement intéressants dans des domaines stratégiques comme le développement des futures activités et des nouvelles solutions. Par conséquent, un environnement qui encourage la coopération et les coentreprises entre grandes entreprises et petites sociétés de service constitue un élément déterminant pour le système d'innovation (comme il ressort des études de cas sur la Corée et sur la Nouvelle-Zélande). Publications, revues professionnelles, conférences et expositions semblent aussi être des sources non négligeables de nouvelles idées pour les entreprises du logiciel (étude de cas sur la Nouvelle-Zélande).

L'utilisation et la demande de services à forte intensité de savoir évoluent tout au long du cycle de vie du produit et de l'entreprise. Des études de cas sur l'Australie et sur la Finlande, il ressort que le recours à des services d'origine externe s'accroît en règle générale aux stades avancés du cycle de vie du produit. Nombre d'entreprises du logiciel procèdent à la spécification, la conception et la réalisation de nouveaux produits à l'aide de leurs ressources internes ; ensuite, elles recherchent une aide extérieure en ce qui concerne la formulation de la stratégie et la finance, puis les services juridiques. Si certaines entreprises du logiciel considèrent que le recours à des services externes étouffe la créativité, d'autres estiment utiles ces apports de l'extérieur. Néanmoins, du travail de recherche réalisé pour ce projet, il ressort que la plupart des entreprises faisant appel à des services extérieurs aspirent à développer ces compétences en interne à mesure qu'elles gagneront en taille et qu'elles rencontreront le succès. Le recours permanent à ce type de services est envisagé pour assurer le respect des réglementations et s'acquitter d'autres obligations administratives comme celles liées à la fiscalité et au dépôt de brevets (étude de cas sur l'Australie).

Source : Etudes de cas présentées au chapitre 3 du présent rapport.

L'innovation est un processus collectif qui requiert une très large palette de compétences

L'étude KISA illustre à quel point l'innovation est un processus interactif entre les acteurs. Les activités de service à forte intensité de savoir influent sur l'innovation par le biais de processus de collaboration ou de résolution conjointe des problèmes dans le cadre desquels les organisations coopèrent pour saisir une opportunité de marché ou répondre à un besoin du marché. L'innovation devenant, en règle générale, un processus de plus en plus complexe, elle exige pour réussir un spectre toujours plus large de compétences. La mise au point d'un nouveau type de papier d'impression, par exemple, mobilise un éventail diversifié de services à forte intensité de savoir tels la recherche sur les fibres, les biotechnologies, la chimie, l'électronique, l'ingénierie, la gestion de l'entreprise, le marketing, la logistique, les grands clients, le développement de logiciels et les technologies d'impres-

sion. Ces exemples font ressortir le caractère multidimensionnel de l'innovation et la diversité des connaissances nécessaires à la mise au point de nouveaux produits, processus et services. Les entreprises innovantes doivent mobiliser une large palette de compétences, qui dépassent souvent leurs capacités internes. Cette palette comprend non seulement des compétences techniques mais aussi l'étude du marché, la logistique et les sciences du comportement. De l'étude sur *les loisirs et le tourisme*, il ressort que les trois grands problèmes que pose le processus d'innovation dans ce secteur concernent l'intégration d'une expertise au niveau du développement des produits, l'alliance du style et de la technologie, ainsi que le rôle du client/utilisateur et de ses nouveaux styles de vie qu'il importe de bien cerner. Tous ces problèmes intéressent les activités de service à forte intensité de savoir.

Les utilisateurs et les clients sont de puissants moteurs de l'innovation

L'étude KISA met en lumière l'importance des utilisateurs et des clients dans le processus d'innovation. Les clients sont des partenaires non négligeables dans l'acquisition de savoirs : l'interaction entre l'entreprise et ses clients permet souvent l'élaboration de connaissances nouvelles. De l'étude sur le *secteur du logiciel* par exemple, il ressort que les idées de nouveaux produits logiciels sont en règle générale le fruit de l'interaction entre les fournisseurs de logiciels et les clients. L'interaction avec les utilisateurs aident aussi les fournisseurs à développer leurs compétences internes car ils participent à la résolution conjointe des problèmes et au développement des produits. Globalement, les utilisateurs jouent un grand rôle dans les réseaux, ces acteurs majeurs des services à forte intensité de savoir dans le secteur du logiciel. Dans le *secteur des loisirs*, l'innovation est axée sur les pratiques des consommateurs et doit se fonder sur une connaissance de leurs styles de vie et de leurs habitudes quotidiennes. S'agissant des *industries de ressources* aussi, le fait que l'innovation soit de plus en plus axée sur le client modifie l'orientation stratégique pour privilégier le maillon final de la chaîne de valeur où se situe le client.

Même dans les industries de ressources, l'analyse du comportement du consommateur, des segments du marché et de l'évolution de la structure de la demande, la logistique, les marchés et le marketing, qui relèvent des activités de service à forte intensité de savoir, revêtent une importance croissante car les entreprises relient désormais plus étroitement leurs activités d'innovation aux besoins des clients et des utilisateurs finaux. Une interaction étroite avec les clients est perçue comme un atout stratégique qui permet d'assurer la position concurrentielle de l'entreprise. Il en découle la nécessité, pour les entreprises axées sur la production, de développer un large éventail de compétences nouvelles en recourant à des services à forte intensité de savoir fournis en interne ou d'origine externe. De l'étude de cas sur la Finlande concernant la grappe d'activités Forenel, constituée de l'industrie forestière et des secteurs connexes de l'industrie mécanique et de l'électronique finlandaises, il ressort que, comme ces entreprises continuent d'évoluer vers une offre de solutions à contenu de service, l'interaction entre les services à forte intensité de savoir d'origine interne et ceux d'origine externe est appelée à jouer un rôle grandissant dans le renforcement des capacités des entreprises et dans la réorientation de l'innovation vers des domaines non technologiques.

Parallèlement aux utilisateurs, les services de marketing sont un moteur majeur de l'innovation dans certaines industries. Le rapport sur *le tourisme et les loisirs* souligne l'importance des services de commercialisation en tant que moyen de renforcement de la capacité interne d'innovation des entreprises de tourisme (encadré 0.2). Une nouvelle gamme de services liés au marketing fournit aux entreprises de tourisme des informations sur l'évolution du style de vie des clients qui est à l'origine de la demande de nouveaux types de services. Les études de cas sur le tourisme font apparaître une certaine adéquation entre les politiques de l'innovation et les services.

Encadré 0.2. Les services externes dans le secteur du tourisme et des loisirs

Le tourisme et les loisirs constituent deux secteurs distincts, mais présentent un certain nombre de similitudes qui influent sur leur utilisation de services à forte intensité de savoir. Tous deux se sont développés à la faveur de l'amélioration des conditions de vie et du niveau d'éducation et de l'accroissement du temps libre ; ils exigent l'un comme l'autre une perception aiguë des tendances et des préférences culturelles et contribuent à l'émergence d'activités de service à forte intensité de savoir produisant ce type d'informations. Les études sur le tourisme et les loisirs montrent que les entreprises de ces secteurs recourent pour les mêmes raisons à des prestataires de services externes qui leur apportent, non seulement des compétences souvent inexistantes au plan interne, mais également un point de vue extérieur original et créatif, ou encore une certification indépendante.

Bien que le tourisme n'échappe pas aux modes et tendances du moment et subisse les effets du changement technologique, l'attrait de nombreuses destinations touristiques réside dans le fait, ou dans l'idée, qu'elles restent intactes. C'est le cas des lieux de villégiature traditionnels qui offrent des prestations à l'ancienne, loin des trépidations du monde, mais également des formules plus nouvelles comme l'écotourisme. Même si ce n'est pas une règle générale, de nombreux séjours touristiques misent avant tout sur le repos et la détente. Les consommateurs achètent bien souvent des forfaits préparés à leur intention par les agences de tourisme, ce qui leur demande un effort minimum et peu d'investissement personnel. Le secteur du tourisme est par ailleurs fortement tributaire des infrastructures physiques et humaines : site de destination, réseau de transport, hébergement et personnel qualifié.

Les études sur le tourisme en Australie et en Espagne font ressortir le rôle des intermédiaires qui vont d'une entreprise à l'autre, diffusent les bonnes pratiques et lient les entreprises par des intérêts communs. Les prestataires de services jouent aussi un rôle important en faisant connaître aux entreprises les programmes gouvernementaux, les technologies nouvelles et les tendances de l'économie; ils recueillent de leur côté des informations qu'ils utilisent pour se faire l'écho des préoccupations des entreprises de tourisme auprès des pouvoirs publics, des organismes de recherche et des fournisseurs. Ils favorisent l'établissement de réseaux vecteurs d'innovation. Bien que l'industrie du tourisme soit peut-être moins innovante que celle des loisirs, les prestataires de services externes contribuent à insuffler un esprit novateur dans la culture de ce secteur.

Le secteur des « loisirs manufacturés » doit impérativement jouer la carte de la nouveauté, quitte à produire des gadgets, pour s'assurer un avantage concurrentiel. Les articles de loisirs manufacturés sont souvent des objets détenus et utilisés par des particuliers plutôt que par des groupes (même si des groupes d'utilisateurs voient le jour et recourent à des infrastructures de communication). La commercialisation dépend de l'aptitude à anticiper les tendances. De nombreux produits de l'industrie des loisirs demandent un véritable investissement de la part du consommateur qui doit apprendre à s'en servir et à en maîtriser les applications. Ce secteur est très sensible à l'évolution des goûts des consommateurs. L'étude de la Finlande montre que les ressources les plus importantes pour l'innovation dans ce secteur sont la maîtrise et la veille esthétiques, la connaissance du contexte et la communication avec les clients.

Encadré 0.2. Les services externes dans le secteur du tourisme et des loisirs *(suite)*

Les fournisseurs de services externes jouent aussi un rôle important dans l'industrie des loisirs en apportant des compétences spécialisées en matière de design, de publicité et d'études de marché. Ces services sont utilisés parallèlement et intégrés dans les activités de développement de produits et d'étude de marché des entreprises. Dans l'industrie des loisirs, l'innovation est un processus de réflexion continu, qui ne suit pas de chronologie précise : les connaissances et compétences d'un large éventail de spécialistes doivent être intégrées tout au long des projets d'innovation, du début jusqu'à la fin du processus. Comme le montre l'étude de la Finlande, la conception n'est pas une contribution ponctuelle, mais un processus consultatif permanent. Les fournisseurs de services à forte intensité de savoir et de services connexes jouent le rôle d'intermédiaires culturels en faisant connaître les besoins des consommateurs aux entreprises et les nouveaux produits aux consommateurs.

Dans le secteur du tourisme, tout comme dans celui des loisirs, le recours à des services externes favorise la flexibilité puisque ces services peuvent être utilisés à la demande. Cette motivation apparaît plus forte en Espagne, où le marché de l'emploi est plus rigide, qu'en Australie, où les emplois occasionnels sont fréquents. La possibilité de choisir parmi un grand nombre de fournisseurs, y compris internationaux, semble aussi peser plus lourd pour l'industrie espagnole. Cela tient peut-être au fait que les entreprises espagnoles sont plus grandes et que les multinationales sont plus nombreuses dans le secteur. Dans l'étude australienne, aucune entreprise n'a indiqué utiliser de services fournis par un prestataire international.

Source : Études de cas présentées dans le chapitre 5 du présent rapport.

Le développement de l'offre de services à forte intensité de savoir est tributaire de la demande

Le développement de l'offre externe de services à forte intensité de savoir dépend de la montée de la demande pour ce type de services. La plupart des entreprises assurent ces services en interne, la décision de se les procurer à l'extérieur dépendant de nombreux facteurs dont la taille de l'entreprise, le cycle de vie du processus d'innovation, et la nature du service requis. Dans les études de cas, la méconnaissance de ces services est perçue comme une entrave à leur développement. On la constate surtout dans les petites entreprises, qui sont nombreuses à considérer ces services comme un luxe qu'elles ne peuvent pas s'offrir ou comme moins importants que l'innovation technologique. Le recours aux services à forte intensité de savoir se révèle être davantage pratiqué dans les entreprises plus riches en ressources et dotées de capacités d'innovation plus développées. Dans le cas de l'industrie aquacole de la Norvège par exemple, on observe que la capacité des entreprises à exploiter efficacement les services à forte intensité de savoir dépend de facteurs tels que la taille de l'entreprise, la division du travail en son sein, les connaissances existantes, et les ressources disponibles pour le développement des connaissances.

Si le secteur privé dispose d'un grand nombre des services à forte intensité de savoir nécessaires pour rendre les entreprises plus innovantes, on constate cependant que le secteur public joue aussi un rôle important, en particulier lorsque les entreprises ne possèdent pas les compétences indispensables pour innover et que la demande du marché est insuffisante ou trop diffuse pour stimuler leur créativité. La plupart des entreprises considèrent les services à forte intensité de savoir comme indispensables à la mise en œuvre de l'innovation, et l'on peut penser qu'il existe un lien entre la capacité d'innovation et la propension à recourir à ces services. Par conséquent, les facteurs qui influent sur l'environnement de l'innovation peuvent exercer un impact marqué sur la demande de services de ce type. Il s'agit notamment de facteurs qui interviennent au niveau des

organisations ou qui caractérisent des secteurs industriels particuliers, comme en témoigne le secteur des services de santé (encadré 0.3).

Encadré 0.3. Créer une demande de services à forte intensité de savoir : enseignements tirés de l'expérience acquise dans le secteur de la santé

Les services de santé revêtent une grande importance, mais leur coût croissant pèse lourdement sur les systèmes existants. Le besoin de maîtriser ce coût, conjugué au progrès constant des pratiques médicales, des produits pharmaceutiques et des appareils médicaux, induit dans ces services une évolution qui se traduit par la nécessité d'améliorer en permanence les connaissances, les compétences et l'organisation. Les services à forte intensité de savoir apportent une contribution essentielle en aidant les établissements de soins à faire face à ces contraintes. Toutefois, le rôle qu'ils jouent dans l'innovation au sein du secteur de la santé dépend du contexte dans lequel celle-ci s'inscrit, contexte lui-même tributaire de facteurs qui interviennent à l'échelon national et local. Les politiques relatives à la fourniture et au paiement des soins de santé sont mises en oeuvre au niveau national et influent sur la structure du secteur de la santé. A l'échelon local, la situation est déterminée par les différents prestataires de services qui doivent adapter leurs activités de façon à pouvoir répondre à des exigences et des réglementations diverses et, parfois, contradictoires (comme le montrent les études sur la Finlande et la Norvège).

La demande de services externes à forte intensité de savoir dans le domaine des soins de santé, très variable, dépend d'un certain nombre de facteurs précis. Dans le cas de la Norvège, on a constaté que ces services externes n'avaient pas joué un grand rôle, même dans la mise en place et l'application du modèle acheteur-fournisseur. Les compétences spécialisées liées aux travaux de mise au point, aux activités juridiques, à l'administration et à la gestion, qui étaient déterminantes pour la transition à opérer, ont été puisées à l'intérieur. Des services internes et externes à forte intensité de savoir ont été associés pour assurer des activités de formation et d'information. L'entreprise prestataire de services de conseil, de formation, de R-D et de gestion dans le domaine des soins de santé, sur laquelle a porté l'étude concernant le Japon, utilise des services externes à forte intensité de savoir qu'elle va chercher dans des universités et des entreprises privées et chez des spécialistes de la R-D et de la gestion. Les services liés aux TIC font partie des services à forte intensité de savoir qui sont le plus souvent fournis par l'extérieur, étant donné que les établissements de soins de santé ne disposent généralement pas sur place des compétences dont ils ont besoin en la matière. C'est aussi le cas des services d'enseignement et de formation. L'élaboration et la mise en œuvre de stratégies, ainsi que la définition de méthodes de gestion appartiennent à des catégories de services à forte intensité de savoir qui posent davantage de difficultés.

Dans l'ensemble, les structures, les modes d'organisation et les relations entre dispensateurs de soins de santé ont une forte incidence sur la diffusion de l'innovation. L'adoption de pratiques novatrices entraîne souvent une remise en question des conceptions, normes et valeurs profondément ancrées qui sous-tendent de longue date la façon dont la fourniture de certains services est organisée dans un lieu particulier. Les professionnels doivent repenser leur rôle, leurs objectifs et leurs relations avec les autres sections de l'établissement et les autres disciplines, mais surtout avec les malades. Les obstacles à surmonter sont plus grands lorsque les services mis en œuvre exigent une coordination entre les disciplines, les sections ou les établissements, ainsi qu'une refonte des rapports qu'ils ont entre eux, ou mettent en cause l'autonomie des acteurs d'un établissement. En Finlande, par exemple, les principes relatifs à la gestion de la qualité sont considérés comme des bonnes pratiques propres à assurer des progrès constants en la matière, mais ils ne sont pas totalement acceptés car, s'ils permettent d'améliorer les capacités d'organisation, c'est au détriment de l'autonomie dont jouissent les spécialistes dans le domaine des soins de santé. En outre, les organismes spécialisés, comme ceux qui existent dans le secteur de la santé, tendent à privilégier l'apprentissage par l'expérience par rapport à l'adoption de pratiques déjà suivies par d'autres.

Encadré 0.3. Créer une demande de services à forte intensité de savoir : enseignements tirés de l'expérience acquise dans le secteur de la santé *(suite)*

Jusqu'à présent, les conditions du marché n'ont pas permis de créer des services spécialisés en dehors des établissements de soins de santé. Ces derniers possèdent généralement eux-mêmes davantage de compétences qu'ils ne peuvent en trouver à l'extérieur. Le potentiel d'innovation existant dans les systèmes de santé pourrait, semble-t-il, être beaucoup mieux exploité s'il y avait un réel partage des connaissances et des bonnes pratiques. Pour répondre à ce problème, les établissements pourraient notamment offrir leurs compétences à l'extérieur, mais ils n'y sont guère incités. Dans le secteur public, la conclusion d'un accord peut être singulièrement difficile, tant à l'intérieur que sur le plan externe. Par conséquent, les prestataires extérieurs de services à forte intensité de savoir doivent être très proches de leur clientèle afin de créer la confiance nécessaire. Les réseaux de services à forte intensité de savoir jouent un rôle essentiel dans la diffusion des nouvelles technologies médicales. Une fois que ces dernières ont été mises en place, la vitesse à laquelle elles se répandront dépendra d'un certain nombre de facteurs tous soumis à l'influence de ces réseaux. L'utilisation des technologies nouvelles crée de nouvelles informations qui sont diffusées à travers des séminaires, des conférences et des publications. Ces éléments permettent aux concepteurs de perfectionner ces technologies, et aux autres utilisateurs d'améliorer la façon dont ils les appliquent (Espagne).

Source : Etudes de cas présentées au chapitre 4 de ce rapport.

L'intégration des capacités internes et externes revêt une importance grandissante

A mesure que les services à forte intensité de savoir gagnent en utilité pour les activités d'innovation des entreprises et que le nombre de fournisseurs externes de ces services augmente, les entreprises sont confrontées à la difficulté croissante que pose l'intégration des capacités internes et de l'expertise externe. Comme il ressort de l'étude de cas sur les industries de ressources, cette intégration peut s'opérer de diverses manières. On peut entre autres :

- **Gérer efficacement les ressources humaines** : faire appel à des experts capables de renforcer les connaissances et la capacité d'absorption du personnel ; former des équipes de recherche multidisciplinaires qui élargissent les connaissances requises pour vendre des solutions ; et exploiter les relations personnelles avec les acteurs du secteur et d'autres experts.
- **Mettre en place les structures organisationnelles appropriées :** créer des unités opérationnelles spécialisées qui explorent l'environnement et développent de nouvelles compétences et activités ; acquérir des entreprises susceptibles d'apporter de nouvelles connaissances et des approches innovantes ; et mettre sur pied des coentreprises (par exemple avec des entreprises de services industriels), ce qui en règle générale institutionnalise la coopération avec d'autres entreprises et l'intégration des services à forte intensité de savoir.
- **Instaurer des liens et des réseaux efficaces :** participer à des réseaux qui offrent des possibilités d'intégration des connaissances internes et externes ; coopérer étroitement avec les fournisseurs et mettre sur pied des projets conjoints de développement ; collaborer étroitement avec les clients sur la mise au point de nouvelles solutions et mettre en place des projets conjoints de recherche.

- **Recourir aux transactions de marché :** acheter des offres groupées produit/service ce qui revient à importer dans l'entreprise des services à forte intensité de savoir d'origine externe ; recourir à l'externalisation pour associer d'anciens services internes à forte intensité de savoir à une expertise externe ; et acheter des services à des entreprises de services et collaborer avec celles-ci.

Pour utiliser efficacement les services à forte intensité de savoir, il est indispensable que les entreprises développent leurs compétences dans chacun de ces domaines.

Intégrer la dimension des services à forte intensité de savoir dans les politiques de l'innovation

Il y a tout lieu de penser que la poursuite de l'expansion de l'économie du savoir et le renforcement de la mondialisation économique vont accentuer l'importance de la contribution apportée par les services à forte intensité de savoir à l'innovation. L'évolution de la division du travail et l'offre de connaissances sont de puissants moteurs pour le développement de ces services. Le défi que devront relever les politiques de l'innovation consistera à promouvoir l'offre, la demande et la qualité des services à forte intensité de savoir pour améliorer les performances d'innovation. Les politiques pourront cibler les acteurs de ces services, directement ou indirectement, par le biais d'organisations intermédiaires ou par la création de conditions-cadres plus générales concernant la réglementation publique, la formation et le développement des compétences, et les pratiques de passation des marchés. En outre, le secteur public lui-même est un important fournisseur et utilisateur de ce type de services, et par conséquent une cible pour les politiques de l'innovation. Le tableau 0.2 présente certains aspects clés auxquels il convient de prêter attention pour mettre au point des panoplies équilibrées de mesures en faveur de l'innovation fondée sur les services à forte intensité de savoir.

Les connaissances issues de la recherche et une main-d'oeuvre hautement qualifiée sont indispensables pour un grand nombre de services à forte intensité de savoir. Les services à forte intensité de savoir interviennent de façon décisive dans la production et la diffusion des connaissances dans la mesure où ils appliquent et reformulent à des fins pratiques les connaissances issues de la recherche. Les pouvoirs publics peuvent jouer un rôle capital dans ce processus en soutenant la recherche fondamentale. La majeure partie des savoirs de base est apportée par les systèmes d'enseignement et de formation qui sont chargés de former une main-d'œuvre qualifiée. Des liens étroits avec les organisations du secteur public et du secteur privé peuvent contribuer à sensibiliser les établissements d'enseignement et de formation à l'évolution de la demande de main-d'œuvre qualifiée.

Parallèlement, **le cadre d'action pour l'innovation doit tenir compte des aspects non technologiques des services à forte intensité de savoir** et de leur impact sur la capacité d'innovation. L'étude KISA a mis en évidence le poids des contributions non technologiques dans la capacité d'innovation des entreprises. On peut donc penser que l'approche classique de l'innovation, qui est fondée sur la R-D, est trop étroite et que les politiques de l'innovation doivent prendre en considération les différents types de services à forte intensité de savoir et leurs rôles diversifiés dans les processus d'innovation. Il faut que les politiques se concentrent davantage sur les activités interactives centrées sur les personnes, et qu'elles soient ciblées non pas tant sur l'entreprise considérée isolément que sur le renforcement de la puissance collective du secteur ou du réseau. Dans la mesure où en règle générale les services à forte intensité de savoir reposent surtout sur des actifs incorporels, les politiques doivent assurer des financements

privés et publics suffisants en faveur des services de ce type qui sont axés sur la croissance. Il faut continuer à chercher à mieux cerner les éléments non technologiques de l'innovation, et la contribution des utilisateurs à l'innovation.

Tableau 0.2. Types de mesures susceptibles de faciliter l'innovation fondée sur les services à forte intensité de savoir

Formes d'action publique	Exemples de mesures en faveur de l' innovation
Intervention publique directe ciblée sur les entreprises/organisations	• Assurer aux entreprises des financements privés et publics, des aides et des crédits d'impôt pour le développement des services • Faciliter le transfert de technologies habilitantes capables d'étayer le rôle des services à forte intensité de savoir dans l'innovation
Intervention publique indirecte ciblée sur les acteurs autres que les entreprises au sein du système d'innovation	• Assurer la base de compétences nécessaire aux innovateurs dans le domaine des services • Elargir le champ d'activité des organismes de recherche et de technologie aux innovations non technologiques
Création de conditions-cadres facilitant le rôle des services à forte intensité de savoir dans l'innovation	• Ouvrir de nouveaux marchés pour les prestataires de services • Alléger les obligations réglementaires • Financer le recours à des services à forte intensité de savoir d'origine externe • Définir des bonnes pratiques et des normes de qualité des services • Promouvoir les services liés à la culture de l'innovation
Infléchissement des politiques de l'innovation en place pour une meilleure prise en compte des services	• Adopter une conception large de l'innovation, reconnaître la valeur des innovations de processus (technologiques et organisationnels), et des innovations de produits (biens et services) • Adapter les critères de financement et d'aide de façon que les projets d'innovation dans le domaine des services disposent d'un meilleur accès aux mesures en place • Assurer une formation et un développement des compétences en matière d'innovation liée aux services pour les acteurs qui mettent en œuvre la politique de l'innovation
Mise en place de nouvelles mesures axées sur des questions centrales pour le développement des services à forte intensité de savoir et l'innovation liée à ces services	• Favoriser les réseaux et l'interaction avec les clients en tant que plates-formes d'innovation • Mettre sur pied des organisations qui soient davantage en mesure d'utiliser les services à forte intensité de savoir fournis en interne et en externe

L'amélioration de l'accès aux services à forte intensité de savoir constitue un enjeu majeur. Le problème tient à l'immatérialité, à la complexité et aux difficultés auxquelles se heurte l'évaluation de la qualité et de l'adéquation des services offerts avant d'y faire appel. L'aide financière n'apporte qu'une solution partielle. Il faut d'abord assurer une meilleure connaissance des services à forte intensité de savoir et remédier à l'asymétrie de connaissances entre les fournisseurs de ces services et les utilisateurs, par exemple en certifiant les services et en mettant en place des projets de démonstration financés sur fonds publics.

Globalement, les politiques qui stimulent la demande de services à forte intensité de savoir peuvent aussi susciter une progression de l'offre et un renforcement de la qualité de ces services. Les politiques ne doivent pas trancher entre sources internes et sources externes de services à forte intensité de savoir tant que des travaux de recherche supplémentaires n'ont pas été menés sur les impacts plus généraux de l'externalisation sur la créativité et le développement des compétences. Les politiques de l'innovation en vigueur doivent être examinées et si nécessaires affinées pour veiller à ce qu'elles encouragent le renforcement des capacités et l'interaction au sein des organisations. Les politiques sus-

ceptibles d'améliorer la capacité d'absorption des connaissances des entreprises peuvent avoir un impact significatif sur leur capacité à utiliser les services à forte intensité de savoir qui sont à leur disposition. Les questions de réglementation doivent aussi être prises en compte. Dans le secteur des soins de santé, l'innovation et le recours aux services à forte intensité de savoir sont influencés par les incitations et les politiques en place dans le secteur de la santé, dans la mesure où les services de santé sont assurés conjointement par des acteurs publics, des acteurs privés et des tierces parties à l'intérieur d'un cadre très réglementé. Les pressions exercées en faveur de la maîtrise des coûts, associées aux innovations permanentes dans les pratiques médicales, les produits pharmaceutiques et les matériels médicaux sont des moteurs majeurs du changement. L'adaptation à ces mutations exige de constamment mettre à niveau les connaissances et les compétences mises en oeuvre dans les systèmes de santé, souvent par le biais d'activités de formation, d'enseignement et de divers autres types de services à forte intensité de savoir.

Les politiques doivent s'adapter à l'évolution des besoins en matière de services à forte intensité de savoir. Les besoins de ce type de services évoluent à mesure que les industries, les organisations et les innovations montent en régime. On peut se servir du cycle de vie de l'organisation innovante et du processus d'innovation lui-même pour déterminer quel type de service à forte intensité de savoir favorise de nouvelles avancées. L'équilibre entre les services à forte intensité de savoir d'origine interne et ceux d'origine externe peut aussi changer selon les stades du cycle de vie de l'innovation, ce qui rend nécessaire de prévoir différents types de mesures.

Bien entendu, les politiques doivent viser à favoriser des processus d'innovation interactifs, réactifs et basés sur la confiance sans pour autant intervenir directement. On peut parvenir à une perception plus fine de l'adéquation des différents types de mesures en développant des synergies étroites entre la conception des politiques et la mise en oeuvre des programmes et en prêtant attention aux besoins et aux réactions des bénéficiaires des politiques. Les politiques qui stimulent la demande de services à forte intensité de savoir sont tout aussi importantes que celles qui encouragent l'offre et la qualité de ces services. La coordination des politiques est appelée à jouer un rôle essentiel à cet égard, mais il sera nécessaire de mener des travaux de recherche complémentaires pour étudier plus en détail quelles sont les politiques publiques susceptibles d'être les plus efficaces pour stimuler l'offre et la demande de services à forte intensité de savoir.

Encadré 0.4. Les activités de service à forte intensité de savoir dans les industries de ressources

Les études de cas consacrées aux industries de ressources illustrent un certain nombre de thèmes généraux importants concernant le rôle des services à forte intensité de savoir dans l'innovation. L'étude de cas australienne sur les sociétés de services technologiques du secteur minier et l'étude de cas finlandaise sur les entreprises de la filière bois, par exemple, montrent que pour utiliser les services à forte intensité de savoir, il faut déjà que les entreprises aient conscience de l'importance de ces activités. Les sociétés de services technologiques du secteur minier étant elles-mêmes des prestataires de services, elles comprennent bien comment l'interaction avec le fournisseur d'un service à forte intensité de savoir peut favoriser leurs activités commerciales. Leur main-d'œuvre possédant un haut niveau d'instruction, elles savent maîtriser le processus d'apprentissage et s'appuyer sur les compétences et les connaissances qu'elles possèdent. La description ci-dessus s'applique aussi parfaitement à la filière bois, dont l'activité centrale est la fabrication, mais dans laquelle les services de soutien et de développement jouent un rôle essentiel en stimulant la productivité et la qualité des produits. Les grandes entreprises du secteur forestier s'efforcent de développer leurs activités autour de solutions intégrées produits-services.

Encadré 0.4. Les activités de service à forte intensité de savoir dans les industries de ressources *(suite)*

Ces études de cas illustrent aussi la relation entre les activités manufacturières et les services, et font ressortir la nécessité des activités de service à forte intensité de savoir. Plusieurs entreprises du secteur australien des services technologiques miniers ont mis au point des outils destinés à des tâches particulières et les ont ensuite commercialisés de façon autonome, ou ont compris que leurs modes opératoires internes avaient une valeur et qu'ils pouvaient être vendus. Les entreprises de la filière bois ont pris conscience de l'intérêt du développement des connaissances au niveau des entreprises et des grappes. Les entreprises utilisent largement l'automatisation et constituent leurs bases de connaissances sur des procédés de production complexes. Elles réorganisent leurs efforts de recherche afin de former des unités de recherche pluridisciplinaires plus efficaces qui s'attachent à combiner des innovations aussi bien technologiques que non technologiques (par exemple, de type organisationnel). De telles évolutions mettent en lumière l'importance que revêt la constitution de liens étroits avec les clients, car les entreprises qui contrôlent l'interface avec l'utilisateur final peuvent également exercer un contrôle sur l'ensemble de la chaîne de valeur.

Le comportement des consommateurs, les segments de marché, l'évolution de la structure de la demande, la logistique, les marchés et le marketing, qui relèvent des activités de service à forte intensité de savoir, revêtent d'autant plus d'importance que les organisations se positionnent vers l'aval de la chaîne de valeur, au niveau des clients et des utilisateurs finals. Deux éléments moteurs au moins dynamisent les activités d'innovation à l'extrémité « client » de la chaîne de valeur. D'une part, l'interaction avec les clients et les communautés d'utilisateurs apporte aux organisations des connaissances inestimables pour les processus de R-D, de même que les entreprises sont pour leurs clients une source de connaissances spécialisées pouvant les aider à résoudre leurs problèmes. D'autre part, une interaction étroite avec les clients est perçue comme un atout stratégique qui permet à l'entreprise de consolider sa position pour mieux asseoir sa compétitivité future. Comme on l'a vu déjà à propos de l'étude de cas finlandaise, maîtriser l'interface avec l'utilisateur final permet donc de contrôler la totalité de la chaîne de valeur.

L'étude sur l'aquaculture norvégienne montre comment l'aptitude à recourir à des services à forte intensité de savoir varie selon les types d'entreprises. Les principaux facteurs influant sur la capacité d'absorption des entreprises sont notamment : la taille de l'entreprise, la division du travail en son sein, la base de connaissances et les ressources disponibles pour le développement des connaissances. Les petites entreprises en particulier ne semblent pas avoir pris la mesure de l'importance des activités de service à forte intensité de savoir et, d'une façon générale, les services de ce type fournis en externe ne sont guère perçus comme une source d'innovation potentielle. Néanmoins, les fournisseurs externes sont plus sollicités qu'auparavant, en particulier pour les activités de développement liées à l'innovation de produits et de procédés, aux projets TIC, ainsi qu'aux activités bancaires et d'aide financière (souvent liées à des fusions et acquisitions). Ces acteurs externes appartiennent généralement à d'autres parties du groupe d'entreprises, ou à des réseaux de fournisseurs, de concurrents ou de spécialistes des questions fiscales et réglementaires. Seules les entreprises à vocation scientifique du secteur norvégien de l'aquaculture considéraient les organismes de recherche et de technologie financés sur fonds publics comme une source d'innovation spécifique.

Source : Études de cas présentées au chapitre 6 du présent rapport.

Chapter 1

SYNTHESIS AND MAIN FINDINGS[1]

Introduction

The KISA project forms part of the OECD's ongoing analysis of national innovation systems. In contrast to most of the work in the area, the KISA project: *a)* has a micro-level focus on firm or organisation level activities; *b)* recognises the importance of service activities to innovation; and *c)* examines the dynamic growth of innovation capacity within organisations. With more than 230 personal interviews and survey data from over 1 000 respondents, the KISA project represents a major research contribution in the area.

Businesses and other organisations are involved in knowledge-intensive service activities — internally and externally provided KISA — in their everyday operations. In the research for this project, the concept of knowledge-intensive service activities was defined as follows:

> *KISA refers to production or integration of service activities, undertaken by firms and public sector actors — in the context of manufacturing or services, in combination with manufactured outputs or as stand-alone services.* (OECD 2001, 2003, 2004).

The range and scope of knowledge-intensive service activities is extensive and different types of organisations are involved in their delivery and consumption. KISA can be delivered to organisations by other firms; publicly funded or sponsored organisations; formal and informal networks; and/or by in-house experts. Importantly, knowledge-intensive service activities do not constitute a 'sector' or 'cluster', but a function that is present in all industries (see OECD, 2001).

The KISA project explores the role of knowledge-intensive service activities in innovation.[2] More specifically, the project investigates the nature and use of knowledge-intensive services in innovation in a number of different settings. It is assumed that services can act in different roles, for instance as facilitators, carriers and sources of innovation (Miles *et al*., 1995; Bilderbeek *et al*., 1998:40-42; Toivonen, 2004). As such, the study is exploratory in nature, but it also seeks to achieve a certain level of comparability across industries and participating countries.

1. This section of the report was compiled and edited by Jari Kuusisto and Anne Holmes.

2. Innovations in this study include product and process innovations. Product innovations are new – or better – material goods and intangible services. Process innovations are new ways of producing goods and services. They may be technological or organisational (Edquist, 2005:182).

The first part of the report synthesises the findings of the KISA project. This chapter defines knowledge-intensive service activities, reviews lessons learned from the country case studies, and identifies policy implications. Chapter 2 reviews the approach taken to conduct the country case studies. Part 2 presents more detailed summaries of the sectoral case studies conducted as part of the project. Chapters 3 through 6 summarise the key themes emerging from the country studies conducted of the software, health care services, tourism and leisure and resource-based industries.

Putting KISA in context

The KISA project takes as its starting point that innovation occurs in a system where numerous public and private sector actors, external and internal experts, are involved in knowledge-intensive service activities, creating and disseminating knowledge that provides the basis for the innovation capacity. The system is characterised by interactions and relationships among the various actors. Feedback loops allow new ideas and knowledge develop, resulting in to learning, greater absorptive capacity and innovation. Hence, the KISA project builds on the idea of an innovation system where interactions among players have a key role in innovation, and various agents and organisations communicate, co-operate and establish long-term relationships (Christensen, Schibany and Vinding, 2000; OECD, 1999).

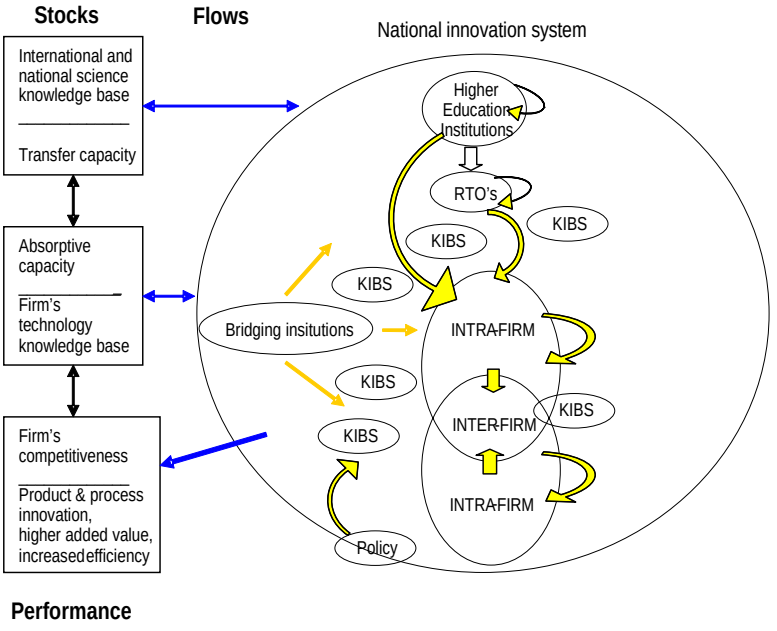
The KISA project also investigates what happens within organisations as they build their competences and capabilities: Where do organisations acquire new knowledge, and how do they internalise and build on such knowledge through their innovation processes? Figure 1.1 presents knowledge flows, stocks of knowledge and absorptive capacity within the national innovation system and links them with firms' competitiveness. Arrows representing knowledge flows indicate that knowledge creation and dissemination are interactive processes where KISA plays a key role (see Manley, 2003). Inside the business sector knowledge flows within and between organisations, and to and from their suppliers. Firms that provide knowledge-intensive business services (KIBS) are located in different parts of the system, and such services can have multiple roles as carriers, sources and innovators on their own right. In such a system, society as a whole should provide a fertile ground for interactive innovation raising the issue of horizontal innovation policies (European Commission, 2002:51-3).

Defining service-related innovation

Early studies of innovation focused on the development of new or improved manufactured products, with a strong reliance on models of technological innovation. More recent studies of service innovation have broadened the scope of innovation significantly to new service concepts, new ways of communicating (with intermediaries and clients) and organisational innovations. In this study service-related innovation can be defined as:

> *A new or considerably changed service concept, client interaction channel, service delivery system or technological concept that individually, but most likely in combination leads to one or more (re)new(ed) service functions that are new to the firm and do change the service/good offered on the market and do require structurally new technological, human or organisational capabilities of the service organisation* (van Ark *et al.*, 2003:16).

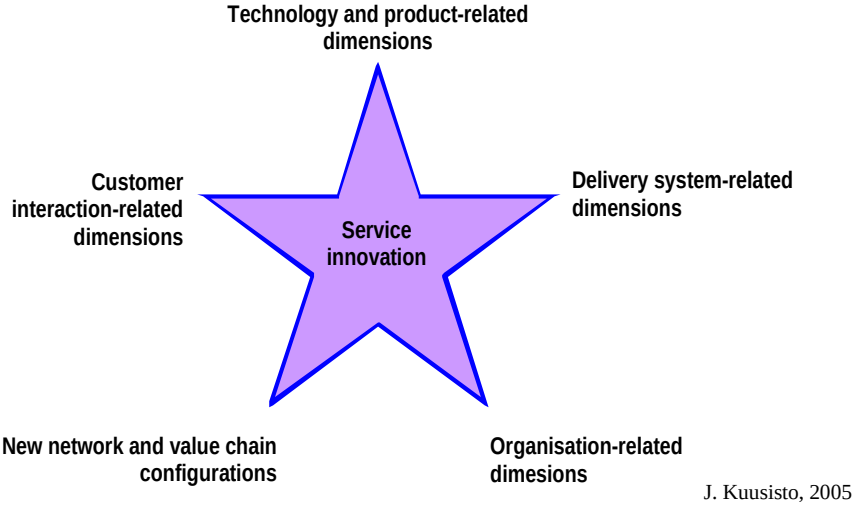
Figure 1.1. KISA in knowledge production and knowledge diffusion within the innovation system



Source: den Hertog *et al.* (1995), p. 9.

The concept of multidimensional innovation has been strongly linked with services (Figure 1.2). However, it is gaining ground in the wider context, including manufacturing innovation. It can be argued that many of the claimed peculiarities of services innovation, such as a strong presence of organisational innovation, involvement of multiple actors in the process of innovation and the codification of knowledge for carrying out innovation, are increasingly present in manufacturing. The traditional technology approach to innovation appears to be too narrow also for manufacturing. Hence, the need for synthesis approach to innovation is underlined (Drejer, 2004:560).

Figure 1.2. The multi-dimensional nature of innovation



J. Kuusisto, 2005

Another perspective on the role of knowledge-intensive services is provided by taxonomies based on the sources or drivers of innovation. A useful typology in this connection is the one presented by van Ark *et al*. (2003:16-18), which defines five different types of service innovation:

- **Paradigmatic innovations** representing complex and pervasive innovations that affect all actors in a value chain, for example, new technologies or regulatory changes.
- **Supplier-dominated innovation** largely based on technological innovations supplied by hardware manufacturers.
- **Customer-led innovations** where the organisation innovates on the basis of specific needs articulated by its clients.
- **Innovation within services** initiated by and taking place within a service organisation.
- **Innovation through services** where the service supplier influences the innovation that takes place within the client organisation.

The last of the above categories, *innovation through services*, proves the most interesting in framing questions for the KISA project. As will be shown, however, the cases also generated interesting information on the other above-mentioned areas of innovation.

KISA and research on services

The KISA project utilises several research traditions in the area of services and innovation. Up to now research on services has been characterised by parallel traditions that have fairly limited interaction among them. Yet all of these approaches can provide useful insights to KISA, and their role in innovation.

Economic and marketing research

Economics and marketing research have been among the first disciplines to focus attention on services. The notion that advanced economies had entered a new era in which the services sector and service occupations had replaced manufacturing as the engine of economic growth became widespread in the 1960s (see Fuchs, 1968; Sayer and Walker, 1992:56-7). The economic significance of services rapidly increased research interest in to more detailed analysis of service processes. Marketing research then recognised that suppliers and buyers are jointly engaged in complex decision-making process, risk-taking and problem-solving (Bonoma and Johnston, 1978). Since the late 1970s services marketing has developed into a strong body of research focusing on the interaction between suppliers and buyers, as well as organisational issues and operations management in service organisations. More recently, innovation literature has recognised interactive elements in innovation and the user-centred innovation process (OECD, 2001; Hippel, 2005).

Services and innovation research

In innovation research, services have occupied a secondary position in relation to the manufacturing sectors (Toivonen, 2004). Services have been mainly examined as users of innovations produced in technology-based sectors, not as sources of innovations. However, this way of thinking has proved too simplistic. It has been shown that many

significant service sectors are highly innovative (Howells, 2000:6; Metcalfe and Miles, 2000:2-3). Further on, analysis of innovation processes has revealed that these processes invariably include many kinds of service functions. Hence, it has been realised that it is important to study both 'innovation in services' and 'role of services in innovation' (Hauknes, 1996; Hauknes, 1998).

The need to study services-related innovation as a subsystem of an emerging service-economy has been stressed by Hales (2001:66). Service organisations are not important only because of their great and growing economic weight but also as suppliers of innovation inputs to other firms. The division of labour among firms is constantly advancing so that organisations that were once vertically integrated now outsource functions that are not their core business (Coffey and Bailly, 1991; Sayer and Walker, 1992; see also Abramovsky *et al*., 2004). As a result, new markets for services are constantly emerging. Many new organisations have been established to provide these services, and they have developed specialist expertise. As they deal with more client organisations, they gain greater depth and breadth of knowledge of their areas, so that with specialisation has come an increasing sophistication in the services supplied. This in turn has materialised as service firms' greater capacity to contribute to the development of client organisations.

Knowledge-intensive business services and KISA

Knowledge-intensive business services (KIBS) in particular have emerged as a dynamic industry supplying for instance, management consulting, accounting, legal, marketing, and personnel services. KIBS organisations are private service businesses that sell their services on markets to other businesses and organisations (Miles, 2003). As such, KIBS represent a subset of KISA that has an important role in the innovation system. They have been studied as an industry in their own right. For example, accounting and legal solutions are sold, even exported, and the growth rate of these kinds of businesses is significant (see for example Toivonen, 2004; Miles, 1993).

However, KIBS are not the only source of knowledge-intensive services. KISA is a wider concept including activities carried out by private and the public sector service suppliers as well as services produced within the organisations. For instance, government-funded research and technology organisations are very well established suppliers of KISA, and they have been excessively studied as important actors in innovation systems. A range of other types of organisations — for instance, industry associations — supply various types of KISA at varying levels of complexity.

Knowledge-intensive service activities and their role in innovation

KISA can have different roles in relation to innovation. Some services are routine-like, such as most accounting. In other cases, KISA can be a vehicle for bringing in important new knowledge to the organisation. For example, advice on a specific issue of intellectual property protection might change the whole way a firm looks at its new ideas and values its routines. Some services are tailored to the organisation, and may be the source of new ideas about products or about implementation. Knowledge-intensive service activities may have at least three different roles in facilitating innovation in the client organisation (adapted from Miles *et al*., 1995). KISA can act as:

- A **facilitator** of innovation supporting the organisation during the process that leads to an innovation.
- A **carrier** of innovation transferring existing knowledge and innovations between organisations, industries or networks, or within the organisation so that it can be applied into a new context.
- A **source** of innovation playing major role in initiating and developing innovations within client organisations.

The different ways that services operate depend partly on the response of the client organisation: how it engages with the supplier of the service, how it retains learning from the service, and how it manages knowledge throughout the organisation. All these features are part of the interactive nature of the service process.

Research approach to KISA

The KISA project takes a novel approach to studying the nature services. It investigates *knowledge-intensive service activities* and their role in innovation. The focus of KISA is not on one sector or a particular technology, but on the role of knowledge-intensive service activities in a range of different settings including: the software industry, health care, tourism and leisure, and resource-based industries. The project investigates the nature and use of knowledge-intensive services in innovation in these different settings. As such the study is exploratory in nature, but it also seeks to achieve a certain level of comparability across the industries and participating countries.

The ultimate objective of the KISA study is to contribute to the development of innovation policies in OECD member countries by assisting them in the production and use of knowledge-intensive service activities. This can be achieved by combining qualitative case studies and aggregate level national statistics and generic indices of service trade. Potentially, increased understanding of knowledge-intensive service activities can transform into many new insights into innovation systems – given that the flow of such activities clearly plays a key role in innovation systems (OECD, 2001).

Research questions

As an exploratory study, the first main research task of the KISA project was to identify and describe different types of KISA. The second task of the research was to analyse the role of various types of identified KISA in relation to innovation. The final research task is to discuss the policy implications of the research results.

The analysis includes such issues as: How do organisations use knowledge-intensive services to supplement their competitive advantage in their industry? How do organisations use KISA to build their capabilities? How are organisations able to utilise KISA in innovation? How do organisations use KISA to improve their absorptive capacity for further new ideas?

The original research questions were of two kinds:

- What kinds of KISA can be identified in different countries and industries? This data was acquired by through survey research.
- How do KISA-related processes work? These issues were examined in case studies.

More detailed research questions and the results of the analysis are presented in the second part of this report. The first part presents the emerging themes on KISA and innovation, as well as a synthesis and policy implications.

Research method

The KISA study has taken a novel approach to addressing subtle questions that may not lend themselves to definitive answers. This study seeks to further develop analytical concepts and an understanding of the KISA and innovation-related processes. The research includes a set of industry-specific studies in participating countries employing a range of different research approaches. This type of analysis can highlight differences and similarities in the role, composition and importance of KISA across the countries and industries.

Since the KISA study is a multinational research effort, some degree of comparability between the countries is desirable. Such comparability favours a rather structured quantitative approach applied mainly in the surveys and statistical analysis. Here, each country study assembled the available data on the selected industries. These varied in depth and relevance, but most shed some light on the innovation process of the specific industry in the specific country and some actually gave information on use of services. In several country studies this was followed by a survey designed around the specific KISA-related questions. In some areas, such as software, there were enough surveys and they were comprehensive enough for statistical analysis.

Each country study included case studies of organisations in the targeted industries. They varied significantly, but in general were informed by the quantitative work and involved structured investigation seeking answers to the common research questions. Each study also presented a survey of government innovation policies targeting the industry under investigation. Particular attention was given to policies that seek to influence supply and/or demand for knowledge-intensive services. Finally, the country studies present some analysis of policy measures influencing knowledge-intensive service activities and identify needs for further actions. The adopted research approach is based on the theory that triangulation of research methods (qualitative-quantitative), data (cross-country, cross-industry) and theoretical approaches can improve the reliability and validity of the research results. The purpose was to minimise the risk that findings would be simply an artefact of a single method, a single source, or a single investigator bias (Patton, 2002). Such triangulation is a key feature of the KISA study and the following will provide more details on the quantitative and qualitative studies. Part 2 of this report presents both the quantitative and the qualitative data that provide the empirical basis for the synthesis and policy discussion.

Industries investigated

The empirical studies conducted by participating countries covered a range of industry sectors including health care, software, tourism and leisure, and resource-based industries (*e.g.* mining technology services, aquaculture and forestry). The industries chosen give a good overall coverage of the economy. Each is also an important area for research:

- **Software** represents a relatively new, innovative and dynamic industry.
- **Health care** represents a significant challenge for most developed countries because of rising costs due to ageing populations, increasingly sophisticated and costly medical treatments, and the opportunities for improved prevention and treatments through the application of technologies such as biotechnology and ICT.
- **Tourism and leisure** represent an important growth sector since consumers increasing spending power creates new demand for a wide range of services related to people's time outside working hours.
- **Resource-based industries** face challenges and competitive pressures created by increasingly global value chains, low cost base of developing countries, and the use of new technologies which often requires KISA to be operational.

Emerging themes from the KISA Study

The major outcome of the KISA project is a comparative analysis of different kinds of service inputs to the innovation in firms and organisations. These research results can enhance the effectiveness of policy directions and delivery in government. The role of KISA in innovation includes two major aspects: the type of interaction involved and the nature of the KISA themselves (OECD, 2001).

The research results demonstrate how KISA can be provided either externally by specialist businesses, externally by the public sector, including public sector research organisations, or internally by the user organisation. The research also provides evidence that shows the significance of the cluster context and network relationships in determining both the strategies of different service providers and users, and the contributions that specific services make to innovation processes in firms. The research results demonstrate the influence of different types of contexts, health care services, software services, tourism and leisure services and resource-based industries, on the role of KISA. The context determines, for example, the balance between commercial, public and internally provided services needed by organisations for different types of innovation. Such detailed understanding of the production and use of knowledge-intensive service activities cannot be obtained from analysis based solely on aggregate national statistics and generic indices of service trade.

The subject area of this study, knowledge-intensive service activities, is a new area of study. There were many instances where research group had some difficulties in operationalising this novel concept. As such, this is a common challenge for explorative studies. Indeed, it is impossible to study KISA in isolation from all the other things that are going on in the firm, its network and its innovation system. Maintaining conceptual clarity was made even more difficult by the choice of industries for study. Service industries are the largest and fastest growing sector of the economy, so it is not surprising that many of the country studies are on knowledge-intensive service industries, particularly software, health care, and mining technology services. These were good choices, too, because services have often been neglected in studies of innovation systems.

Studying knowledge-intensive service activities was perhaps most challenging in cases where the receiving firm was itself a provider of knowledge-intensive services. In such cases it is challenging to keep track on the direction of KISA, and whether the respondents speak as a supplier or recipient of services. Indeed, in some studies the focus

did slip from the industry being studied to its customers. However, some studies tackled the issue head-on: the Korean software report, for example, included a section on the impact the case study firms had on other industries. Others, like some of the software studies, used it as an opportunity to look at interactions, network effects, and customer-driven innovation. In general, the dual role of some of the firms heightened the important perception that a firm's learning strategies and use of KISA depend at least partly on its general innovation strategy, which in turn is often characteristic of its industry.

Knowledge-intensive services: supply and demand

Knowing enough to recognise the need for a service

At their most basic, knowledge-intensive service activities are characterised by their absence. Businesses may simply be ignorant of the need for knowledge, the existence of it, or the availability of a service in the market. For example, in Australia in the 1990s, it was concluded that scientists did not know enough about patenting, or even the need for it, to protect their discoveries. Without a patent, they had no equity in their discovery, and without the equity they could not raise funds to develop a product. In these cases the necessary knowledge-intensive services activities were not undertaken because the need for them was not recognised. So the first issue involves whether knowledge-intensive service activities are engaged in at all. Lack of awareness of knowledge-intensive services occurred mostly in small firms, for two kinds of reasons. In the Norwegian aquaculture study, small low technology family firms were struggling to survive, and regarded KISA, if they thought of them at all, as a luxury they could not afford.

Many of the non-innovative tourism firms were similar. Small high technology entrepreneurial firms in the aquaculture industry tended not to think they needed business services, seeing the development of their technology as their important activity and everything else as secondary. On the other hand, firms that were themselves suppliers of knowledge-intensive services were generally aware of the importance of such services. They also recognised the value of interacting with suppliers and customers, and its potential contribution towards innovation. In general, the use of knowledge-intensive services tends to cumulate to businesses with more resources and innovation capabilities, both internally and externally provided. Most regarded such services as essential to implementing their innovation, and there may be a link between innovativeness and the willingness to use knowledge-intensive services. Some particular services were underused. Failure to protect intellectual property was still fairly frequent in most industries. Many firms did not appreciate the usefulness of marketing services. There were instances of firms being unaware of the available government assistance for innovation, research and development, or export development.

Health care is a special sector where the environment is highly regulated and organised. At a very high level of abstraction the innovation climate is set on one hand at the national level by general and health care-specific policies and incentives and on the other hand, at the level of health care service providers who must adjust their operations to meet the various and often conflicting demands. A third dimension comes from the continuous innovation in medical practices, pharmaceuticals and medical devices. Their adoption requires constant upgrading of the knowledge and skills of health care professionals through training and education.

What services the organisation decides to use depends, of course, on what is available and what services it needs to complement its internal capabilities. The question of what is available creates the 'chicken-egg' problem. If there is no demand for expert services there is probably no supply either. At expert organisations health care is 'curious', eager and willing to learn new things. However, introduction of professional management practices is not fully accepted as its main thrust is in organisational improvement at the cost of losing part of the autonomy that experts enjoy on health care. As a result, management is not considered important in comparison with the main function of health care, treating ill patients. Adoption of an innovation often means altering beliefs, norms, and values embedded in the traditional organisation of a particular services provision in a particular place under long cultural roots. Staff members have to think differently about their roles, their goals, and their interrelationship with other departments and disciplines, and what is more important with patients.

Make or buy?

Central to discussion of knowledge-intensive service activities is what causes a firm to develop knowledge internally versus getting it from outside. According to the transaction costs theory, a firm will purchase services in the market if they are cheaper; but intangible factors such as issues of trust may also impose costs (Williamson, 1985). In the case of knowledge-intensive services, almost by definition the seller of the service will have information that buyers will not have, so it will be difficult for the buyers to know if they are getting good value. There are also questions of the fit between the skills the firm has and the ones it wants to acquire. If the skills the firm requires are similar to the ones it has, it is likely to develop them in-house; if they are complementary but different, it is likely to acquire them externally (Richardson, 1972).

In general, the studies showed that many firms provide knowledge-intensive services internally most of the time. The decision whether to develop a service internally or buy it in depends on a number of variables, including the size of the firm, various life cycle factors, and the nature of the service. In addition, the use of external services depends on the supply of specialist services.

Some of the studies were on companies or systems big enough to provide most services in-house, should they choose to do so. A number of the Irish software firms, for example, were subsidiaries of multinational corporations and were able to use services provided within the company, sometimes in other countries. Some of the health care services organisations were also part of large systems. In many of the studies, however, small firms provided their own services because they could not afford to purchase them on the market. They recognised the need for, say, business planning or accounting, or personnel management services, and so they developed sufficient expertise to perform the needed services themselves. Sometimes they begrudged the time and effort away from what they saw as their core business, and hoped that in the future they would be able to buy the service in the market place. The very small Norwegian aquaculture firms were family-managed without knowledge-intensive services. This situation prevailed until the firm grew large enough to employ middle management that acquired the skills to provide such services.

Make-or-buy decisions are often contingent on the strategic role of the service to the firm's core business and its relation to innovation. Often firms kept everything to do with their core business in-house. Sometimes they thought that they would get better results that way, as was the case with many software firms. In some cases they were conscious

that they learned and built skills by doing it themselves, like the tourism firms learning about marketing. Some organisations used internal provision to build a culture of innovation and a commitment to the new ideas, as in the Finnish health care study. In many cases, too, there were issues of commercial confidentiality – the obverse of the network effects that will be discussed later. At other times, it was important to maintain control of important processes, and retain an integrated view of the whole enterprise, as in the Finnish forest industries study. All of these elements were at work in the generalisation that firms used external research providers for long-term basic research, but did short-term, product-related research projects internally.

Clear differences can be seen in the case studies regarding three classes of KISA:

1. **Strategic KISA.** The control services that are strategic to the firm are typically kept inside the organisation, although some highly specialised complementary KISA could be acquired from external experts. Examples of strategic KISA include core business competences (*e.g.* techno-economic management of a paper mill); key technologies and their development (*e.g.* fibre-related research and development and process technologies; and integrated business level information systems (*e.g.* systems that enable process control in paper manufacturing, related logistics and marketing systems, systems that simulate and assist in the management of the economics of the paper mill).
2. **KISA supporting and/or improving existing processes** can be outsourced to an external provider. The key problem with such services is to determine whether they are strategic or supportive in nature. One example of a supportive KISA is service and maintenance of a paper mill. Some businesses have outsourced the entire service and maintenance function whereas others maintain that this is part of their core business.
3. **KISA delivering solutions or improvements** to specific, well-defined tasks. The use of external KISA is common and increasing in types of services such as: marketing and advertising; accounting services; and legal services

Other factors also appear to influence make-or-buy decisions. Firms sometimes outsource services for compliance reasons to do with auditing or certification. These services may still contribute to activities which enhanced innovative capacity by suggesting quality improvements and improvements to processes. Sometimes firms consciously seek outside views to complement insiders' perspective. This was especially noticeable when the innovation came from an idea of senior management, and ideas were sought for its implementation. There was a perception that some creative consultants would lose their edge if they became part of the routine management of the firm. In the Finnish health care study it was important to have an outside, impartial perspective for the strategic overview, and neutral honest brokers between levels of government. Finally, there were cases where firms used external consultants to complement existing but limited internal expertise. For example, Spanish tourism firms often employed environmental consultants who would drive innovations that would then be administered by regular staff.

Firms also outsource work because they lack necessary skills in-house. Sometimes they aspired to develop them. If the firm was simply too small to justify employing a specialist with the skills, however, it sometimes employed an external provider in order to learn the skills so it could be done in-house next time. In other cases, they were not regarded as core business. In the latter case, they were unlikely to engage much with the service or learn much from it. In some cases, appropriate services were not available

externally. For example, some Australian mining technology services firms operated in remote locations where services were unavailable; some industries, like the Finnish leisure industries, were part of a new wave of development where the required services, in this case knowledge of life style issues, were only just emerging.

Sources of knowledge-intensive services

Firms acquire knowledge-intensive services from a variety of sources. One of the most obvious sources that was examined in all the studies is firms in the knowledge-intensive business services sector. In general, firms had little difficulty in finding the regular business services they needed, such as accounting, legal advice and management consultancy. Some large firms outsourced large parts of their business, so that presumably the only activity on the part of the firm was settling the contract and supervising it. Industry associations, in contrast, were not seen as important service providers. However, the differences in the scope of associations in the different industries and countries are significant.

Government-funded research organisations were used in some industries, particularly the resource-based sectors. They were relied on more for long-term research rather than for development. In software business, however, many firms reported that government research organsations were irrelevant, and several Australian tourism firms observed that the firm was the site rather than the beneficiary of research. On the other hand, they benefited from the market research of government funded local tourism organisations. Only for the science-based entrepreneurs in the Norwegian aquaculture industry did publicly funded research and technology organisations represent a source of specific innovation.

Perhaps the most striking finding from the research is the importance of the firm's networks as a source of knowledge-intensive services, especially industry and market intelligence. The most important single driver of innovation for existing firms was customers, both immediate and end users, who provided not only the demand and the impulse for innovation but also much of the technical specifications and know-how. Suppliers, too, were the source of much knowledge. Peers and even competitors were also important in the innovation system. This was equally true in the high and low technology sectors. The network was especially important when a firm was contemplating a new activity, for example, commencing exporting.

The Norwegian health care study pointed to an interesting specific example of external provision of knowledge-intensive services. When a public sector function is split into a separate purchaser and provider roles, in effect an external service provider is created. This new organisation can then offer services to number of other buyers as well.

A cluster perspective to KISA

The analysis provides some evidence that industry clusters serve as a platform for various types of KISA. Studies of the health care, aquaculture and forest industries showed the significance of clusters and network relationships in determining both the strategies of different service providers and users, and the contributions that specific services make to innovation processes in firm.

The professional culture of the health care sector seems to be a bottleneck that can often prevent the full use of external KISA, even if the need for it has been recognised. There seems to be an obvious need for external expertise on health care management and quality management but so far the progress in the use of external KISA is rather limited.

Health care is a knowledge-intensive service in itself characterised by highly independent health care professionals. Introduction of both quality management and organisation management functions are viewed as taking decision power away from experts and putting into the hands of experts from other domains (managers, administrators and politicians). Another dimension typical of health care cluster is the large number of stakeholders who have influence on decision-making. It is very hard to introduce any strategic changes due to various interest groups that exercise their influence on the health care cluster, this problem is being emphasized by the consensus-based decision making process.

The role of small and medium-sized enterprises (SMEs) as part of the investigated aquaculture and forest clusters indicates that smaller enterprises tend to be in a weak position because of their limited resource base. As a result, small firms may have limited access to KISA even if their limited resources mean that they could clearly benefit from external expertise and resources. In the case of Finnish forest cluster larger firms expressed their concern because of the limited number of small and medium-sized firms in the cluster. Innovative SMEs are seen as an essential source of KISA and innovations within the cluster. Typically large firms buy in innovations that have been developed by smaller firms, since they have resources to develop and fully capitalise the value of innovation on the markets. SMEs also have a key role as large firms are developing their value chain and business concepts. Many of the internal KISA can be outsourced to medium-sized firms that become sources of external KISA. In this way larger firms can redirect their resources to the other areas of value chain they are keen to develop.

Over time, clusters have developed into complex networks of different types of businesses, industry organisations, education, research and development institutions and numerous informal linkages. These elements of clustering can clearly advance an effective division of labour in research and development activities and in the overall availability of KISA. However, this division of labour is dynamic in nature and there were concerns that globalisation and changing business practices may change much faster than those parts of the network that are closely linked with the institutional framework. As a result, the supply of public research-based KISA does not match with the rapidly evolving demand, for instance in terms of cross-disciplinary consumer oriented research. In other words, public R&D may not be able to evolve at the same speed as the commercial actors do. For instance, there was a perception that both public sector research and businesses are now putting more resources on the applied research, implying that a lack of sufficient investment in basic research could in the end erode stocks of knowledge. Without a sufficient science-based knowledge base, applied research will also suffer.

The role of KISA in innovation

Managing knowledge and developing innovative capacity

The key aim of the KISA project is to generate a comparative analysis of different kinds of service inputs to the management of innovation in firms. The research analyses both the production and use of knowledge-intensive services (OECD, 2001).

The following perspective is related to the use of knowledge-intensive services, more specifically how firms manage knowledge once they have acquired it: how they build on internally and externally provided services to acquire a new capability.

With a purely internally provided service, the process of learning by doing is obvious and well documented. Firms may have ways of capturing knowledge, for example by staff suggestion schemes and staff meetings to share new insights. Sometimes firms used internal provision as a way of building and maintaining leading edge skills: for example, it might decide to have a person responsible for training who would thus have to keep up with events in order to pass them on to other staff. Even with internal provision, there is likely to be external input from manuals, Web-based services and industry journals. Technical staff maintained their expertise to a great extent by interaction with the network – though the Danish health study showed that this could have uneven results.

The most obvious example of developing new capabilities by KISA occurs when training is undertaken. Then the objective is to transfer the information from the external organisation to the firm so that it can be reproduced and used. Some firms form close relationships with selected service providers, who contribute to building the firm in the same way as staff, especially in the introduction of new technologies. When firms use external service providers, they often have to acquire complementary skills. For example, employing an accountant to audit the books may well entail learning to present the accounts in a particular way, which then becomes a time-saving and management-enhancing tool. Dealing with external providers may thus improve the firm's absorptive capacity.

The knowledge embedded in a service will be left behind in documentation and the skills of staff, at least. Firms may have formal methods for storing and reproducing knowledge, or they may rely on memory and experienced staff. It is important to recognise that what is provided and what is received are not necessarily the same thing. Firms may learn lessons that a service provider does not know it is teaching, perhaps about the way information is acquired as well as the information itself. Equally, it may not take in indirect information – for example, the logic behind certain processes – which the provider thinks is obvious. The extent to which firms build capability is partly a function of their absorptive capacity, which depends on the existing technical knowledge of staff but also on the time people have for learning and their readiness to learn new skills.

In the context of knowledge-intensive services, the notion of co-production of knowledge is important. In working together, the firm and service provider build new knowledge, and sometimes even a new innovation culture. In the Finnish health care study it was reported that external input of technical knowledge was of little use until it was integrated into practice, which in fact kept some of the old ideas as well. The external concepts had to be internally tailored. Similarly, the Norwegian health care study noted that a variety of external services had to be integrated before true learning took place. This was the case because each actor was focused on the task rather than the individuals who would perform the care.

The importance of customers as sources of KISA is reflected in their importance as partners in learning. Often new knowledge was developed in the client relationship. The Australian mining technology services provide an example of this kind of co-production of knowledge. In this case, knowledge which was developed to solve a particular customer's problem was then packaged and sold as a stand-alone package to the wider markets. In low technology industries, too, customer feedback was important. In tourism firms customer feed back was carefully collected, and analysed within the firm. Suppliers can also become intermediaries between firms, helping to spread information about markets and technologies. In these cases the suppliers are learning from their customers and passing the knowledge on to other customers.

The firm's network was also important in giving them the contacts that would enable them to engage the best and most appropriate service providers. This was particularly important for small firms. Firms may increase their capabilities by recruiting experts, or by taking over firms that hold the expertise. Conversely, circulation of trained staff among firms in a network is another way that knowledge is disseminated. Research driven entrepreneurs and firms with formal research arrangements seemed to develop new cutting edge knowledge in collaboration with research and training organisations. This was the case in the Norwegian aquaculture industry and in number of other industries as well.

In the Finnish health care study the notion that one learns by teaching was extended to the organisation. Here staff developed expertise by sharing their own knowledge at conferences and other interchanges with other health organisations. In delivering knowledge, they invited a critique and an expansion of what they had developed in their own organisation, which they could then apply to further innovation. The perception that the original idea for an innovation almost always originates inside the firm demonstrates the importance of building and maintaining firms own innovation capacity. Whereas for individual services the choice of making or buying is contingent on circumstances, the ability to innovate must be developed within the organisation.

KISA and the life cycle of the industry, the product and the firm

There is no simple answer to the question of whether an organisation is better off providing a service internally or buying it from the markets. The existing business model, the life cycle of the innovation and the firm all influence the situation. A service may move in and out of the firm, depending on circumstances. For instance, a struggling start up firm may not be able to afford an external service, so it provides it itself. As the business grows, it can afford to outsource the service. Eventually, the firm is large enough so that it can recruit a specialist to perform the service internally. This pattern was clear in the Norwegian aquaculture industry, where small firms hardly outsource any services until they developed the capacity to supply their own services. However, medium-size firms used almost entirely external KISA providers, and large firms supplied their own services, often from a different branch of the firm. The Irish software industry showed a similar pattern. The learning and knowledge development activity associated with each of these stages is different and has its special characteristics.

The firm's knowledge-intensive service activities vary also according to its business model. Where the firm is (or is aiming to become) vertically integrated, it will always tend to learn enough to incorporate the services. If it is going to stay small, perhaps focused on a particular technology or activity, it may consciously adopt a strategy of outsourcing everything possible. In such a case, however, it has to maintain enough internal knowledge to supervise the contractors. Where new technologies or new industries are involved, externally provided services may not be available early on. Thus firms will have to develop their own ways of providing service inputs. As the industry develops, a division of labour occurs and services can become a commodity. This is apparent with many programming tasks, but also with services such as accommodation booking and lifestyle-related knowledge required by the leisure industry.

The services used and activities undertaken will vary during the innovation process. Services related to research and development are important in the early stages of the process. In the later stages of the innovation life cycle intellectual property rights, commercialisation, marketing and production process development-related KISA tend to be

much more important. Thus an organisation that is seeking to develop a new product or service has a distinctively different profile of KISA from the one trying to break into the international market with a more established product or service. In some industries, particularly in the software studies, the pattern was for a firm to be founded on the basis of a radical innovation. Future innovation was incremental. So the nature even of a particular service changed from those needed for setting up a business to those needed to maintain it, and from open ended R&D to product focused R&D.

The source of the service and the nature of KISA

More generally, the source of the KISA may change the nature of the knowledge activity. Innovation can be classified in terms of whether it is technology-driven, management-initiated, or customer or supplier-driven. This variation in type of innovation is often related to the structure of the value chain and networks in which the firm is engaged. Different kinds of innovation require, and produce, different knowledge-intensive service activities within a company. When a firm learns from its customers, it is likely to engage in sustained, incremental innovation, and the learning will be embedded in individuals within the firm. Learning from the network, too, is likely to be gradual and informal. A radical technology-driven innovation is often initiated by a technology supplier, and it often results in more formal and more distributed learning activities. Cases where a multinational corporation engages a small firm incidentally in knowledge-intensive activities, will probably be somewhere in between. Organisational factors are particularly important in the KISA study because the project is, at least in part, about building firm – and system – capabilities. That is, it is not only concerned with analysing how current innovations take place; its emphasis is on how KISA contribute to building the capacity for future innovation. This happens partly by the interaction between kinds of innovation and kinds of knowledge-intensive service activities.

Orchestrating the services

Managing increasing numbers of external experts, who represent different disciplines, presents a growing challenge that was recognised in several of the country studies. Effective use of the external R&D and management of cross-disciplinary networks and teams has become one of the key capabilities in many industries. In the Finnish forests study it was seen as the key to future competitiveness. Studies focusing on small businesses revealed that this capability was sometimes a limiting factor to their growth. Such co-ordination is especially an issue in designing complete solutions, where a firm may have to expand its offer outside its original field of expertise. In the health studies, where complex services were being tailored to a unique customer, co-ordination was the key skill for making the innovation work. Naturally such orchestration is easier in large integrated firms, like in the case of Finnish forests firms that have sufficient resources for R&D management, and in the Irish software firms where services are provided internally. The large Norwegian science-based aquaculture firms saw themselves as integrating KISA along the whole value chain.

KISA and new services

New business services tend to emerge as an industry matures. It seems that there are two main development paths that characterise this process. An essential part of the value chain may be spun off into a stand-alone service, and it can then be extended to cater also other industries. This has happened in the case of accommodation booking services. They

began as an internal service activity within tourism firms. Subsequently they became independent services dealing with a number of tourism firms, and then began to provide scheduling services in other parts of the industry and even in other industries.

The set of knowledge-intensive services which businesses use is by no means fixed. Some new activities are done *ad hoc* within a new firm without being identified as a separate activity, like learning about customers. As time goes by, these activities become routine; they become more formalised; and eventually they could be outsourced to a service provider. The Finnish study of leisure industries and the emergence of a new category of 'cultural intermediaries', offers an interesting case study of such a process. Two examples are given, a brand analysis and development company which analyses the performance of brands, and a match making company which offers strategic marketing specialising in sponsorships. In the forests study market knowledge function is emerging as a separate area of KISA.

Integrative KISA represents another emerging service that is developing as a response to the use of increasing number of suppliers of knowledge-intensive services. These firms are meeting the need for orchestration of services described in the previous section. 'Turn-key innovation' is another example of a service product offered by integrative KISA. Here the service provider takes care of the realisation of novel product for the client, including product design and setting up a manufacturing network. The client in turn will take care of the marketing of the product through existing distribution channels.

Policy implications

This section seeks to distil and discuss the most significant research findings, focusing on those that bear most relevance in the policy context. The discussion is organised around emerging themes on the role of KISA in innovation, rather than on the investigated industries. This discussion covers the traditional areas of technology policy as well as more recently developed multidimensional innovation concepts that are still a fairly novel area for policy making. The KISA perspective cuts through the entire innovation system providing fresh insights into innovation processes across the industries in public and private sector organisations. The analysis highlights the development and flows of knowledge, the variety of organisations involved, and the types of interaction that are typical aspects of KISA in the innovation process. The emerging role of knowledge-intensive service activities, their significance for innovation policy, potential bottlenecks and future development areas will be addressed.

Increasing importance of KISA

The role of knowledge-intensive service activities in innovation is pervasive and important across the economy in developed nations. Increasing supply and demand for specialised KISA signifies the evolving division of labour in the economy. Specialised experts and integrator services help organisations to manage increasingly complex technologies, rapidly changing operational environments and evolving business concepts. On the demand side, clients are increasingly looking for complete, turn-key solutions rather than physical products or services alone. Such solutions consist of tailored products-service combinations and here the market place is not nearly as crowded as in the case where businesses supply manufactured goods only. The great potential of knowledge-intensive service activities is connected to the problem-solving role of expert services.

Service activities account around 70% of GDP and jobs in advanced economies (OECD, 2005*a*). KISA in turn represent a very dynamic and high value added segment of services. They are activities that have a significant impact on innovativeness and performance across the economy. In global value chains manufacturing is increasingly transferred to the countries that offer the most cost-effective production base. So far the high value added knowledge-intensive services[3] have mainly remained in the developed countries, even when the manufacturing is being relocated. The question is, how to maximise the benefit of these knowledge-intensive service activities? What type of measures can be effective in facilitating the further growth of KISA in developed countries?

KISA and the key policy themes

Some valuable policy lessons for the development of the public and private provision of knowledge-intensive services can be drawn from the analysis of KISA. This is important, since most innovation policies are designed to support manufacturing innovation and traditional modes of R&D. The research indicates, however, that some countries are taking steps towards more balanced innovation policies by introducing new measures specifically targeting services. They are also modifying existing innovation policies so that they are more able to facilitate service-related research, development and innovation activities. However, all this will take time and service-related innovation policies represent an area with significant development potential.

Given that the provision of policy programmes represents knowledge-intensive service activity, the contribution to policy development can take place at three levels. The report can:

- Increase the understanding of the dynamic relationships between manufacturing and knowledge-intensive service elements of the economy. This can contribute to better-informed discussion on innovation systems and policies that promote knowledge-based competitiveness.
- Assist the development of more balanced innovation policy that addresses both traditional R&D and other modes of intra-firm and inter-firm learning and development activity.
- Enable better assessment of policy instruments, and their capability to promote services and service activities that contribute the performance of innovation system. In this context government policy programmes themselves can be seen as knowledge-intensive services to firms.

Changing roles of innovation policy

Over the last decades government policies supporting innovation have evolved significantly. At the early stages policies were driven by a linear innovation model and support was mainly targeted on fostering scientific and technological advances and enhancing the flow of knowledge along the 'innovation chain' (see Fagerberg, *et al*., 2005:8-9). In the 1990s the complex nature of the innovation system, with many feedback loops between the different stages of the process, was recognised and analysed. The interactive nature of innovation gave justification for a wider policy scope including the regional and sectoral perspectives to innovation process. The innovation system thinking

3. This type of KISA includes expert services such as technical and creative design and high-level management functions.

extended the focus to framework conditions and infrastructure, networks and capability failures. Such widening scope of innovation policy highlighted the fact that it is not just specific innovation policies that have an influence on innovativeness. Thus the coherence of all innovation-related policies were raised as a key task for the effective and learning government.

Relevance of service-specific policies

In terms of policy development two key issues have received attention in the recent discussion (van Ark *et al*., 2003:13-14). *Firstly*, while the analysis of economic growth and innovation has only recently shifted the attention from manufacturing to service-related areas, manufacturing and services are becoming increasingly intertwined making the 'service specific' policy approaches less relevant. However, knowledge-intensive service activities are emerging as a significant element in most innovations and it is increasingly important to analyse and understand the new dynamics that KISA brings into the processes across the sectors. Thus, policy making ought to become better informed on the role of knowledge-intensive service activities in innovation. *Secondly*, while the role of ICT is increasingly recognised as a key element of improved performance and innovativeness in services, much of the innovation in service context is still non-technological in nature. Typically, service-related innovation has to do with novel application of technology in combination with business concepts, client interfaces, and organisational innovation. This strong connection between technology and other softer elements of innovation make it very difficult to treat them separately. *Thirdly*, service activities take place in value chains that cut across the industries. Thus, it is preferable to analyse the role of services in innovation from a functional perspective, rather than service industries as such. KISA project takes this approach as it investigates the role of knowledge-intensive service activities in innovation across different industries.

KISA-related policy implications

This project concerns knowledge-intensive services typically performed by well-paid professionals. Yet it is important to acknowledge that other important segments of services do exist. For instance, various service functions that are not considered very knowledge-intensive play an important part in the economy. Often such services provide essential support for the more knowledge-intensive services. Hence, horizontal policies that improve framework conditions for broad range of services can also facilitate the role of KISA in innovation.

The challenge of multidimensional innovation

It takes a carefully designed policy portfolio to address the relevant aspects of a multidimensional innovation process, including technological and non-technological dimensions of innovation. Multidimensional innovation often takes place in the intersection of disciplines, and sometimes entirely new disciplines emerge, such as nanobiology and bioinformatics. Besides strong disciplinary expertise the changing nature of innovation requires well functioning knowledge and learning networks. Such networks can facilitate collaboration at the frontiers of many disciplines and they can cross organisational boundaries between suppliers, clients, academia, and government (see Council of Competitiveness, 2004:16). Most innovations involve a combination of different types of novel changes. Such changes can, for instance, concern organisation, technology, business concept, customer interface and delivery systems (see van Ark *et al*., 2003).

Policies targeting manufacturing ought to recognise KISA as a key element of competitiveness. Policy instruments ought to promote the role of KISA in value chains and as part of the product service offer. The rapid phase of technology diffusion means that even advanced products can be quickly commoditised. By integrating services into the offer, businesses create solutions that change the value hierarchy and boost the revenue flow. As result, services and manufacturing are increasingly intertwined and by the time innovations reach markets very few of them are only technological or purely services in nature. Most innovations today involve both technological and service-related elements.

The multidimensional nature of service-related innovation expands the scope and variety of innovation policy. This calls for open dialogue, and interaction with individuals, businesses and various reference groups. Direct dialogue between policy makers and businesses, organisations and individuals with ideas for policy improvements is essential (see Christensen, 2003). As a result, decision makers can develop better understanding and ability to anticipate the appropriateness of different types of policy measures. For example, situations where indirect interventions are more appropriate than policy measures targeting businesses more directly (see van Ark *et al*., 2003). The widening scope of innovation policy also implies a need for prioritising and careful targeting as limited resources need to be spread across even wider range of activities.

The heterogeneous nature of KISA represents a challenge for policy development. To be effective in promoting KISA and their role in innovation, the policy portfolio should consist of horizontal policies as well as more much more specific measures targeting KISA. In particular, there is a need for well-informed micro level policies addressing the issues that can facilitate KISA in its various, innovation-related roles. Here academia can have indirect influence by doing research in the area, and by developing modern innovation theory to decision makers.

Further on, there is an apparent need for measures that can improve awareness, understanding and sensitivity towards non-technological and multidimensional innovation. The target audience includes decision makers working for government ministries and -agencies, public sector institutions and businesses alike. From the very early stages of the KISA project it became apparent how complex set of issues the chosen theme involves. This topic calls for further analysis and wider discussion on the role of KISA in different innovation contexts. It is clear that all this takes some time resources. Overall, this creates a challenge for effective policy execution. It is important to develop a realistic development agenda that prioritises the development tasks and sets clear targets for short-term and longer-term policy development.

Different types of KISA and their relation to innovation

KISA in itself represent a wide variety of activities and all of them can have important, albeit different roles in innovation. Hence policy development ought to recognise different types of situations and the specific role of KISA in each particular case, *e.g.* situations where the demand and supply of KISA do not meet, KISA in different stages of the product and business life cycles, and the role of KISA in the renewal of value chains and business models. In addition, the demand for KISA originating from informal networks, research institutions, business services and internal expertise appear to follow certain patterns that can vary between countries, and between different types of organisations. Such detailed information contributes the policy and more detailed instrument designs.

A life-cycle perspective alone provides an interesting dynamic perspective to innovation policy. The need for KISA evolves as industries, organisations and innovations mature and this development pattern could be utilised in policy development. The life cycle of the organisation and that of the innovation could be used in determining which type of KISA could best facilitate their development and innovations. Further on, at different stages of the life cycle the demand and supply of internal and external KISA can evolve, implying a need for careful policy desing.

Table 1.1 presents a typology that classifies KISA on the basis of their relation to innovation. A key policy implication here is that by identifying different segments of KISA and by analysing their relation to innovation it is possible to develop better evidence-based policies. In each category KISA can be provided by internal and/or external experts. At minimum level the client organisation needs to have enough knowledge and absorptive capacity to make use of external KISA.

Table 1.1. Different types of KISA and related innovation

Types of KISA	Characteristics of KISA, internal or external to the organisation	Characteristics of innovation
Renewal KISA: improvements that can help firms to maintain their position and to enhance competitiveness on the markets.	KISA directed towards renewal, research and development of aspects in any part of the value chain (upstream and downstream).	Innovations in products, processes, services, organisation, markets and value chains. Incremental and radical.
Routine KISA help firms to maintain their internal processes.	KISA for routine matters (ICT, maintenance services, ISO accreditation, market research).	Innovations in company procedures and structures.
Compliance KISA help firms to meet their legal obligations.	KISA helping firms comply with regulatory systems or taxation regimes (*i.e.* tax returns, corporation law, auditing, environmental regulations etc.)	Incremental innovation in procedures, processes, product/service, structures, equipment, facilities and work units.
Network KISA	A network of actors that each hold a specific type of knowledge that can contribute to the innovation. A network can bring together complementary skills that are required in innovation.	Typically relates to pre-market stages of innovation, *e.g.* standards in the software industry. Network KISA can also play a key role in solutions selling.

Renewal KISA refers to the type of KISA which is very closely related to innovations. Research and development activities are typical examples of renewal KISA, representing a systematic drive for change and innovation in products, processes, services, organisations and value chains. Renewal KISA can involve very broad strategic expertise, or a very specific type of expertise. For instance, strategic management consulting belongs to this category.

Routine KISA help organisations to maintain and improve their processes. They are typically related to fairly routine matters related to development of ICT, quality (*e.g.* ISO accreditation), market research, service and maintenance of production systems, just to name some key areas. Related innovations typically involve improvements in organisational processes and procedures. Often it is a challenging task to distinguish such innovations from the normal organisational development (see van Ark *et al*., 2003).

Compliance KISA represents knowledge-intensive service activities that are mainly related to legal, technical and other obligations that the organisation has to meet. Their main aim is to keep the activities within the legal framework and avoid sanctions that organisation has to face in the case of non-compliance. Innovations, when they occur, are mainly incremental improvements to the existing processes. Major changes in legislation can also incur significant innovations as a result of the changes in framework conditions.

Given that this expertise must often be external, the relevant activities within the firm concern raising awareness of the services, and strategic placement of the firm in the regulatory environment.

Network KISA typically consist of individuals that represent different types of organisations with some common knowledge base and interest. Trade and industry organisations, informal personal networks, and numerous kinds of vertical and horizontal networks can facilitate knowledge exchange and innovations. Industry organisations represent a typical example of horizontal network KISA. Here, even competitors can share information and knowledge which is not closely related to daily markets and competition.

The typology presented is by no means a comprehensive presentation of the various types of KISA, but it illustrates the variety that signifies their great potential in terms of innovation. At the same time their heterogeneity represents a formidable challenge for innovation policy.

Interaction between various parties is a typical element of KISA

The interactive nature of services implies that much of the policy influence needs to be indirect rather than direct business specific measures (see van Ark *et al.*, 2003). As soon as KISA has a role in innovation it implies some amount of interaction between the parties. Complex interaction patterns between experts, or between supplier and buyer tend to be a sensitive process that can be easily disrupted by external impulses. This is a key message for policy design. The question is how to facilitate the multidimensional innovation process without simultaneously compromising any aspects of it.

Interaction with the external service is perhaps an easier target for policy than internal KISA that is encapsulated within organisations. However, even external KISA can be highly informal in nature. For instance, external informal KISA can be accessed through former colleagues at the university, or through extensive personal networks of the senior staff. Suppliers and customers are also significant sources of more or less informal KISA embedded into the on-going exchange relations.

Another significant issue from a policy point of view is the relatively weak role of KISA delivered by the public sector. For instance, in the software surveys the proportion of firms using government services ranged from insignificant to 13% at most. Overall, government was perceived as a source of financing rather than a supplier of KISA. This would imply that the public sector has a more important role in building the knowledge base than in supplying more applied research directly to businesses. In the case of highly applied knowledge, businesses tend to provide knowledge-intensive services to other businesses, either formally as KIBS, as part of the product-service package, or informally through networks.

Absorptive capacity, KISA and innovation are closely related

One of the key areas for policy attention is organisations' ability to engage and make use of KISA. The role of KISA in innovation depends on the service supplier, recipient firms and their mutual interaction. Even the most advanced type of KISA can do little to facilitate innovation, if the recipient organisation has insufficient capacity to make use of the offered new knowledge. The supply and demand for KISA needs to make a good match not only in terms of supply and demand, but also in terms of the level of knowledge. Lack of absorptive capacity frequently creates a problems for the small businesses that have limited resources (time, money and knowledge) to make use of KISA.

Policies that can improve businesses absorptive capacity for new knowledge can have a significant impact on the firm's ability to utilise the available KISA. As such, external KISA represent a source of flexible capacity as well as complementary knowledge for organisations equipped with limited internal resources. Raising awareness of the potential benefits of KISA is particularly important among those who have latent development needs. This can be the first important step in the process towards effective utilisation of KISA in the innovation process.

The second critical step is the choice of an appropriate supplier of external KISA. Here, information asymmetries between service providers and client organisation are inevitable. Hence, stimulating the use of KISA in organisations with no previous experience utilising them should be one policy priority. For the first-time client the challenge is twofold. The first task involves formulating the needs and communicating them correctly to the KISA provider, and secondly, assessing the suppliers' ability to provide a service that meets the requirements. These are formidable tasks for all organisations, and especially for those with no previous experience in the area. Suitable policy instruments could include certification of services and publicly funded demonstration projects. Practical examples for the first-time buyers can create motivation for taking the necessary time and efforts that the utilisation of KISA requires.

Upgrading of the quality of existing compliance KISA should be a policy priority, since a large share of small client organisations are unlikely to get involved in any other type of KISA. Upgrading of the compliance KISA could also help many service suppliers whose current services are becoming commodities, and in some cases will be totally replaced by automated ICT solutions. For example, this concerns much of the traditional accounting business, just to name an example of compliance services that will be automated in the future. Typical compliance KISA include accounting services, basic legal services, some financial advisory services and other services which help organisations to comply with the legal obligations. The key strength of compliance KISA is that they have established relations with a vast number of small organisations, and they could offer an effective route of access to this category of organisations. High quality compliance services and somewhat wider service offerings could encourage many small organisations towards more effective use of KISA for renewal and innovation.

The role of the KISA depends on the type of innovation

The nature and role of KISA in innovation largely depend on the characteristics of the innovation itself. From the policy point of view this means that the type of the innovation is as significant as the type of the innovator. One way to characterise innovations is to divide them into two main categories based on their relation to the clientele. The role of KISA in innovation can involve elements that are closely connected with the client interface (front office), and/or the innovation can be mainly related to the internal processes of the organisation (back office). Typically back office innovations are focused on production-related systems, organisation and technologies. This is more familiar territory for the existing technology-oriented innovation policies and related KISA. Front office innovations are typically taking place in close interaction with the clients. This area is less established in mainstream innovation policy but its significance is increasing. The area needs to be further developed as part of the innovation policy portfolio.

KISA: an integral part of innovation system

Policies need to pay sufficient attention to knowledge base development as well as the flow of the research-based knowledge. Universities, research institutions, supplier businesses, professional organisations, and industry associations represent the types of knowledge providers that are elementary for the renewal and long-term success of investigated clusters. The value chain analysis indicates that different types of KISA can contribute to innovations in different parts of the value chains and business models. Basic research and more applied R&D services are essential intermediary service inputs at the beginning of the value chain. Availability of this type of services provides the foundation for development of a strong and competitive cluster.

Choices between internal KISA development and use of external knowledge-intensive services represent strategic decisions for organisations

Effective ways of organising and using internal and external KISA have profound influence on innovation and competitiveness. Policy instruments should be neutral towards the use of internal and/or external KISA. Good practice development in this area ought to be supported through systematic analysis. For instance, the wider impacts of outsourcing on innovativeness and skills development are areas that could benefit from empirical research. Organisations tend to develop their core competences internally and the same applies to the early stages of innovation process.

Active resistance towards the use of external KISA can create a barrier for the renewal of the organisation. Large organisations in particular require skillful change management and careful planning in using the external knowledge resources. Use of external KISA can bring in additional resources, complementary knowledge and 'neutral opinions' to the organisation. Outsourcing services can be seen as a way to cope with increasing complexity as it opens up possibilities for specialisation, combination of cross-disciplinary knowledge and hence, more effective division of labour. Outsourcing decisions are always strategic in nature and indicate focusing of resources to certain segment of the value chain. In situations where organisations develop their 'business' concept, outsourcing can be a flexible way to redirect resources according to the new strategy. Naturally, the change management itself cannot be outsourced. Finally, external KISA have an important role as facilitator of the development of internal KISA.

Typically, internal KISA related to R&D, marketing and organisational development are among the areas where business organisations prefer to develop their own competences. Supply of skilled labour is a policy priority and the most important way to develop internal KISA within organisations. Education systems ought to have well functioning links with the public and private sector organisations that employ professionals to perform KISA. This can secure a better match between supply and demand of skilled labour. Also, further education and training of employees ought to be organised, so that the renewal of organisations can happen through internal development.

Increasing use of specialist experts sets challenges for innovation management

Some of the most important KISA exist in the area of innovation management, which ought to be recognised as a policy priority. Management skills are essential as the innovation processes become more complex involving interaction with customers, suppliers and a number of different kinds of KISA. The increasing number of internal and external experts involved in innovation processes poses a challenge for the overall management of

the process. It is a challenge to manage effectively a great number of experts who often represent a number of various disciplines. It is also important to avoid the negative consequences of innovation process fragmentation, resulting from excessive use of external experts.

As the drivers of innovation evolve so do the needs for KISA

User-driven innovation is an area that the KISA project can highlight as a priority area for innovation policy. Soft elements of innovation are increasingly important across the industries and organisations are focusing on innovation at the customer end of the value chain. Interactions with customers are among the most important KISA. The software study and the analysis of resource-based industries indicate that soft elements of innovation become more important as an industry matures. This creates a need for new types of competences in the areas of organisational and/or user-driven innovation. Research and training related to market analysis, logistics, behavioural science and socio-economic research ought to be within the scope of 'innovation policy'. Free and open software development are well known examples of user-driven innovations but such activities are much more widely used, ranging from surgical equipment to surfboards. In policy terms this area of innovation has not received as much attention although it ought to be one of the focus areas in the future. For instance, R&D subisidies and tax credits should be redesigned to eliminate biases against user innovation. Manufacturing industries and other organisations have great potential in re-designing their research and development to cater user driven innovation more effectively, and to develop their ability to make use of user innovations. Already, software and semiconductor industries are providing their customers with toolkits that can assist user-innovators in their efforts (Hippel, 2005).

Consumer behaviour, market segments, evolving demand patterns, logistics, markets and marketing are increasingly important KISA as organisations appear to move down stream in the value chain closer to customers and end users. There are at least two key drivers that give impetus for innovation activities at the customer end of the value chain. First, interaction with customers, clients and user communities provides organisations with invaluable knowledge, which is an invaluable asset for the R&D process. In turn, businesses provide customers their specialist knowledge that can solve their problems. Secondly, close interaction with customers is seen as a strategic asset, as it can provide a power base that can help to secure the future competitiveness of the organisation. In other words, those who control the end user interface can exercise control over the entire value chain.

The great variety of innovation processes requires flexibility from innovation policy at all levels. There are indications that product and service development is concentrated among 'lead users', who are ahead of marketplace trends and whose innovations can often be commercially attractive (see Hippel, 2005). There is demand for research and policy measures that will systematically develop lead user-based innovation processes. On the other hand, policy instruments ought to be developed so that their possible bias towards lead user-based innovation can be ironed out. Organisations producing consumer goods and services can be highly innovative in nature but they appear to offer a development challenge for innovation policy. One key feature is that while innovativeness on consumer markets may be irrational in nature, innovation is manageable – and managed – activity. Most important resources for innovation include aesthetic knowledge, and 'alertness', contextual knowledge, and communication with the client.

Policy implications related to the specific character of health care sector

Health care represents a mix of public and private initiatives both in service delivery and financing and is therefore a specific type of case among the investigated sectors. Yet KISA has a pervasive role within the health care sector and it provides a valuable, if somewhat different, perspective into the topic. Further on, the health care sector has an interesting relationship to the innovation policy. Medical technology, new types of treatments, pharmaceutical products and medicines are tightly connected to the science, technology development and wider innovation systems. At the same time health care systems tend to have a more distant role in the innovation systems and in innovation policy. Yet there is an increasing need to develop and transfer good practices in health care management across the operational units of health care, across the health care regions and internationally. The following policy implications point to some areas where the role of KISA in health care-related innovation could be developed, also providing some directions as to where the linkages to the innovation system could be strengthened.

The national innovation policy environment should address also health and social services. Although these are mostly in the public sector and under the governance of a different ministry or department at governmental level, this sector represents a very large portion of a national economy. Its effectiveness and efficiency should be the concern of all. New ways must be found to better co-ordinate activities.

National innovation policies should address systemic aspects more clearly. In the health and social services sector there is tight regulation in place and a hierarchy of service providers and relationships that dictate the degree of freedom for change at an organisational unit level. Systemic change is only possible within the limits of the overall system. Presently, national health care renewal programmes are too unspecific as to what the providers must do to meet the objectives set at the national level.

Health service providers should be encouraged (through incentives) to develop strategic objectives in dialogue with their stakeholders and develop skills in its implementation (change capability). This will lead to the development of internal KISA with support from external KISA.

The mix of internal and external KISA in health care needs to be recognised. There needs to be the right balance of these to enable renewal and learning and knowledge transfer.

More attention needs to be given to the development of indicators that health service providers can use to improve and benchmark their performance. This requires internal, external and network KISA for implementation.

Clearing houses (with Web sites) at national level could be created to assemble and disseminate information about systemic innovations in the health care sector. At the moment there are activities at national and international levels focusing on best clinical practices (evidence-based care) and health technology assessment (*e.g.* in Finland, Duodecim and FinOHTA respectively). This proposal aims at bringing the systemic viewpoint into focus.

Building a KISA perspective into future innovation policy

Policy level

Based on the KISA project analysis, it can be argued that existing innovation policies need further development to be able to cater for the increasingly multidimensional innovation processes. Non-technological soft dimensions such as organisational change, design and training, business concepts, delivery channels, customer interfaces, and R&D in services are increasingly significant features of innovation (see van Ark *et al*., 2003:6-7). Another feature highlighted by the KISA project is the interactive nature of the innovation process. This type of innovation process involves a number of actors, such as suppliers and a variety of networks and clients, that are not well recognised in innovation policy. The innovation seems to be very much embedded in the continuous KISA-related interaction process between various parties. Policy needs to address these interactions, and on relevant capacity building in the firm rather than just specific technological developments.

The growing complexity of innovation systems means that a new type of empirical analysis and knowledge is needed as a basis for innovation policy. The broadening scope of innovation policy means that the number of interest groups is growing. As a result, policies need to be evidence-based and acceptable to various interest groups. The KISA project is a step forward in gaining a better understanding of relevant features of the evolving innovation system. This is helpful in diagnosing problems and bottlenecks in the system, understanding the on-going changes and identifying opportunities for performance improvements.

Knowledge management and monitoring can play an essential part in the extended innovation policy development and execution. Strategic intelligence and international co-operation can support policymakers by providing them with relevant information. Policy impacts need to be anticipated, and clear policy objectives enable effective monitoring of the achieved results. Feedback on present and past interventions facilitates learning government. The KISA study has demonstrated how both internal and external expertise are essential in the innovation policy process.

Agency and programme levels

Government agencies have a twofold challenge in delivering innovation policies that can successfully facilitate the role of KISA in innovation. Instruments need to be able to support increasingly heterogeneous types of innovation processes. This clearly requires a shift from supporting hard technology towards supporting all relevant aspects of multidimensional innovation.

Innovation agencies are in a position to produce systematic micro-level analysis for the higher-level policy development at ministry level. They have more grounded empirical knowledge on the key characteristics of multidimensional innovation in various recipient communities. Like the ministries, they should develop an effective mix of internal expertise and access to external experts.

The second challenge is in terms of policy development. Agencies need to tailor programmes closely to the needs of the beneficiary communities catering both technologies and non-technological dimensions of innovation. Here, programme managers have a very important role as a key link between public sector innovation support and beneficiaries. Increasingly, beneficiaries are also being surveyed in order to provide feedback on service levels, inputs into performance indicators and to some degree to help assess impacts of the evolving innovation supports (Arnold, 2005).

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Chapter 2

OVERVIEW OF THE KISA RESEARCH PROJECT

Introduction

With more than 230 personal interviews and survey data from over 1 000 respondents, the KISA project represents a major contribution to services research. Within the service sector, this research focuses on the most dynamic and innovative services. The knowledge-intensive service activities under investigation have a major influence across the economy on the public and private sectors, and in manufacturing and services as facilitators of innovation, competitiveness and growth. Thus, the KISA project can provide new perspectives to innovation system thinking, as well as indications of horizontal co-ordination of policies in a manner that creates favourable framework conditions for service sector development.

Figure 2.1. Sampling framework of the case studies in the KISA study

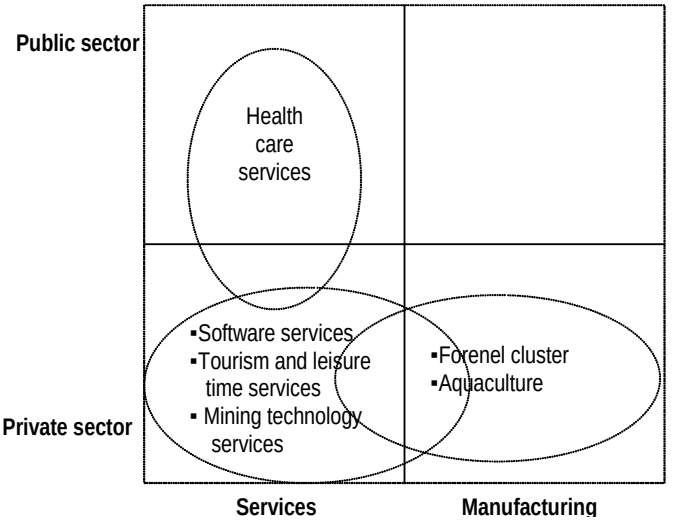

Figure 2.1 illustrates the overall coverage of KISA project in terms of sectors (services-manufacturing) and along the private/public sector dimension. The aim of the sampling has been to produce a good overview of KISA across the economy. The public-private dimension of the illustration refers to the situation in contributing countries rather than a global state of affairs. For instance, in the case of the health care sector, the service provision can be mainly public or private sector-bound depending on the national situation.[1]

1. Health care services tend to be based on local supply due to regulation at national level and a number of socio-cultural issues which lead into local supply of such services.

Software services represent an industry which operates in a global marketplace whereas investigated health care services are mainly limited to national markets. The range of studies also highlight the interdependence between services and manufacturing, many services being based on technology and industrial products typically bundled with services. In the case of mining, the focus is on spin-off of knowledge-intensive services commercialised as stand-alone-services.

Research approach

The KISA project takes a novel approach to studying knowledge-intensive service activities provided by external actors or internally within the organisation. The focus of the investigation is on knowledge-intensive service activities and their role in innovation. More specifically, the project investigates the nature and use of knowledge-intensive services in innovation in a number of different settings. As such, the study is exploratory in nature, but it also seeks to achieve a certain level of comparability across the industries and participating countries. The aforementioned objectives set quite a challenge for the research.

The nature of knowledge-intensive service activities (KISA)

The range and scope of knowledge-intensive service activities is extensive and a number of different types of organisations are involved in the delivery and consumption of such services. KISA do not constitute a sector or industry cluster, but a function that is present in all industries. Knowledge-intensive services that are important for innovation processes are not always bound to the institutional settings of particular knowledge-intensive firms or institutions. Yet most organisations, whether perceived as knowledge-intensive or not, make use of some knowledge-intensive activities. These service activities can be provided internally and/or externally to the organisation in question. This focus on activities can be seen as the functional perspective to knowledge-intensive services. At the core of the KISA concept is the coproduction and transfer of knowledge between knowledge providers and users. It emphasises the fact that organisations need to build up their internal competences and knowledge base to be able to use external knowledge in their learning and innovation processes. In the research for this project, the concept of knowledge-intensive service activities was defined as follows:

> *KISA refers to production or integration of service activities, undertaken by firms and public sector actors — in the context of manufacturing or services, in combination with manufactured outputs or as stand-alone services.* (OECD 2001, 2003, 2004).

Based on this working definition, more detailed types of interaction and knowledge-intensive service activities can be distinguished (see OECD, 2001):

- **Service activities provided externally to organisation by other firms:** strategic business services or so-called KIBS; also some other services not typically identified as such in trade statistics, for instance services bundled with manufacturing goods.
- **Service activities provided to organisation by publicly funded or sponsored organisations**, *e.g.* public or semi-public research and technology organisations.
- **In-house service activities:** these are now acknowledged to be highly important in all internationally competitive sectors of OECD economies.

- **Service activities provided by networks:** formal and informal networks provide an important multidimensional platform for KISA provision.

In practice there were a lot of challenges to overcome, especially in operationalising the KISA concept in the empirical context. As such KISA is a novel concept, with a rather thin research tradition behind it. Almost all research so far has been from the KIBS perspective, or focused on public private partnership between research and technology organisations (RTOs) on the one hand and private firms on the other. Many basic questions had to be considered seriously during the work and still remain open for discussion. For instance, which services can be considered knowledge-intensive, and what is meant by knowledge-intensive. The whole concept of knowledge-intensive is somewhat moving target due to continuous development of knowledge. Another major question is, what services are important for what types of innovation, and in which type of industries? On the basis of the following case studies we can argue that services are important in relation to innovation. For the moment, lack of aggregate level information prevents more comprehensive analysis. Statistics of service sectors and service innovation in general are not very detailed or comprehensive. Almost no statistical information is available on the internal service activities within firms/organisations, or on network-based non-market services. Yet, all of these appear to have an important role in examined innovation processes (OECD, 2004).

Research methods

Since, the role, composition and importance of KISA varies by industry/cluster, the KISA project includes a set of industry specific studies that employ a range of different research approaches. Exploratory studies require a rather open approach to the inquiry and they seek further develop key analytical concepts and understanding of the KISA-related processes. Since the KISA study is a multinational, cross-country research effort, comparability of the analysis is also important. This target favours a more structured quantitative approach.

In any research design the research questions, collected data and analytical approach need to be coherent. To this end, the KISA project adopted two complementary research approaches: quantitative surveys and qualitative case studies. These two research methods seek answers to somewhat different research questions, and they apply different data collection methods and analytical procedures. The following will briefly outline the adopted twofold approach which can accommodate both of the somewhat contradicting targets. The chosen research methodology covers a variety of approaches and different types of research questions (OECD, 2004):

- Quantitative macro-analysis of the existing statistics to draft the overall picture of the target industries.
- Surveys of the target industries to identify KISA and their specific features in different settings.
- More intensive interviews with businesses, providing detailed information on the KISA-related processes, such as: Why and when do organisations use a certain type of KISA? What do organisations do with the acquired knowledge? How do organisations use KISA: how do organisations interact, how is coproduction organised? How do they use services to build their capabilities?
- Analysing the policy measures and needs related to KISA in innovation.

A variety of theoretical perspectives and concepts are applied to interpret the empirical results. For example, why firms use certain types of KISA is related to the business model chosen by the firm. The way a firm uses KISA has its roots in the structure and nature of the value chain and networks in which the organisation is engaged. Also, the need for KISA appears to change with the life span of the innovation and the product. While services related to research and development are important in the early stages, intellectual property rights, commercialisation, marketing and production process development related to KISA tend to be much more important during later stages of the innovation life cycle. Thus an organisation seeking to develop a new innovation has a distinctively different profile of KISA usage than the one trying to break into the international market with a more established product or service.

The adopted research approach is based on triangulation of research methods (qualitative-quantitative), data (cross-country, cross-industry) and theoretical approaches can improve the reliability and validity of the research results. The purpose was to minimise the risk that findings would be simply an artefact of a single method, a single source, or a single investigator bias (Patton, 1990). Such triangulation is a key feature of the KISA study and the following will provide more details on the quantitative and qualitative studies.

Quantitative approach

In the quantitative approach, research seeks answers to 'what' and 'how much' types of questions. Typically this type of study can be survey-type cross-sectional studies and they produce profile information on:

- Structure of the sector, *e.g.* composition of the KISA sector by different types of expert services.
- Rate and frequency of the use of different types of KISA.
- Use of KISA by different industries.
- Use of internal vs. external KISA.
- Nature of relationships with KISA suppliers.
- Partners in innovation and sources of innovative ideas.
- Cross-country comparisons.
- Development processes and trends based on time series data.

In this type of study, large, carefully drawn samples and a robust data set provide a basis for reliable statistical generalisations. In the case of services, statistical coverage is often patchy and existing industry classifications do not offer very good insights into services. Another challenge in the quantitative approach is the heavy 'process nature' of services. Overall, it is difficult to capture processes in the form of numerical data and on the business process level, such data hardly exist.

Qualitative approach

The study has shown that a qualitative approach is more suitable for explorative research where the target of the research needs further clarification and conceptualisation. In-depth qualitative analysis provides tools for process exploration and analysis. So 'how' and 'why' types of questions can best be approached by utilising qualitative data and illustrative cases. Typically business process analysis requires in-depth case studies and qualitative analysis, or detailed surveys. Due to its explorative nature, specific research questions and the inquiry as a whole can evolve during the research process. For instance, in sampling it is possible to use a snowball method where interviewees point out new key informants. Often, such a sample could not possibly have been identified at the beginning of the inquiry. However, continuous learning throughout the research process makes such sampling possible. In many respects the process nature of KISA and innovation favours in-depth inquiry. The following types of issues can be captured through a carefully conducted qualitative inquiry:

- Informal processes where learning and innovations are incremental, frequently based on *ad hoc* solutions rather than any specific plan.
- Lack of formal structures and R&D departments in a service innovation context.
- The specific nature of innovation is recognised only during the discussion with the interviewee.
- Research agenda and specific questions evolve during the process.

Unlike large-scale surveys, in-depth qualitative studies do not allow statistical generalisations. However, evolving concepts can be generalised and reveal basic socio-economic processes that underlay the dynamics of the research area. Some theoretical generalisations can be achieved by conceptualising the data and by developing a grounded middle level theory (see Glaser, 1978; and Glaser and Strauss, 1967). For instance, such concepts as the incremental nature of innovations can draw on studies across sectors and to a large extent across countries.

Countries and studies contributing to the KISA study

The OECD KISA project is a multinational research effort which includes more than 20 studies from nine countries brought together in country studies. In addition, the United Kingdom and Czech Republic provided national data for the KISA project. In 2002, the OECD launched a set of case studies in innovation. Two are sector-based – energy and pharmaceutical biotechnology – and the third focuses on the role of knowledge-intensive service activities in innovation. In particular, the study at hand is seeking to shed light on following areas:

- How do firms use these services to supplement their competitive advantage?
- How do organisations use them to build capabilities?
- How do organisations incorporate them to create a dynamic of continuous innovation?
- How do organisations use them to increase their absorptive capacity for further new ideas?

Other issues central to discussion of KISA are the questions of what causes firms and other types of organisations to develop knowledge internally, versus getting it from outside, and how organisations manage knowledge once they have acquired it.

The investigation of the role of KISA in innovation takes place in four key areas including health care, software, tourism and leisure services, and resource-based industries. More specifically, the resource-based industries category includes studies in three industries: mining technology services, forest and related electronics, engineering cluster (Forenel) and aquaculture.

Table 2.1. Empirical material collected for the KISA-study*

Industry-specific studies by contributing countries			
	Country	Type of study(ies)	Research team(s)
Health care	Denmark	One case study	University of Southern Denmark
	Finland	Two case studies	VTT and STAKES
	Japan	One case study	AIST/MITI/University of Tsukuba
	Norway	One case study	STEP Group
	Spain	Case study	Institute of Health Carlos III
Software industry	Australia	Survey and case studies	University of Western Sydney/AEGIS & Innovation Dynamics
	Finland	Survey and case studies	Helsinki Univ. of Technology/LTT Research
	Ireland	Survey and case studies	CISC, National University of Ireland Galway
	Korea	Survey	STEPI
	New Zealand	Analysis of existing data	Ministry of Research, Science and Technology
	Norway	Case studies	STEP Group
Tourism and leisure	Australia	Case studies and survey on tourism	University of Western Sydney/AEGIS & Innovation Dynamics
	Finland	Leisure cluster study	National Consumer Research Centre
	Spain	Case studies on tourism	Centro de Estudios Ecónomicos Tomillo
Resource-based industries	Australia	Mining tech. services case studies	Innovation Dynamics
	Finland	Forest cluster, three case studies	ETLA/SC-Research/VTT
	Norway	Aquaculture case study	STEP Group

* The contributions and research teams have been identified according to country reports.

Table 2.1 provides further information on the type of research and contributions by each participating country through their country studies. Different types of industries are included in the study: software represents an innovative cluster with services at the core; health care is an example of a sector with a complex set-up of actors and intensive public-private partnerships. The other cases were chosen by the participating countries to highlight their production structures. They may represent mature industries with traditional manufacturing at theit core (*e.g.* forest industry), but more directly consumer-oriented service industries were also included (tourism, leisure). Taken together, all the industries studied provide a rather versatile understanding of the role of KISA in innovation (OECD, 2004).

Software industry

The software industry analysis is based on empirical material from six countries: Australia, Finland, Ireland, Korea, New Zealand and Norway. Of these countries, Australia, Finland, Ireland and Norway have contributed both survey and case study analysis in the report. The remaining countries conducted survey-type research or analysed existing data. In addition to empirical material collected for the KISA study, national and OECD statistics on the software industry were used as a way to further shed light on industry characteristics. The software project analyses the use of KISA in the software industry especially in supporting and improving companies' innovation activities. The research involves both software products and service businesses, but excludes firms selling embedded software (OECD, 2004). Overall, the software industry can be characterised as a dynamic service industry that is closely linked with the rapid development of software and electronics manufacturing. Hence, software services provide an example of where the knowledge-intensive services in many cases have global markets, and also wide coverage across a number of different industries.

Health care services

Five countries — Finland, Denmark, Japan, Norway and Spain — took up the task to commence case study-based research on health care services. The project studies the role of KISA in improving the innovativeness of the health care sector. Health care can be characterised as an area of the service sector where most countries are facing numerous challenges. By investigating the role of KISA, it is possible to provide a fresh way to look into the area of service innovations. For instance, such innovations may concern the evolving division of labour between public and private sectors, new types of organisational arrangements such as customer interfaces, delivery channels and service delivery processes, just to name some of the possible dimensions for renewal.

The health systems are national, highly regulated and legislated with regard to the right to practice medicine and provide medical services, for example. The systems are highly complex with a broad variety of actors involved. For example, a multitude of service provision and payment schemes exist. There is a mix of public and private service provision in most countries. Systems can be divided into four layers: public health (mainly promotion), primary care, secondary care, and tertiary care. National systems are under constant cost containment pressures aggravated by demographic trends (*e.g.* ageing) and progress in medical diagnostic and therapeutic capabilities. At the national level, health policies are formulated and implemented by other authorities than those in charge of innovation policies. National health systems are to a certain extent closed environments in which standard market conditions do not apply (OECD, 2004). As a result of such localisation, there are many barriers that seem to delay and even prevent the spread of service innovations. Such barriers exist both within the national systems of health care and between the countries as well.

Other industries

The other industries studied were optional, and chosen by participating countries based on national interest and importance of each sector. Some of the industries chosen represent mature industries (*e.g.* mining, even though the analysis will focus on the dynamic spin-off mining technology services) often with manufacturing at the core (*e.g.* forest industry), but more directly consumer-oriented service industries were also included (tourism, leisure).

Tourism industry and leisure cluster

Case studies on the tourism industry and leisure cluster were completed by Australia, Finland and Spain. While Finland explored the increasing leisure time of consumers and related rapidly growing commercial activities, Australia and Spain analysed the role of KISA in connection with tourism services. The Australian and Spanish studies concentrate on the tourism industry, with the special aim of better identifying the human resources management and innovative financial instruments increasingly used by businesses. The Finnish leisure time project concerns a new and expanding dimension of the consumer market. The study focuses on manufactured leisure, products linked to leisure time aiming to create experiences for the customers. Manufactured leisure is linked to increasing commercialisation of lifestyles in an affluent world: the consumer's choice of how to live and what kinds of products (brands) to include in one's life. The leisure industry study opens a very different and complex view of the types and role of knowledge-intensive services in developing new business areas. As a whole, these case studies provide insights into the wide spectrum of consumer services, which represent an important sector of the economy (OECD, 2004).

Traditional mature or resource-based industries

Case studies from Australia, Finland and Norway cover resource-based industries. These cases include mining technology services, the forest industry and related cluster, and aquaculture. All of these industries play a very significant role in each of the countries' economies. For example, Norway exports cultured salmon to over 100 countries and Finland is the largest exporter of paper in the world. Essentially these cases illustrate the role and scope of KISA within these industries which once were resource-based but have since developed into highly knowledge-intensive businesses. The Norwegian project deals with the relatively new fish farming and aquaculture industry which is facing new challenges after an exceptionally rapid growth period in the industry. The main objective of the study is to identify the role and structure of KISA used in developing the innovation capabilities of the aquaculture industry. Studies of the role of KISA in renewing the innovation dynamics of more mature industries present a somewhat different situation. Australia has used case studies to investigate KISA related to mining technology services as a critical component of Australia's largest export earner, the mining industry, and as a knowledge-intensive service industry in its own right. Gross sales revenue in the mining technology services sector was AUD 3.12 billion in 2000-2001 — this is expected to increase by 13% in 2005-06. Finland will study the role of KISA in renewing the old backbone of Finnish economy, the forest industry, or more specifically the Forenel cluster linking forest industry to engineering and electronics industries. The Finnish study combines three levels of research work: a macro-level study on the use of KISA at cluster level, a study on the role of KISA in emerging businesses, and a study on the role of KISA in individual innovations (OECD, 2004).

Provisional framework for policy development areas

It is not really possible to define – or list – KISA-related policies from the outset, so wide is their variety and scope. KISA vary by industry, and even, for example, between different networks of actors that have been studied. The research results indicate a certain duality of policy measures related to KISA. On the one hand, a broad spectrum of policy measures to enhance innovation generally exists in all countries. On the other hand, specific targeted measures tailored for supporting either the production or use of particular service activities have been introduced in some countries. For example, Australia has a measure, Commercialising Emerging Technologies, to enhance firm access to and use of external KIBS and associated activities for new spin-off and start-up firms.

While the role – and nature of – KISA varies largely by industry, so do policy measures. Policies supporting KISA in health care innovation are usually quite different from those supporting software KISA. Table 2.2 provides one way to analyse KISA-related policies in different industries (OECD, 2004).

Table 2.2. Preliminary framework for analysing policy options targeting KISA

Targets of policy tools	Stimulate supply and quality of KISA	Stimulate networking	Stimulate demand for KISA
Internal KISA in all types of firms and organisations	Stimulate KISA internally in firms and organisations	Support co-operation between internal users and providers of knowledge-intensive services	Stimulate/support the demand for internal KISA from internal users of knowledge-intensive services
External KISA providers to all types of firms and organisations	Create favourable conditions for the development of independent providers of KISA	Support co-operation between external providers and internal users of knowledge-intensive services	Stimulate demand of firms and organisations for external knowledge-intensive services

By and large, the influence of policy on KISA is often indirect and varies by industry. The following chapters provide empirical material of use for the further development of a policy framework for the development of KISA. Detailed policy implications can be formulated only after studying the role of KISA and the existing policy portfolio by industry and country on a concrete level. Despite the significant amount of empirical data at hand, this study is only the first step in developing KISA-related policy discussion.

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SUMMARIES OF EMPIRICAL STUDIES*

* Editors: Jari Kuusisto and Anne Holmes.
A complete list of the full-length country studies prepared by national experts can be found in the Annex. The full studies are available on line at *www.oecd.org/sti/innovation* under the heading "Sectoral Case Studies in Innovation".

Chapter 3

THE ROLE OF KISA IN THE SOFTWARE INDUSTRY[1]

Features of the software industry

The information and communications technology (ICT) industry has been an important driver of economic growth in recent decades. The growth has been due partly to improved productivity and the emergence of new subsectors within the industry, which is an important producer in its own right, and partly to the contribution that ICT makes to productivity in other industries, indeed in all facets of the economy (OECD, 2004; Pilat *et al.*, 2002). In the recent downturn in the ICT industry, software appears to have been somewhat more robust in terms of sales volume and price level than computer hardware. The output of the software industry and the proportion of investment capital devoted to software appear to have risen fairly steadily since the mid-1990s (OECD, 2004).

The software industry's importance in the world economy is, like ICT, twofold:

- There is a significant volume of production of software for sale as final products to consumers and businesses, both in domestic and international markets.
- Software is an important input to production in other industries, improving scope, efficiency and quality in production and the provision of services; this input is increasingly in the form of outsourced services.

Software can be described as comprising four broad areas: systems infrastructure, applications development, mobile and embedded software; and applications solutions. Within these four areas there are nine subsectors. These subsectors encompass a range of tools and activities, including client-server operating systems, application programs and programming languages, interoperability software, operating systems for mobile devices, enterprise resource planning and personal productivity tools.

In this study the software industry is defined in terms of production of software for sale as stand-alone software and not embodied in other non-ICT products. That is, software which is embedded in other applications – controls of motor car engines, for example – is not included. Even with this constraint, there are difficulties with statistics for the industry, because many software producers may identify themselves with the industry of their customers. No distinctions are made here as to the kinds of software applications produced.

Two characteristics dominate the production of packaged software. The first is that development costs can be very high but, once developed, software can be replicated for almost nothing. That is, fixed costs are very high and marginal costs are very low, and there are huge economies of scale. The second characteristic is the importance of standards, modularisation and network externalities. In effect, a software item must be compatible

1. Information for this chapter was complied by Arne Isaksen and Anne Holmes based on country studies. A complete list of the full-length country studies prepared by national experts can be found in the Annex.

with the dominant systems or it will not sell no matter how 'good' the product may be in itself. It should be noted, however, that software services constitute the greater part of the industry.

Several industry characteristics emerged from the country reports. The industry has grown very rapidly in the last ten to fifteen years. Its employees are better paid than those in most industries, and tend to be highly educated. In the countries which contributed case studies, with the exception of Korea, software was more important than hardware in their ICT sectors; and within software, the most important subsector was software consultancy and solutions. Industries were dominated numerically by small firms (although varying definitions, ranging from fewer than five employees to fewer than 25, limit the value of this international generalisation), but in most cases a good part of the employment and turnover were attributable to a small number of very large firms, often multinationals or their subsidiaries.

While ICT and software had general access to a range of government innovation programmes and assistance to business in all countries, there was also a wide range of specific measures to promote them, ranging from special R&D organisations such as National IT Australia (NICTA) and incubators in Australia through a targeted suite of programmes in Ireland (the biggest software exporter in the world) to a deliberate and wide-ranging policy in Korea supported by its own legislation. All countries assisted ICT, being an important industry in its own right and an important technological input to other industries; and there was indirect assistance by way of infrastructure, measures to increase demand, and government procurement policies.

Software is an appropriate industry for use as a case study in the KISA project for a number of reasons. Firstly, software is often an important element in innovation. Many process and structural innovations, in particular, depend heavily on organisational changes which are facilitated by new software. So for innovation in the economy at large, it is important that the innovation system within the software industry functions well, and one element of this is software firms' access to and use of knowledge-intensive services.

Second, software is a highly innovative industry, with a fairly short timeline between invention and introduction on the market. It provides many easily visible examples of the contribution that KISA can make to an industry's innovation system. Because it is technology-intensive, it is perhaps even more dependent than other industries on being at the forefront of acquiring and building on knowledge-intensive services. It is dependent on these services also because software firms do not seem to have established standard patterns of interaction with formal research institutions. A common feature of the industry overviews in the country studies was that contact with such organisations was rated of low importance.

Third, software is both an innovating industry depending on KISA and a vital element in KISA for other industries. Sometimes there is confusion in the analysis between the roles of the software firm as user and provider of knowledge-intensive services. But one message that appears to come out of the KISA studies is that innovation is an interactive and iterative process, and these relationships between user and producer are important for understanding how KISA contribute to building firms' innovative capabilities.

The innovation system in software

Software is an innovative industry in terms of the number of new and altered products it brings to market, and in terms of the self-description of firms in the industry. This is partly due to the nature of an industry that has grown from a new platform technology over the last 30 years. It may also partly be a product of the prevalence of small start-up firms in the industry. A high level of innovativeness may also partly be due to the nature of the relationships with customers in the industry. At one extreme they are consumers of entertainment, seeking novelty; at the other they are businesses seeking technologies to maintain their competitive edge.

Governments have a major role in creating the context for innovation in the industry. In addition to all the economic and innovation settings that affect all industries, governments are important to the software industry as regulators, standards makers and infrastructure providers. They are also important as leading edge customers, generating a large volume and variety of work and providing critical and demanding feedback. Large firms are also important as customers and collaborators for small and medium firms, and also as a route to markets, particularly internationally, for software that has been used as part of a larger project. In turn, the huge economies of scale available in the industry mean that for firms in small countries a global market is crucial for viability.

Software firms engage in product, procedural, personnel-related and structural innovation. In many cases they are building on an initial radical innovation and making incremental changes to the product as well as changes to the firm to enable it to produce it more efficiently and to keep abreast of changes to it. However, innovation surveys show that a large proportion of software firms (compared with other industries) believe that they are engaged in radical innovation – usually the introduction of an original product. As the industry matures, there appears to be a move from technology driven innovation to demand-driven innovation. It is as if customers had first to be educated as to what was possible in the technology push phase before they started demanding new products in the market pull phase.

The dynamics of process innovations and organisational innovations are somewhat different. In some case firms, product innovations have led to a need for restructuring of organisations. Organisational innovations, including changes also in processes and upgrading of equipment, are often a precondition for succeeding with the actual product innovation. Thus, in the Australian case study firms ‘soft’ innovations relating to staff development and training, and changing of company structure are important.

These three dimensions of the type of innovation have implications for the kinds of knowledge-intensive services that the firms require, and the kinds of knowledge-intensive activities they engage in. Technological expertise and design services are important for the early stages of radical product innovation; business strategy and human resources consultancies are more important for organisational innovation. Producers of the different elements of software – systems design, packages, software solutions designers, and consultancies – also make use of different services and engage in different knowledge-building activities.

The software industry is more R&D-intensive than the average for all industries, according to aggregate R&D figures. Also, firms' R&D tends to be concentrated on 'development' rather than research. A disproportionately large amount of the R&D expenditure is by big firms, while many small firms do virtually none, apart from gradual improvement of existing products. Even this gradual improvement is frequently done by releasing successive, improved versions and fixing imperfections piecemeal.

Many software firms actively and deliberately collaborate with their customers in producing new or improved products. It appears to be fairly common for software specialists to design a solution for a particular customer's problem, and then find that it has more general application and package it for general sale. Because it is a fast-moving, technology-intensive industry, firms require information about new developments. They can get this from research and technology organisations, the literature – scholarly journals and more accessible trade journals – and from firms in their network, as well as from customers.

A perennial problem for software firms is the difficulty in obtaining growth capital. The Norwegian case study firms finance innovations mostly by internally generated funds, equity funding, but combined with external financing like public or customer funding. This is likely to be a common pattern. Finding capital is an issue for almost all entrepreneurial firms, but is exacerbated in software by the lack of fixed capital for security and bankable intellectual property. To a great extent, software inventors rely on being first to market and the difficulty of replication, rather than patents.

Software country studies

Methodology

The six country studies of KISA in the software industry had the common aim of investigating:

- The provision and use of knowledge-intensive services in innovation processes.
- How knowledge-intensive service activities contribute to innovation.
- How services from different sources are integrated and internalised to develop a firm's innovative capability.

There were differences in emphasis. Korea put a somewhat greater emphasis on the supply side, especially the role of government as a provider of services. Australia had an interest in the relationship between building internal competence and the reasons for internal provision versus using external services. New Zealand, also, was interested in the combination of external and in-house expertise. Ireland began with the prior question of whether KISA were important for innovation processes, and went on to examine whether the conditions existed for their development. Finland related innovation and KISA to three elements of a framework: the firm's business model, its value network, and its stage in the life cycle. Norway focused most directly on the question of whether firms use KISA to develop innovative capability. Both Korea and Norway gave attention to the role of software firms as providers of knowledge-intensive services, and how they contributed to innovation processes in their role as 'innovation agents'.

There was a lack of clarity within and between studies in the discussion of knowledge-intensive business services (KIBS), and KISA. In some country studies, access to KIBS seems to be the primary concern, and sometimes a service such as advice on technology was referred to as "a KISA". Sometimes the focus was on the subject matter of past KIBS studies – the availability of services, and how important they were – rather than on the activities of firms in connection with the services. This was magnified by the dual role of software firms as both users and providers of knowledge-intensive services. Such confusions partly illustrate the newness of the KISA concepts and the recognised difficulty of understanding abstract notions in the context of a firm's behaviour.

The studies agreed fairly closely in their identification of the knowledge-intensive services that were of interest. While the terminology differed, the services of general interest were:

- Research and development.
- Technical consulting services.
- Legal services, especially to do with intellectual property.
- Accounting and financial services, including advice on access to capital.
- Project management and product development.
- Marketing, especially internationally.
- Training.
- Recruitment.
- Strategic and business planning.
- General management consultancy.

All studies gave some attention to which knowledge-intensive services were provided in-house and which were acquired from external sources; and to what the sources were – KIBS, research and technology organisations (RTOs), networks and so on. All looked at the role of KISA in planning and carrying out current innovations.

There was less common ground in how the different studies examined the activities arising from the knowledge-intensive services, how they were integrated by the firm, and how they contributed to developing innovative capacity. Norway discussed knowledge management and processes for internalising new skills in the context of a framework of competences. Korea took a set of innovation capabilities and correlated use of various knowledge-intensive services (KISs) with the development of those capabilities by formal statistical methods. Australia investigated firms' ways of capturing the learning from externally provided services, and their provisions for knowledge management. Finland looked at developing innovative capacity more or less incidentally to the questions of why, how and when various knowledge-intensive services were used. Ireland focused on the differences between foreign-owned and indigenous firms, and on how services from different sources were combined to produce innovative competence. New Zealand looked more at the sectoral level than at the behaviour of individual firms, and emphasised the importance of relationships and networks as loci of competence. A finding common to almost all the country studies was that firms made clear distinctions between those competences which they would like to internalise and those which they were happy to

outsource, either because they were not central to their operations or because there were circumstances where they needed fresh input.

Finally, all studies drew conclusions, and set out policy implications at various levels of prescription.

Individual country reports

Norway

The software industry

Software has become more dominant in the Norwegian computer industry and related activities over the last ten years. The workforce in the industry is now older and better educated and the industry is more innovative. Employment in the industry almost trebled between 1989 and 1999, when it accounted for 1.14% of the workforce. The fastest growth was in firms with between 10 and 49 employees. Micro firms, with one to nine employees, also increased rapidly, while those with more than 250 employees fell as a share of the industry from 36% in 1989 to 24% in 1999. The industry is concentrated in the Oslo-Askershus region, with another significant cluster in the western county of Hordaland.

What the study did

Semi-structured in-depth interviews were conducted with 16 Norwegian software firms. They discussed the use of knowledge-intensive services, both internal and external, possible effects, the situation with regard to competitors, core competences and learning, innovation and its financing, collaboration for innovation, barriers to innovation, and the role of the public sector in innovation in the software industry.

Key findings

Research and development activities are the most important KISA, and R&D services are mostly conducted internally. So are project management and the development of strategy and business plans, and some less important activities, including the development or introduction of new information technology systems for internal use, and organisation development and team building. In other areas there is a mixture of internal and external competences and knowledge. This occurs particularly in marketing and sales, and training and recruitment services. The extent to which externally sourced services affect learning and innovation depends on why firms have outsourced the activity. In some cases — such as management training, sales training and public relations activities — KIBS providers may contribute to changing working methods in their customer firms. In other cases, however, the customer firm has no wish to learn the externally provided knowledge.

Software firms also provide knowledge-intensive services, and in the process mix internal experience and knowledge with external ideas, information and knowledge. This is a two-way process.

Other features of the study

The study proposes a *policy implications framework* which would take into account that knowledge-intensive service activities are not an aim in themselves but a means to achieve the overall objectives of more innovation and increased competitiveness. KISA do appear to be important both in carrying out innovations and in improving innovation capacity. Policy measures should target both providers and receivers of services, and firms as generators of internal KISA; and they should work through stimulating supply of and demand for services, continuous improvements in quality, and networking.

New Zealand

The software industry

The software industry in New Zealand is characterised by a large number of small firms and a small number of large firms. Activities include application and development of proprietary software, with low infrastructure requirements, for niche market consumers. This coupled with the diverse range of cellular frequency technology platforms produces useful test-bed conditions for solution-focused software innovations. Of the 16 companies with turnover exceeding NZD 100 million, half are the New Zealand-based activities of multinational corporations. The industry is important to the economy because it is highly productive (average output per employee is NZD 141 000, compared to the economy average of NZD 61 280); because it is research-intensive, and because it develops human capital which enriches the whole economy. The industry represents 0.7% of New Zealand's GDP, and 12% of its product is exported.

What the study did

The study analyses KISA in the software industry in New Zealand using information from a series of national statistics of the New Zealand software industry and three other studies: a study of the high-technology sector in the Canterbury region, an industry analysis of New Zealand's mobile and fixed wireless sector, and a survey of software development practices in the New Zealand software industry; and focused interviews.

Key findings

For 15% to 25% of firms in New Zealand's software industry, innovation is not seen as a core activity. All software firms reported difficulties in accessing capital and attracting specialist staff. Lack of knowledge about markets is a barrier to innovation for small firms, which reflects the critical mass required to sustain continuous innovation. Firm owners and competitors are important sources of information for innovation. Books, trade journals, conferences and shows are also important. These results reflect a style of innovation that adapts existing technologies to provide customised solutions.

Other features of the study

Relationships with large-scale firms, such as telecommunications companies and major commodity producers, are important for product development and building international customer and knowledge networks. The industry is R&D-intensive, but most R&D is carried out by a small number of large firms. It tends to be product-focused and *ad hoc* rather than driven by a research strategy and this is consistent with an inexpensive,

solution-focused approach to software innovation, which is based on identifying industry problems and developing clever technical solutions which are easily customised.

Korea

The software industry

In Korea, software services represent 73% of the local industry, while packaged software accounts for 27%. The perception that economies of scale in the software industry could lead to dominance by foreign firms led to the *Software Industry Promotion Act* in 1987. Measures include setting up institutes and promoting the development of the industry through human resources programmes, developing core software technologies, incubating software start-up firms, and expanding the demand for software.

What the study did

A survey of 60 firms, all of which were users of KISA and 40 of which were suppliers of knowledge-intensive services, generated preliminary analysis which was followed up by numerous individual interviews and workshop feedback sessions. The discussion was in terms of the role of publicly provided KISs to innovation by software firms, the contributions of privately provided KISs to innovation by software firms, and the role of software services in building innovation capability in user firms. Results are presented for large firms and SMEs.

Key findings

Of publicly provided knowledge-intensive services, R&D and training in information and communications technology were the most frequently used; these were also the areas of greatest government spending. They were more important for product development and process engineering than for organisational innovation, but they were not regarded as contributing much to firms' innovation. Customers were more important.

Software firms that carried out innovation used privately provided knowledge-intensive services more than those that did not, which may suggest that the services promote innovation. Publishing and R&D services contributed to product innovation, but private services were insignificant in organisational innovation. The most important sources of ideas and information were other firms. As users and producers of knowledge-intensive services, software firms need to integrate various sources of information and knowledge in their innovation processes.

There were significant (and in some cases strong) correlations between software firms' innovation capabilities (such as awareness of the need for change, possession of search strategies, ability to build competences) and their use of some knowledge-intensive services.

Other features of the study

The study of the software sector as suppliers of KISs (using an automotive firm as the user) suggests that building a flexible institutional structure for joint ventures between manufacturers and service firms is important. A key issue is how firms transform external KISs into applicable knowledge. Large manufacturing firms with the internal capability formed continuing relationships with suppliers of software services but at the same integrated the services into their own internal knowledge-intensive operations.

Ireland

The software industry

The software sector in Ireland is responsible for nearly 8% of Ireland's GDP and nearly 10% of its exports. Ireland is the largest exporter of software goods in the world. The software sector comprises more than 900 enterprises. Of these, 600 are indigenous, and 250 of them have significant levels of overseas sales. The software industry employs over 25 000. Of these, 14 000 are employed by overseas ICT companies operating in Ireland. Leading US software companies have based their European operations around Dublin and the indigenous software development industry has grown in parallel. Micro businesses (fewer than 10 employees) and small firms (between 10 and 49 employees) dominate the industry numerically.

What the study did

A postal survey of companies in the two main centres for software in Ireland had 274 respondents, 74% of them fully Irish-owned. Senior managers of product development and R&D departments of 16 software companies were interviewed, seven indigenous and nine foreign-owned companies. The interviews covered an overview of innovation in the software firm, the role of KISA in the firm's innovation, barriers to the innovation process and control mechanisms, and opinions on policies and programmes encouraging innovation.

Key findings

In the case of new product development and design of products, 83% and 77% of the firms, respectively, use in-house facilities. However, approximately one-third of respondents use other sources (either solely or in combination with internal capabilities) for process development, adaptation of product, and adaptation of process. Forty per cent of foreign-owned firms use other parts of the company for new product development. Almost half of the firms, predominantly the small ones, received government grants, often as part of joint ventures.

Private providers are the most important sources of externally provided KISs. Public sector research organisations were used for R&D services, engineering consultancy and development advice services, but only by 9%, 5% and 3% of respondents, respectively. Lack of finance was the biggest barrier to innovation.

New product ideas were often obtained through the relationship between the engineering and/or marketing departments and customers (who were sometimes the firm's competitors). Strategy development and management advice teams often worked with the research and engineering and other departments to promote creation, development and marketing of a new product. The product is incrementally improved through feedback from engineers working with customers.

Other features of the study

The software industry in Ireland is interesting especially for its export focus, and the importance of relationships between small firms and multinationals, many of which conduct major operations in Ireland. Providers of knowledge-intensive services are carriers of knowledge which leads to innovation in the software sector. Most KISA are carried out in the early phase of innovation. Software firms are highly specialised in

particular product areas, and concentrate on KISA that are important for their core area of technology, leaving other, peripheral services to be supplied externally.

Finland

The software industry

In 2002, the Finnish software product industry generated revenues of EUR 1 billion, and employed 10 000; the whole software industry's revenues were about EUR 3.5 billion. Forty per cent of revenue from software products came from foreign markets, but recent growth, which was rapid at 13%, was from the domestic market. Even so, Finnish firms are putting greater emphasis on standardisation in order to tap international markets. Individual software product firms do not appear to have been very profitable: 25% of companies generated losses and 60% had a close to zero result. Software businesses tend to be small and have financial constraints, so they have a limited capacity for risk taking; but they benefit from the country's leadership in telecommunications and the forestry sector.

What the study did

Qualitative data on both software product and software services businesses were collected by seven industry expert interviews in organisations providing knowledge-intensive services (KIBS and RTOs), and theme interviews in seven case companies, with 1-3 interviews per company. Quantitative data comprised a software industry survey by Helsinki University of Technology with 166 respondents; and an on-line KISA survey conducted by LTT Research Ltd with 48 respondents. Results were analysed in terms of the business models, value networks, and life cycles of the firms.

Key findings

The case studies showed that KIBS and RTOs were used as support for business management and development functions, and were especially important when firms were expanding into international markets. Network-based KISA were more important in innovation. Networks generated knowledge jointly, and transferred it between companies, customers, subcontractors and authorities in the industry. Network KISA were especially important in strategic areas such as the development of future business and new solutions, and were used to transfer tacit knowledge.

The survey showed that on average companies spent 11% (with a median of 3%) of their revenues on knowledge-intensive business services. Legal services were the most commonly purchased, followed by financial management, business and strategy consulting, human resource development and customer relationship services.

Services were sought outside because the competences were not available internally, or there was neither time nor resources for internal provision. There were reports of difficulty in finding adequate external services. The greatest use of external services was by companies developing standardised products and services for large markets. Businesses developing customised products relied on customers for feedback.Highly technology oriented businesses tried to keep their core competences in-house.

Other features of the study

Use of services and service activities changed during the product life cycle. Most software firms specify, design and implement a new product using internal resources. The first service they seek outside is assistance with strategy formulation and finance, followed by legal services. After testing of the product, service use is greater. Organisational culture and values were important in successful innovation.

Australia

The software industry

Specialist software firms in Australia generate about USD 7.5 billion a year in income, about 1.3% of Australia's GDP. Very small businesses make up nearly 80% of ICT specialist businesses, but account for only 15% of employment and 5% of income for the industry. Software businesses have access to government programmes to promote innovation and commercialisation; the Commercialising Emerging Technologies (COMET) programme is of special interest because in effect it works by facilitating SMEs' access to and integration of knowledge-intensive services. There is a new flagship research organisation, National IT Australia.

What the study did

A survey with follow-up interviews, with 54 respondents to the survey and 41 subsequent interviews, examined the role of KISA in developing the most important innovative product, and the capabilities associated with that development; where services were obtained; and difficulties in the innovation process.

Case studies of six software companies looked at what services were used and when, where they came from, and how companies integrated them in order to build their innovative competence.

Key findings

The survey: Most firms found most services internally. Firms kept in-house those services which were important for maintaining their technical edge, especially those which developed their own skills. Some firms sought some strategic development advice externally because an independent view was useful. External R&D was used for specific purposes and projects. Most externally provided services were from commercial providers, but the most important external sources of knowledge and ideas were customers, suppliers, and other firms in the industry, including competitors.

The case studies: All the firms had built on a radical innovation and were modifying and expanding their products in response to customer demand and changing technologies. Most knowledge-intensive services were found in-house. The firms were aware of the need to build their capabilities. They learned from their customers particularly, and from reports and other written materials supplied by contractors.

Other features of the study

Most firms using outside services aspired to develop the competences in-house as they became bigger and more successful. However, there were occasions, particularly when compliance with regulations was involved, when they recognised they would always need an external provider. There were also cases when they wanted a fresh input. In general the original innovative idea came from within the firm, but often an outsider was able to provide creative ideas for its implementation. In those cases it was felt that hiring and internalising that creativity would stifle it, and that part of the usefulness of an external provider was in its exposure to a variety of companies.

Findings from the software country studies

The studies

Four countries conducted surveys: Korea had 60 responses, 40 from software suppliers and 20 from users; Ireland had 274 responses; Finland used its National Software Survey with 166 responses and a specific KISA survey with 48 responses, and Australia had 54 responses, of which 41 were subsequently interviewed in greater depth.

Case studies of software companies were carried out in five countries. The Australian project examined six software companies, which all started by developing a radical innovation. The Finnish project included seven case companies, in which 1-3 interviews were carried out in each company. The Norwegian report and the Irish report each analysed 16 case studies. In addition, the New Zealand report summarised results from three earlier studies of the industry, and this section utilises conclusions from the New Zealand synthesis of case studies. The case study companies in all the countries were selected so as to represent firms of different size classes, age, markets, products or services, as well as indigenous and foreign firms (in the case of Ireland).

To a great extent the surveys were limited to asking what firms did. The case study method gives a fuller picture of the behaviour of firms and what they do with the services they acquire, and so enables more explanation of how and why they do what they do.

When are knowledge-intensive services used?

The software sector certainly appears as a very innovative industry. In the surveys, most firms reported recent innovations. The 16 Norwegian case study firms include firms with a very high degree of radical innovations. Two-thirds of the firms have introduced innovations considered of a radical nature to their markets. This result may however reflect the fact that the case study firms were among some of the largest and most well-known Norwegian software firms.

The degree of innovativeness may also reflect the age or the stage of the life cycle of a company. Thus, a characteristic of software firms in New Zealand is that once the initial product (often of a radical nature) has been created, further innovation activity is conducted on an ad-hoc basis, if at all. R&D and innovation in these firms tend to be product-focused, ad hoc and self-funded, which relate particularly to small firms. Most R&D is carried out by a small number of large firms that typically have formalised procedures for specifying customer requirements.

Software companies use different types of KISA, depending on the stage of the product's or service's life cycle. Software products go through different release life cycles. The cycle starts by strategy formulation, business development, feasibility studies and requirement specification. In this cycle important KISA are consulting and research services related to strategy, business development, engineering ICT, marketing, and financing. The idea of a new software product most often comes from interaction between the software company and customers.

The next phase consists of design, implementation and testing. The important activities in this phase are software development and ICT support services. Engineers in the company are normally responsible for design, testing, and developing the idea into a tangible software product. Engineers may gather information and feedback from a range of other KISA sources in their work, such as research services, technical consultancy, training services, and information from the customers' industrial sectors. The market testing phase very often involves the release of an early version of the product to some pilot customers, which give feedback on the functionality of the product.

The final phase consists of launch and marketing, sales and distribution, support and maintenance and after sales services. This phase has the most extensive use of most types of KISA, according to the Finnish study. It also seems that companies use external KISA providers to a larger degree in this last phase.

Which services are used?

Knowledge-intensive service providers can be categorised basically into three groups. A first group is specialised providers holding expert knowledge, and which offer services as part of their core business. This group consists in particular of KIBS and RTOs.

A second group is non-specialised providers that are offering information and knowledge of importance for innovation activity as a consequence of their core business. Examples of such players are clients and suppliers. In contrast to the first group, these external players contribute with ideas and knowledge to the software companies without any direct return. Software companies develop network relations with specific external players in which mutual trust and common understanding have been built up systematically over some time.

Thirdly, service providers are also found inside the companies' own organisation. These in-house service providers are often separate departments and units. Development teams and sales representatives are often important in innovation processes. A main point in the KISA project, however, is the fact that innovation processes often build on a mix and match of internal and external knowledge-intensive services. Companies supplement their internal knowledge with external expert knowledge in learning and innovation processes.

Use of internally vs. externally provided services

Knowledge-intensive services are important inputs in innovation processes. As software firms in general are very innovative, KISA are of considerable significance in the software industry. Most firms surveyed provided their own knowledge-intensive services for innovation most of the time for most purposes. There are several reasons for the predominantly internal provision of knowledge-intensive services: firms want to keep core activities in-house, they want to control the outcome of the production of vital services, internal competences are perceived to be better than external, firms have full control over

the service provided when produced internally, and limited financial resources prevents firms from acquiring external KISA.

There were three main reasons for outsourcing provision of services. Some firms outsourced some services because they were too small to have the competence in-house. Usually they were firms in the early stages of their life cycle. For example in the Irish case studies the small, indigenous software firms were not self-sufficient and often had to look for external suppliers of knowledge-intensive services. These firms perform core services in-house, and outsource more peripheral services to specialised firms. In many studies the small firms aspired to grow large enough to acquire the competence, either by recruitment or by specialisation of the existing workforce. In some cases, however, small firms did not envisage ever having the capacity in-house, thinking that they would never be big enough to justify the level of resources the function would need. Many software firms use externally provided legal advice, especially on intellectual property management, and accounting services, and many use external strategic advice when trying to raise capital externally. There were two opposing elements in the data, however. In both the Finnish and Korean studies, the biggest firms used more outsourced services.

In some cases it was better to have a service provided by an outsider. In cases of compliance, such as audit and health and safety checks, an external service provider was required by law. But there were cases where firms thought that they needed the creativity and freshness of an outside eye, usually to advise on strategy or design for an innovation that had already been originated in-house. In these cases there was no intention to bring the function in-house. Even where a firm was big enough to justify, say, a permanent full-time designer, if often felt that such a person employed on staff would lose their creative edge, as well as the advantage of seeing the innovation practices of many different firms.

Many firms outsourced all services that they did not define as core business, and, conversely, services that were only provided from external sources were considered as rather unimportant to the core business of the software firms. This could include many knowledge-intensive services that were crucial to innovation. The Korean study, for instance, showed that many firms regarded software publishing as highly important to their innovation processes, but preferred to leave it to the experts because it required generic competences rather than specific knowledge of the firm's business.

Use of external services varied along the value chain. Most firms do their initial innovative idea or product design internally, and are more likely to look for services at later stages such as process development. The Norwegian case study firms spend most on R&D early in their life cycle, and then regularly develop new standard solutions, or develop tailor-made software for individual firms.

The studies showed that the meaning of 'internal' sourcing differs according to the structure of national software industries. For example in the Irish survey firms on average 83% of firms used in-house facilities for new product design, but among multinational firms the Irish operation used other parts of the corporation for these services 40% of the time. Irish-based units of foreign multinational corporations tend to find knowledge-intensive services in engineering, management and marketing from within the MNCs, rather from other Irish companies. Engineers in the Irish unit constantly co-operate with colleagues in other units abroad within the MNC.

Other services are carried out both by external and internal providers. Thus, Norwegian case study companies employ both internal and external marketing and sales services, training services and recruitment services. These are services not directly related to the development of new products or services. However, the services support innovation activity by, for example, recruiting skilled labour. Units in multinational corporations constitute a special case. These units often choose other MNCs as their suppliers of highly specialised knowledge-intensive services. MNCs that supply KISA can offer these services to other units of MNCs on an international scale.

Most firms kept in-house the services that maintained their technical advantage. They felt that they had to be at the cutting edge in terms of technical issues, and kept the technical activities in-house as far as they could both to develop their own skills and because they could not get better services elsewhere.

The studies underline that particularly KISA of high and medium importance to the firms are mainly performed in-house. Important in-house activities are research and development, project management and the development of strategy and business plans. Activities such as the development or introduction of new information technology systems for internal use, organisational development and team building services are also mainly performed in-house as regards the Norwegian case study firms. These activities make up the core activities of software companies that they seem to rarely outsource. The Australian, Irish and the Finnish reports also maintain that companies quite rarely employ external services to support their early innovation processes. In particular, product development, technology scanning and project management are carried out by the companies' technical staff.

Sources of knowledge-intensive services

Most software firms reported using internally provided services most of the time. But software firms also draw on ideas, information and knowledge from a wide range of external players. In order to be innovative and internationally competitive software firms have to access and combine knowledge-intensive services from several fields, such as engineering, management, marketing, finance and legal accounting. The Norwegian case study firms mention players ranging from other software or system development companies, individual consultants or consultancy firms, research and development institutes, universities and colleges to public regulatory authorities and directorates.

The services which were usually externally sourced were employment agency services, legal advice – especially on questions of intellectual property – and some strategic development advice. Research and development services, usually for project specific purposes, were also sourced externally. Some services used a mix of internal and external provision.

When services were found externally the ones that were provided by KIBS were especially legal and accounting services, marketing, training and employment agencies. Few firms in any of the surveys reported difficulty in access to services they required. Some, however, reported difficulties in contracting because of the information asymmetries which must exist in knowledge-intensive areas.

The Finnish case studies suggest that companies developing customised software do not use much expert knowledge from KIBS firms. Especially companies operating in close collaboration with customers rarely use KIBS. Companies developing more standardised software products or services seem to use more KIBS, at least in the Finnish case. These companies use KIBS related to business management consulting and market research activities.

When external R&D services were sought, they might be obtained from universities and public sector research agencies, but on the whole this was fairly rare. In some case companies participated in research programs financed or run by research and technology organisations to search for new technological competences. Some firms maintained long term relationships with universities, not so much as suppliers of discrete services but as sources of information about new developments. On occasion the firm combined this with a supplier role: the university undertook data collection and analysis, and the firm created a product for processing the data in some way relevant to the research project. Also, New Zealand companies co-operated with research institutes and universities in specific fields. Companies that had few formal links to universities, however, might maintain informal networks, perhaps links to former colleagues, and use them to keep up with technological trends. However, the main function of universities was as a base for recruiting technical staff.

In the surveys, the proportion of firms using government-provided services ranged from insignificant to 13%. In all surveys, government was more important as a source of finance than for service provision. Knowledge-intensive services from public or semi-public organisations in Finland are related to financing of product development. In these cases, advice, information and knowledge go with the money to the software companies. The external financing goes into projects that are otherwise too risky or too large for the companies' own financial resources. Australian firms also benefited from government programmes, above all seed funding and advice and assistance from specific programmes.

The Korean study pointed out that in training graduates in information technology, funding research, developing core technology and infrastructure, and providing incubators for start-up firms, governments are in fact providing a large volume of knowledge-intensive services to software firms. However, in the survey, respondents said that when they needed external knowledge they looked to private firms to provide it.

Ireland's survey found an interesting difference among firms: in general there was no difference in sources of service by nature of investment or company size, except in the case of R&D services, where 23% of foreign-owned firms used universities and public sector research agencies, compared to 7% of Irish firms.

Industry associations also provided some services, particularly (and not surprisingly) in information technology industry development advice and in training.

Not all of the surveys asked about the geographic location of services, and the answers showed no clear pattern. In Australia, companies mostly sourced expertise from their local areas, whereas in Ireland the level varied to include regional, national, and international sources. Again, this reflects both the structure of the industry in the two countries and their geography.

One very clear message from all the surveys was that the main external sources for innovative ideas for software firms are not public or private service providers but informal processes. For small firms in particular, the personal networks of senior staff were crucial, especially for assessing market trends and new technologies. Customers were very important for all firms, and often a longstanding relationship generated a continuing flow of innovation. Suppliers also were important, especially for technical information. Often these were formal collaborations, but other firms in the network, including competitors, also conveyed information and stimulated new products and processes. Many firms also reported using database services which were available on the internet.

The networks also include organisations such as industry associations and standardisation organisations. However, it is important to keep in mind that informal links are between individuals. Thus, entrepreneurs, technical staff and advisory board members often have active personal networks to former colleagues, study mates, university professors, etc. These networks are used to notice, assess and confirm market and technological trends, and to find experts to deliver services that are not available inside the companies.

Relationships with large firms assisted innovation in small firms in most countries. The New Zealand and Norwegian case studies also stress the importance of close contact with companies delivering technology platforms, which are often daughter companies of large, US-based corporations. Close contact with platform suppliers is important for becoming aware of new technologies early on, and enables a diversity of innovation. Often, too, the large firms were customers, and they gave the small firm access to overseas markets, either as a component of the large firm's contract or by access to networks and agents, or through advice about how to do business in other countries. Indeed, some firms in the New Zealand study reported that relationships like these were more important than competence for the success of a small firm.

KISA and the firm's innovative capabilities

Capturing the learning

In many cases the intention of engaging an external KISA supplier is solely *to get a job done*. The intention is then not to learn from the external provider. Thus, in such cases the external KISA provider is expected to contribute little to learning and innovation activity in the software company. The external knowledge-intensive service may, however, indirectly contribute to innovation, in that it frees internal resources to be devoted to the improvement of products and processes internally.

In other cases software companies explicitly want to acquire knowledge from the service providers, learn from them and increase the competence of the internal staff. In doing so, they increase the ability to acquire and create knowledge. In such cases the software firms report considerable interaction and cooperation with the external service providers, and these are cases where mix and match of knowledge-intensive services occur. Often the firm's capabilities are enhanced by making the contractor a part of the team in the medium to long term. Some external KISA providers may contribute considerably to innovation activity by changing the working methods and way of doing things in client firms. Alternatively, the firm may access and hopefully appropriate external knowledge so that it turns into new competences internally in the software firm, without going through a learning-by-doing process. Often an external service is provided by way of a written report or some other lasting encapsulation of the new knowledge.

When firms use external services, they often have to acquire complementary competences from several players, among them also professional service providers. For example, according to Finnish service providers the main reason for companies using external knowledge is lack of in-house competences. External expertise provides knowledge that for example solves specific problems during the innovation process. When using external knowledge, in particular from KIBS and RTOs, companies may gain state-of-the-art knowledge and methods, they access complementary skills on a longer-term basis, and they obtain objective knowledge and unbiased views on the business. The 'best' available knowledge (provided internally or externally) is seen as necessary for companies to remain competitive.

The Korean study asked firms what the important factors for innovation were. The responses demonstrated that this kind of activity at the level of the firm was important: 'innovative efforts of all parts of the firm' and 'close co-operation among internal and external parts of the firm' were rated highly, along with R&D and core skilled manpower. Firms learn, in much the same way as individuals learn. Both the new knowledge and the enhanced absorptive capacity contribute to the firm's innovative capabilities.

Other elements of the surveys show that firms are often conscious of the potential for using services to build innovative capacity. The decision to provide a service in-house was often based on the need to build and maintain leading edge skills in the firm's area of technology. Sometimes it was a philosophy of learning by doing; sometimes it was an appreciation that team work within the firm generated new knowledge; sometimes it was realising that in order to deliver a good service in an area like training, the person responsible would have to keep abreast of the latest developments; and sometimes it was simply an observation that in interacting with partners staff learned new things.

In the Australian survey, firms were asked about the innovation capabilities that they had, and those that they would need. The answers reflect the pattern of use of external services. Most firms were confident of their innovation capabilities in the areas of product design and development, which were services they mostly supplied in-house. They were less confident of their marketing capabilities, and these were often acquired externally.

Firms seem to be aware of the need to build internal capabilities in order to sustain their innovation activity. The Australian and Norwegian case study companies expect their professional staff to keep abreast of technical development themselves. The staff often obtain information from external sources, such as the internet, trade magazines, seminars and informal contacts with colleagues in other firms and organisations. The Korean and Australian surveys showed similar patterns of sources of information.

In the case studies, development work was first of all based upon pre-existing experiences from former projects, and on existing software modules of the firms. Thus, a key point is that innovation activity mostly rests on long-term building up of competence inside firms. Organisational learning and competence building take place in several corresponding ways. The efforts of individual workers to keep their knowledge up to date are important. An important part of the individual learning is learning by doing, *i.e.* learning when developing new software solutions for specific clients.

Clusters and networks increase the firm's capabilities in part by helping them select new external providers of knowledge-intensive services. New providers are selected on the basis of references made by contacts and acquaintances to the company, where the references are a quality assurance method. Particularly small firms may get information of importance for innovation activity in clusters that they do not have time or resources to

organise themselves. Software firms also benefit from being located in areas containing numerous competitors, which creates an innovation pressure. Thus, the bulk of the software industry in Norway is located in the Oslo area, while the other large cities also have comparatively many jobs in the software industry.

Knowledge management

The Australian survey reported on knowledge management, on the basis that retaining and internalising the knowledge acquired with services is an important aspect of building the firm's capabilities.

Forty per cent of firms used documents as a method of knowledge diffusion. Others indicated that information is collated into reports or stored in a database for future retrieval. Some organisations had adopted ISO 9001 guidelines which required them to document their processes, and these became a resource for future projects. About a third of the firms used informal methods for the transmission and assimilation of knowledge – casual communication, meetings and social gatherings. These methods are appropriate in the small firms which dominate the software industry.

The case studies also showed that internal communication is important for learning and innovation by making individual knowledge more of a company asset. Companies had established routines for diffusing information and knowledge inside the companies, for example by putting together project teams consisting of experienced and less experienced employees, and having a sophisticated system for cross-project learning. Some firms also carried out basic research and development, which might take place in dedicated R&D departments.

Barriers to innovation

At the outset, the KISA project had as one of its topics the issue of whether difficulties with access to or use of knowledge-intensive services constituted barriers to innovation. These studies show that such difficulties are relatively unimportant.

The most important innovation barrier for the Norwegian case study firms is the *lack of time* to conduct innovation activities at all. Lack of time relates to the fact that the pressure from everyday work (particularly in a period of market downturn in the Norwegian case) is so large that firms find difficulties in prioritising time for innovation activity. Other innovation barriers are limited sources of innovation financing and lack of human resources required for development work. The last factor relates both to lack of available persons with technical specialist competence and personnel with good sales and marketing competence. Lastly, market-related factors, for instance too limited Norwegian user markets, as well as a limited number of national software producers, are perceived as barriers to innovation amongst the case study firms.

These barriers are also found in another small country, New Zealand. Thus, the New Zealand study maintains that particularly small firms may have difficulty to obtain the specialist advice they need for innovation and growth. Contributing to the difficulty is the fact that many firms are specialised in niche markets where experienced experts may be difficult to obtain.

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Chapter 4

THE ROLE OF KISA IN HEALTH CARE[1]

The international health care study

This section of the report is based on the case studies conducted in Denmark, Finland, Japan, Norway and Spain, each dealing with a different aspect of health care. All case studies seek to identify carriers of and barriers to systemic innovation in health care and explore the role of knowledge-intensive service activities (KISA) in enhancing systemic innovation.[2]

This chapter is structured as follows. First, an introduction to health care systems is given. Its aims are to highlight *1)* that the structures and functioning of national health care systems are quite different although they have been created with more or less the same purposes of equity, access and quality; and *2)* that health care systems face strong pressures owing on one hand to the changing needs of the citizens and continuous innovation in medicine, life sciences and technology, and on the other the desire to contain health expenditure at an acceptable level of GDP. After that, the case studies are each briefly summarised. In the final section, the results are discussed and policy issues are identified.

Introduction to health care systems

Overview of national health care systems

OECD countries spend between 6% and 15% of their GNP on health care, and this percentage has been growing continuously for the past 30 years. While all countries have similar goals with regard to access, equity, quality and cost, the way health care services are organised, provided and paid for varies greatly across nations. One might expect that as national health care systems have been in existence for a long time, there would have been a convergence into one common system, but that is not the case. One explanation for this is that as health care systems have been created incrementally, the resulting systems each reflect the national values of the country. The long evolutionary process also means that each system comprises a complex set of interdependent policies, practices, vested interests, and therefore a high degree of rigidity towards change.

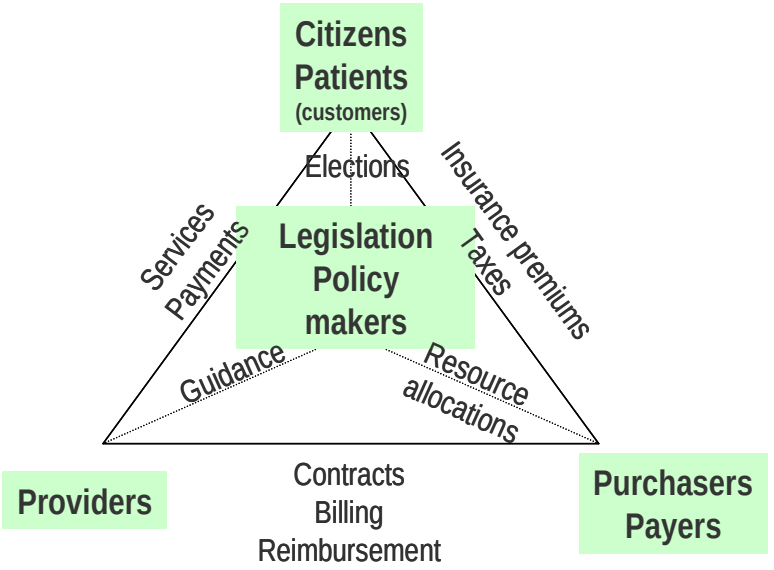
1. This chapter was prepared by Niilo Saranummi based on country studies. A complete list of the full-length country studies prepared by national experts can be found in the Annex.

2. Systemic innovation in this context refers to changes in the integrated system of health care practices, services, technologies and organisation that together form a new mode of operation.

The provision of health services is generally based on a mix of public, private and third-party sector providers.[3] Health care systems are quite tightly regulated based on national legislation prescribing especially:

- Patients' rights.
- Conditions for providing health services.
- Ways and means to fund and pay for health services.
- Rights to practice medicine (and other health professions).
- Data protection and privacy of individual data.
- Safety and security of health technologies (In Europe through EU directives and in USA FDA regulations).

Figure 4.1. The main actors of national health care systems and examples of their relationships



National health care systems typically comprise a number of interactions (Figure 4.1). These include:

- Citizens that have instituted the national health system elect the political bodies and finance the system through various means.
- Actors that establish health policies and act as regulators (in most cases public bodies).
- Actors that organise (purchase or pay) health services to make them available to customers, patients (public and private organisations).

3. Third-party organisations include non-profit societies, foundations, etc., created to service varying needs.

- Actors that provide health services to customers, and are reimbursed through a variety of payment schemes (public and private, also third-sector organisations, or enterprises).
- End customers, patients that consume health services.

Health services are financed through several means, such as taxation, insurance premiums and direct (co-)payments. Most national health care systems use a combination of these. Taxation can be applied by the state, regions, counties and/or municipalities. In insurance-based systems, the premiums are paid by citizens and employers. Insurance may be voluntary or mandatory. The amount of direct (co-)payments varies between countries, and there are usually different types of exception rules to limit the total value of co-payments.

There are two main criticisms about taxation and insurance models: they reduce the incentive for citizens to take care of their health, and they encourage overconsumption of services. They also require methods to limit access to certain services, especially those involving expensive new technology; and ways to spread costs, given that the people with the worst health are often the least able to pay high premiums. They also make it difficult to introduce competition and market conditions into health care.

Among countries situations vary between those who purchase and pay for health services and those that provide them. In some countries the purchasers and providers are clearly separated. In others, purchasers and providers are more or less the same organisations. Health care services can be purchased on a per capita or a fee-for-service basis. Most systems use a mix of both. Countries also vary in the level of centralisation of provision of health services.

National health care systems are usually based on a number of parallel health service channels that complement each other. Finland, for instance, has three service channels. The largest is the public primary and secondary care system for which municipalities are responsible. This is complemented by a private sector, which is financed by the Social Insurance Institution of Finland and co-payments by the patients. The third element is provided by occupational health services for employees, which are paid for by employers.

Health care is a knowledge-intensive and skill-intensive service area, and consequently labour-intensive. Salaries are the major cost category in health care. The share of technology has been increasing, mainly due to the emergence of new pharmaceuticals. Pharmaceuticals account today for 10% to 15% of the cost of health care, with medical devices (including medical devices, consumables, ICT products and services) accounting for another 5%. In 2000, the world market for pharmaceuticals and medical technology was estimated at USD 600 billion.

Pressure for change

National health systems in most industrialised countries are facing dramatic pressures for change both from within and outside the systems.

The expansion of medical knowledge through clinical research – collecting and formalising clinical evidence of diagnostic and therapeutic procedures – has led to a concept called evidence-based medicine/health care. In this, the questions that are posed are “is this procedure effective” and “is there clinical evidence to show that it works”, etc. A large number of international and national initiatives exist in this area, *e.g.* Cochrane Collaboration (*www.cochrane.org*) and National Guidelines Clearinghouse in the United States (*www.guideline.gov*), respectively. Health technology assessment (HTA) is a similar

movement aiming at quantifying the cost-effectiveness of new and emerging technologies, including pharmaceuticals. National HTA agencies collaborate through a network, the International Network of Agencies for Health Technology Assessment, INAHTA (*www.inahta.org*).

Technology and its use in service processes are closely intertwined. Innovations in devices and pharmaceuticals require changes in the service processes or, more generally, changes in the medical knowledge and skills base. As an example, digital imaging systems, such as computed tomography and magnetic resonance imaging, have generated the opportunity to acquire new information about the human body and its functioning. This in turn has generated innovations in applications for these techniques leading to a vastly different landscape in medical imaging than what was projected in the early part of the diffusion curve of these medical devices.

From the outside, pressures for change originate from several conflicting trends. One of them deals with the rapid ageing of the population (especially those over 75 and 85 years old). Ageing increases the demand for health care services and changes the illness profile from acute care towards the management of chronic illnesses. The changing age pyramid of many OECD countries means an increase in the elderly population, but it also leads to a situation where the ratio of those of working age over those retired decreases. This leads to increasing problems in financing health systems.

With the ageing population and the current lifestyles of children, adolescents and working age citizens, chronic degenerative diseases are becoming more prevalent. These trends have moved health care toward a more comprehensive approach, where the citizen (the patient) is expected to play an active role together with the health care team to manage the health problem. Wellness management is seen as a highly important instrument to maintain an acceptable level of health. The role of the individual in carrying out these interventions is central for success. A further extension of health care relates to facilitating independent living of the elderly in their natural surroundings by means of technology and technology-based services.

Finally, people are better informed today and are aware of both what health care can offer, and of their rights as citizens to these services.

Consequently, the pressing challenge today is the need to produce more high-quality services without major increases in the share of public health care expenditure of GNP. It seems that three means are being used to respond to this combined challenge:

- Designing incentives and policies that decrease both the demand for and offering of health services.
- Improving the productivity of health care services.
- Shifting responsibility to citizens (patients) to pay for health care services.

Health care service providers

Increasing productivity and quality is a central theme for health care service providers. This has led to the diffusion of cost and process analysis and quality management methods into health care. Some health care professionals see these management methods as a threat to their autonomy when care processes are formalised into services and their resource requirements and quality become transparent to all. They see it as an intrusion in the doctor-patient relationship.

The application of information technology has received a lot of attention lately as it has become clear that patient data generated in the care processes needs to be integrated into a patient record and made available to those that need it, and have the proper authorisation to access it. Today, many countries have embarked on a major ICT investment programme to build the information infrastructures needed to create integrated patient records and to communicate patient data. Examples include Australia, Canada, Denmark, England, Finland, France, Germany, the Netherlands and more recently, the United States.

Structural changes are also taking place. Support functions, such as imaging and laboratory services, are being re-organised into independent service units serving several health care providers, *e.g.* within a region in order to take advantage of automation, technology and economies of scale. This trend is also slowly emerging for rearrangement of the core functions of health care. The quality and productivity of certain procedures, especially in surgery, benefit from increased volume when specialists can really specialise and the care processes can be more effectively streamlined. As a consequence, units are emerging that only produce certain services. Examples include units for minimally invasive surgery, hip replacement surgery and diabetes management.

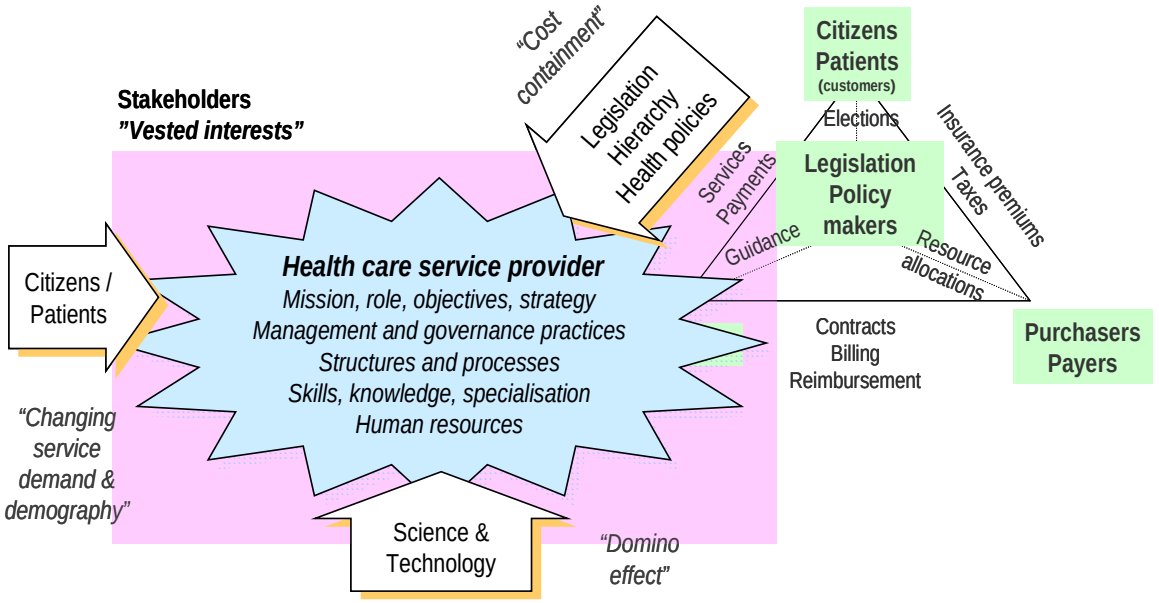
Need for systemic innovation

Figure 4.2 summarises the discussion of the previous sections. Health care service providers are part of the national health system (*cf.* Figure 4.1). Their role within the health care system is based on legislation, health policies and the hierarchical structure of the system. The overall aim of today's health policy is cost containment, the need to produce more high-quality services without major increases in the share of public health care expenditure of GNP, and without compromising the overall objectives of national health care systems (access, equity and quality). Service providers must operate within these policies and structures.

However, there are external forces acting on them. The first of these relates to the continuous progress and innovation in science and technology that improve the medical knowledge and skills base and create new means to diagnose, manage and treat health problems. The diffusion of new innovations into health care can be characterised as a domino effect. Initially, the change is small and confined to a certain domain but with time, as the innovation is used and its development continues, it may pervade a larger domain. Examples of the domino effect include Computed Tomography and Magnetic Resonance Imaging, and minimally invasive surgery.

The second force relates to the changing needs and role of patients. The changes are due to the ageing population, the increasing prevalence of chronic degenerative diseases in all age groups, and citizen empowerment.

Figure 4.2. Forces acting on health care service providers



The service provider must take all this into account and formulate a strategy that allows it to react and adapt to the other external forces. This is the most difficult aspect as there are many stakeholders involved in the decision making process with different vested interests. Change in most cases means that some stakeholders will benefit and some will lose out. Consequently, decisions often take a long time and are difficult to implement. In the continuously evolving context of health care, this means that the sector is in an underdog position trying to react when in actual fact it should be proactive. To be proactive, it should have a strategy and the capability to implement strategic objectives. However, there is quite a lot of documented evidence that the development of a strategy — which is shared by the stakeholders and which the organisation is able to implement — requires special skills (for instance: Adler *et al.*, 2003; Degeling *et al.*, 2003; Pfeffer and Sutton, 1999; Striem *et al.*, 2003; Weick and Sutcliffe, 2003; Young, 2000).

Innovation in health care is characterised by the need to cross boundaries between scientific and professional disciplines and institutions. It must create and sustain a dialogue across numerous individuals with diverse perspectives to negotiate possible solutions. Building trust and developing negotiation skills are definitive challenges for collaboration. Solutions involve the whole organisation and may require changes and adaptations in the integrated system of health care processes and services, institutional and organisational structures and products and technological systems.

Organisational change is always a slow and demanding process. An organisation's core capabilities can become its core rigidities (Leonard, 1998). A further barrier to overcome is that in most countries, governments set up health policies and a major part of health service delivery is in the public sector. Experience has shown that concepts and ideas that have proven to work in the business area (industry and services) cannot be directly translated into health care. Consideration must be given to adapting these to the value systems and business environment of health systems. It is not surprising that some consider health care to be the most change-averse industry (Christensen *et al.*, 2002).

Findings of the case studies on health care services

Table 4.1 presents an overview of the health care sector case studies carried out by the participating countries: Denmark, Finland (two case studies), Japan, Norway and Spain.

In the following sections the case studies are presented by describing the specific characteristics of each case, followed by the key results of each case study. The final section presents a synthesis of policy issues that emerge from the analysis.

Table 4.1. Outline of the health care case studies

Country	Title	Brief description	Type
Denmark	Minimally invasive surgery	Diffusion of minimally invasive surgery into clinical practice in Denmark	Medical technology
Finland	Regional health services	Re-organisation of the service structures, outsourcing of service functions, governance of the regional service delivery system.	Structural and organisational change
Finland	Home health care	Provision of home health and social services by redefining the objectives and processes and by utilising ICT as an integrating tool.	Structural and organisational change
Japan	Health promotion	Spin-off of a research theme from a university setting into a company that provides services to public health organisations aimed at the elderly.	Creation of a KIBS company
Norway	Home health care	Re-organisation of home health services delivery based on incentives set by the government.	Structural and organisational change
Spain	Health services	Personal care services for the elderly and chronic patients using ICT.	Information technology

Health care as a KISA actor

The aim of the health care case studies is to analyse the role of KISA in the systemic innovation processes related to the renewal of health care. However, health care is in itself a knowledge-intensive industry. Therefore, before we can start with the case studies we must make it clear how the core knowledge-intensive activities of health care differ from the expert services we call knowledge-intensive service activities.

The core activities of health care are the clinical actions performed by experts who interpret information obtained from the patient through various means with their knowledge and skills in the context of the confidential patient-doctor relationship. The core activities are supported by a number of activities. Some are clinical, such as imaging and laboratory services. Some are non-clinical, like cleaning, catering, administration and management. All these are knowledge-intensive in nature. However, none of these can be classified as KISA. In health care we need to make a clear distinction between the expertise required in core activities and the expertise used to complement these both internally and externally. Expert services that complement the core activities can be classified as KISA.

As an example, health care professionals share their time between their main function of delivering of health services, and clinical research. The part-time activity of clinical research can be classified as a KISA. This can be internal or external. For instance, in Finland, a large number of physicians take part in authoring integrated care pathway guidelines outside regular office hours. As members of the Duodecim Association (*www.duodecim.fi*) they evaluate medical literature and take part in organised working groups that update the guidelines.

Other examples of health care-specific KISA include participation in the development of quality systems, modeling and redesign of care processes, activities related to costing of care processes, benchmarking of performance and the processes this requires, *e.g.* data mining, knowledge discovery, knowledge management and data warehousing.

In the case studies the following themes were discussed with the interviewees:

- What types of KISA can be identified?
- Why were they used (what purpose)?
- When were they used (timing)?
- What interactions take place in co-production of KISA?
- How do organisations incorporate them into their business practices?
- How do organisations use KISA to increase their absorptive capacity for further new ideas?

However, as the concept of KISA was quite unfamiliar to the interviewees, it had to be translated into concepts that were familiar to them, such as expert services related to:

- Strategic and organisational development.
- Management and change management.
- Education and training of human resources.
- Research and development.
- ICT procurement and deployment.
- Legal.
- Banking and finance.
- Accounting and auditing.

Once the different types of KISA were identified, the analyses focused on the organisations that were delivering knowledge-intensive services. An indicative list of different types of KISA providers includes the following:

- **Internal KISA**: service providers inside the organisation, separate departments or units or individual persons providing services to different units.
- **Enterprise level KISA**: provided by shared resources of the group.
- **Knowledge-intensive business services (KIBS)**: defined as private sector firms providing knowledge-based services to other organisations. The nature of the knowledge they provide is strategic, technical, and professional advice mainly employing the skills of information gathering, processing, and interpretation of information in particular.
- **Research and technology organisations (RTOs)**: public or semi-public organisations providing knowledge-intensive services as their core business.
- **Network KISA**: plays a very important role in health care. As expert organisations health care is oriented towards gaining new ideas and exchanging of experiences. In the Internet age, these formal and informal networks are in many

cases global. It should be noted that their existence is based on the scientific and research interests of the participants.

Denmark: Minimally invasive surgery

Scope and context

Minimally invasive surgery (MIS) is a good example of a knowledge-intensive health service. On the one hand there is considerable high-tech and ICT knowledge embedded in the devices and procedures used in MIS, and on the other hand there is considerable training (skills) required to appropriately carry out MIS procedures. In addition, the advent of MIS in the 1980s has been judged by a number of analysts as a 'paradigm shift' in surgery, fostering innovation in other clinical areas and, more generally, in the organisation of a variety of health care services as well.

MIS is a rapidly growing area of medical treatment that causes substantially reduced trauma to the patient. In part, it is made up of changing techniques, but it also depends in most cases on new and advanced technologies, especially vascular catheters, medical imaging devices, and endoscopes. Today, nearly every organ system in the body can be approached by these technologies. Furthermore, a number of tools have been gradually incorporated into endoscopes. Miniature forceps, scissors and tools for tying ligatures were first, and are still being improved. Over the last 30 years, other advanced tools, including lasers, heater probes, electrocoagulation devices and cryotherapy devices, have also been incorporated into these scopes.

Many MIS procedures are carried out as either day surgery or require relatively short hospital stays. MIS has and is expected to continue to reduce the need for hospital beds and is changing the patterns of specialisation and medical practice.

For patients, MIS holds the promise of improved outcomes manifested as improved survival, fewer complications, and speedier recovery resulting in quicker return to functional health and productive life. For the health care sector, MIS holds the promise of increased cost-effectiveness of care. As a consequence, there may be benefits as well for society as a whole. However, evaluation is relatively scarce in this field, so more evidence is needed to substantiate these claims in most cases.

Research method, data and analytical procedures

The material is based on a literature search in the major clinical databases, Medline and Embase, covering the period between 1988, when the first minimally invasive laparoscopic procedure — laparoscopic cholecystectomy — started to diffuse, and 2004. A number of other sources of outstanding quality were available for analysis, of which three deserve particular mention:

- A study carried documenting the diffusion of MIS in Denmark (Schou, 1993).
- A PhD thesis on health technology assessment and diffusion of health technology, largely focusing on MIS in Denmark (Poulsen, 1999).
- Two special issues devoted to MIS in the principal Danish medical journal *Ugeskrift for Laeger* in 2004.

Additional data were collected from the National Board of Health, and from the publication list of the Danish Centre for Evaluation and Health Technology Assessment. Finally, Web sites of hospitals and medical societies were checked for relevant information.

Diffusion of health technology is complex and not well understood. Usually factors influencing diffusion are distinguished in four categories (Rogers, 1995):

- Characteristics of the innovation or technology, *e.g.* its purchasing costs.
- Factors related to the adopter. In health care this usually refers to the specialist physician or hospital purchasing the technology. For example, the adopter may or may not be cosmopolitan in outlook, which co-determines his or her willingness to adopt an innovation.
- Factors in the environment, *e.g.* the financing and organisation of the health care system.
- The way in which communication is organised around an innovation has been shown to be relevant for the overall process of diffusion. Examples include the role of international conferences and the activities of opinion leaders.

Specific issues

Networks and communication channels

The diverse strands of interests in MIS, surgeons, interventional radiologists and instrument manufacturers have converged with the creation of a number of international societies in the field, such as the Society for Medical Innovation and Technology (SMIT) (*www.smit.de*) and, later, the International Society for Minimally Invasive Cardiac Surgery (ISMICS), which in addition to organising conferences also publishes scientific journals. What these societies have in common is that they provide an effective forum for discussion of technological developments, and virtually all societies organise annual national or international meetings.

Concurrently, in a number of countries, including Denmark, regional centres for minimally invasive surgery have been set up to provide opportunities for training and research in a variety of specialties. From these activities it can be inferred that those who have an interest in MIS have adequate platforms for information on the state of the art in highly specialised fields and, increasingly, to receive appropriate training, which is critical in obtaining good clinical results.

Diffusion of MIS in Denmark

The Danish health care system has been characterised as a public and decentralised system, distinguishing between national level (central government), regional level (counties), and local level (municipalities).

Danish clinicians do not introduce new health technology on face value or simply because a technology is new. Because Denmark is a relatively small country, it is impossible to organise randomised controlled trials for all new technological developments on a regional or national basis, so in many cases results from abroad are awaited before adoption decisions are made. In consequence, adoption of new technology usually follows patterns of adoption and use elsewhere, but (usually) later in time. Additional contributing factors to diffusion speed relate to the pressure for change from patients and patient organisations,

the fact that physicians work in a budget-constrained health care system, and education and training in MIS procedures.

The decentralised organisation of the Danish health care system seems to have a variety of consequences. On one hand, decentralisation may impede the diffusion of minimally invasive therapy in Denmark, as MIS may increase costs of health care services at the municipality level due to the more rapid discharge of patients and increased need for community care services, while potential cost savings may be realised at the county level. Of course, these cost savings can only be realised after a considerable capital outlay for the initial investment, which is often a problem. Furthermore, it is likely that the tendency of counties to be close to fully self-supporting in terms of the supply of health care services and the absence of an authoritative central planning agency, have contributed to widespread conventional surgical practice variation with sometimes poor quality results.

On the other hand, decentralisation allows counties to be sensitive towards local priorities, but the absence of central government legislation on planning of hospital facilities results in a rather uneven geographical diffusion of new health technologies. Interestingly, in the case of MIS, a number of authors, mostly surgeons, have advocated centralisation or at least regionalisation of most procedures, recognising the close relationship between patient load, training level, and treatment outcomes. This echoes recommendations of the National Board of Health which, with some exceptions, have not been followed up by the counties.

This situation may change as a number of wide-ranging reforms are pending after the Danish health sector was the subject of a critical analysis carried out by a government advisory committee on the health care sector. In the second of its two reports, published in 2002 and 2003, respectively, the committee recommended, among other measures, to reduce the number of counties and to increase the powers of the National Board of Health to ensure professionally relevant development of the health care sector (Bech, Pedersen and Christiansen, 2004). This implies a move away from decentralisation and offers the opportunity for improved hospital facility planning. Implementation of these reforms, conditional on parliamentary agreement, is due in 2007. A smaller number of counties, most likely eight ‘health regions’, may each have a relatively increased investment budget for new health technology compared to the current 14 counties, so these reforms may foster innovation the Danish health care system in general, whereas structural innovation in the past relied much on the development of national policy frameworks oriented toward individual clinical specialties, *e.g.* the National Cancer Plan, the National Heart Disease Plan and the National Diabetes Plan.

Main findings – KISA in innovation

Network KISA plays a central role in the diffusion of MIS, as is the case with all new medical technologies. After initial introduction, the diffusion speed depends on a number of factors all mediated by network KISA. The use of the new technology creates new information which is communicated in workshops, conferences and publications. This in turn gives inputs to developers to improve the technology and to other users to improve the ways the technology is applied.

Another factor influencing diffusion is the hierarchy of health care systems. This will determine at what level the new technology will be applied. The appropriate level depends on the complexity of the technology, the amount of training and education needed to master it, etc. In acquiring the necessary knowledge and skills, volume is important. This

means that if a procedure is performed frequently the user is more likely to become a skilled user. This factor speaks for centralisation of complex procedures.

Finland: regional health services

Scope and context

The case study focused on the systemic innovations in the Pirkanmaa Hospital District (PHD). PHD is owned by 34 municipalities. Its mission is to provide specialised health care services to the 450 000 people living in these municipalities. The municipalities pay the costs of health care services. PHD's services are provided by a university hospital and three regional hospitals and by a work force of 5 600 employees. The health centres of the municipalities provide primary care services. Access to PHD's services is through referrals and emergencies. The geography of the district is such that most of the population resides in the city of Tampere and the five adjoining municipalities. The longest distance to the university hospital is around 100 km. As the PHD incorporates a university hospital, it has special responsibilities (based on national legislation) towards four other adjoining hospital districts.

The reason for selecting PHD was that it is considered a forerunner in Finnish health care in terms of finding innovative new ways to meet its responsibilities towards the municipalities and also towards the other hospital districts. Of the several systemic innovations within the PHD, we focused on four: the Laboratory Centre, the Coxa Hospital, the Mänttä Health District and the Imaging Centre. In addition to these business-level innovations, we identified a chain of management system innovations on corporate (enterprise) level that set the scene for the business-level developments (see Table 4.2).

Table 4.2. Systemic innovations studied in the Pirkanmaa Hospital District (PHD)

Systemic innovation, corporate level	Description	
Management methods and tools	*Internal* Quality management system, extensive management training and education programmes, BSC, and data warehousing for MIS *Municipal relations* Purchaser-provider dialogue to place annual orders and to monitor their delivery	
Systemic innovation, business unit level	**Description**	**Organisational form**
Coxa Hospital	Outsourcing of orthopedic joint replacement surgery (previously a clinical core activity of the PHD)	Limited company. Owned by the PHD, municipalities and private parties.
Laboratory Centre	Regional integration of laboratory services in primary and specialised care	Public utility. Owned by the PHD.
Mänttä Health Region	Regionally integrated unit of specialised and primary health care	Profit unit of the PHD.
Imaging Centre	Regional integration of imaging services in primary and specialised care	Public utility. Owned by the PHD.

Research method, data and analytical procedures

The case study was carried out through 21 interviews of representatives of PHD's management, KISA actors and representatives of the Ministry of Social Affairs and Health, analysis of available documentary material, and in the end through a joint meeting with the interviewees to discuss the results.

Specific issues

The study sought to explain why PHD was able to act as a pioneer in systemic innovation within Finnish specialised health care. In PHD several threads of activities have come together and laid the foundation for successful change processes. The first of these deals with long-term, consistent commitment at corporate level to develop internal and external management capabilities. Since the early 1980s, external training and education services have been used to build management skills and to learn from the general business management principles. Today, for example, PHD requires that all business unit managers (who already are recognised health care professionals) also have an MBA or be willing to obtain one (financed by PHD). Long-term investments have been made in quality management (QM). Today, QM cuts across the whole organisation and is part of its day-to-day operation. Parallel to these, balanced score card and data warehouse systems have been implemented for internal management and strategic planning. For the dialogue with the municipalities and their health care centres, a purchaser-provider mechanism has been developed.

Secondly, there are certain management practices that have contributed to systemic innovation. Among these there were skilful leadership and the ability to recruit tenacious champions to lead the reform processes. Additionally, PHD invests considerably in R&D because "it cannot afford not to". Change is part of management strategy. Strategies are formulated in dialogue with the hierarchies of PHD and its constituents and therefore the strategies can be implemented. PHD has been able to bridge the knowing-doing gap effectively (Pfeffer & Sutton 1999).

A third contributing factor is the overall regional environment in Pirkanmaa, which is favourable to new, innovative ideas. Tampere and Pirkanmaa are known for the bold ideas that they have been able to implement. Examples include both universities, which were started some 40 years ago (Tampere University and Tampere University of Technology), the medical faculty about 30 years ago, and the two technology parks (Hermia and FinnMedi) some 20 years ago. There is a history of actors in Pirkanmaa working together to create new activities.

As much as these competences and circumstances have contributed to the ability to carry out reforms, managing change has not been easy. This is because change often influences established power balances. For instance, by requiring measurement and by rendering professionals' performance more visible and controllable, quality management systems tend to reduce the power and autonomy of professionals (Striem *et al*., 2003). The core clinical competences have grown over time as an accumulation of activities and decisions that focus on one kind of knowledge at the expense of others. This is why Leonard (1998) contends that an organisation's core capabilities easily become its core rigidities. She writes that "once a system is set up to deliver a certain capability, the system acquires a momentum of its own and becomes difficult to dismantle even if it is now outmoded".

Several mechanisms interactively tend to maintain the existing core capabilities. They relate to economics, power politics, and behaviour. In the PHD case it was interesting to note, for example, that. in quality improvement projects special attention was paid to weeding out existing practices before replacing them with those developed in the project.

The current national policy environment puts health reform high on the agenda. The government has accepted a number of recommendations that are currently being implemented. Special funding is available for certain change activities. However, the responsibility for action rests with the municipalities and the health care organisations owned and operated by them.

The most important barrier is probably the fact that each organisation tends to consider its operations so unique that successful solutions developed elsewhere are cannot be implemented. In a sense, this attitude was also present in the PHD case: new ideas were adopted but implementation was always local, using internal KISA. If each organisation develops solutions from scratch and builds its own competence and skill base, there is no transfer of accumulated knowledge. It is clear that change processes cannot be led or championed by outside experts, but this should not preclude the possibility of using outside experts who already have gone through a similar change process to facilitate them.

Another barrier relates to metrics. Health care lacks clear, objective, quantitative indicators that could be used to benchmark how the resources are allocated, how effectively they are used, and what outcomes are produced. Naturally, indicators already exist and they are being improved, but a lot of progress is still needed. There is data on outcomes based on disease classifications, usage of in-patient and out-patient facilities, number of procedures performed, etc., at profit centre level. However, there is very little data on how resources are used in different patient/illness segments and what results are produced. The methods used in service and manufacturing industries to determine where resources are needed for optimal performance are only slowly finding their way to health care.

In the PHD case, the corporate management was able to acquire the financial data to back up its arguments for change. These were provided by in-house experts (in the case of the Laboratory and Imaging Centres and Coxa) and by outside experts (in the case of Mänttä and initially Coxa). Objective indicators are also needed for quantifying economic gains of re-organisation.

The third barrier relates to decision making and resolution of conflict situations. The PHD study revealed that all decisions have to be based on consensus. At the risk of oversimplification, the idea of majority decisions seems rather alien to the public sector.

Striving for consensus means that small minorities can block initiatives. It also means that strong quantitative facts are needed to convince all stakeholders. Combining this with the lack of objective performance indicators leads to deadlock. There is nearly unanimous agreement that changes are necessary, but no agreement on what the changes should be.

This is in stark contrast to the decision making climate of clinical medicine. Accepting a new medical procedure, drug or medical device can be seen as augmenting the skills and capabilities of the professionals. These innovations do not challenge their existence or roles. This is something that the professionals can decide between themselves, *i.e.* inside their profession. Health reform with its various initiatives for change, on the other hand, has the potential to taking this decision making out of the hands of the health care professionals.

Another potential barrier relates to how outsourcing is done, *i.e.* what organisational form is selected for the new business unit. For example, it has been claimed that the Laboratory Centre, as a public utility, operates in too sheltered an environment, with its owner, the PHD, as its major customer. Privately owned laboratories can therefore not compete with it on level ground. Similarly, the limited company form has potential problems. For instance, the business idea of the Coxa Hospital is also to get contracts from other hospital districts and municipalities outside the PHD. The question is whether there are strong enough incentives for them to purchase hip replacements surgeries from outside. Or is it easier to continue carrying out surgeries by themselves, even if Coxa can make a case for better quality and hip replacement surgeries with less cost? The decision to buy or not to buy also has implications for the in-house capabilities. The lack of objective indicators means that it is not easy to argue for such changes.

The same competition also exists internally when new business units are created through outsourcing and re-organisation of responsibilities. The newly formed unit must continuously meet the needs of the customers and maintain their trust in its capability to serve them well. Otherwise, the customers may be tempted to produce the services by themselves. Professional organisations, especially, have a tendency to re-develop functions that they initially outsourced. If the incentives are not clear enough, it may seem more economical to carry out certain services inside a profit centre than purchasing them from outside. This results in a double organisation and in deterioration in overall efficiency. This is a known problem related to managing corporations through profit centres. However, the problem is aggravated in public organisations because their cost-awareness is not so good and costing of their own work is not based on all additional and overhead costs. The Laboratory Centre of the PHD serves as an example. Through its centralised analysis facility it can create better economies of scale than the decentralised model. But at the same time, it is removed from points of care (POC) and cannot provide laboratory services as quickly as modern POC instruments can. A balance has to be struck and continuously maintained between needs and the possibilities offered by technology and centralisation.

Main findings – KISA in innovation

The study indicated that in the PHD, setting up new business units has been mainly based on internal KISA. Two explanations were given for this choice. First, in a large organisation such as the PHD, with 5 600 employees, there are latent interests, competencies and skills that can be recruited and trained. Second, change management is a process that cannot be outsourced. Outside experts can only facilitate the process, but cannot lead or champion it.

However, external consultancy services have been used to some extent in the early preparatory steps for two reasons. In some cases, the PHD did not have the necessary competence to assess the overall situation and formulate alternative courses of action. In others, an external expert organisation provided the required neutrality in the early critical stages of change management. The neutrality aspect is especially important in the public sector, where decisions for change must be based on consensus between all parties concerned (in this case the municipalities owning the PHD). At all times, external KISA have been used extensively for training and education at all levels and network KISA have played a central role in accessing new ideas.

Internal and external KISA are connected to organisational learning and knowledge transfer. The encouragement and development of internal KISA is expected to lead to organisational learning. Similarly, the encouragement and development of external KISA should lead to knowledge transfer and diffusion of innovations. The question is, is there an optimal mix of internal and external expert services?

There are two issues that should be considered in this context. First, systemic innovation is a process that takes place inside an organisation and has to be led by internal resources. Using in-house resources for problem solving and implementation leads to organisational learning, and the organisation will be better positioned against competition and changes in the marketplace.

Secondly, the requirement for internal leadership does not, however, exclude the use of external expert services to facilitate the change process. What services the organisation decides to use depends, of course, on what is available and what services it needs to complement its internal capabilities. The question of what is available creates the chicken-and-egg problem. If there is no demand for expert services, there is probably no supply either. And as a corollary, there are no market conditions for such expert services to be created and maintained external to the organisation and therefore the organisation itself is always more capable than outside services. The only way to end this dilemma is for the organisation to make its expertise available to the outside.

The PHD study indicated that ideas and experiences are freely exchanged in conferences and other meetings between health care organisations, but that no single organisation has the position, interest or incentive to promote similar change processes in other organisations. Should the 'promoter' be an external neutral actor or the innovator? The innovator would probably benefit from being involved in the knowledge transfer process. After all, it has been claimed that mastering something comes from a combination of doing it yourself and teaching others how to do it (Pfeffer & Sutton, 1999). According to the interviews, Pirkanmaa receives a lot of invitations to speak on their systemic innovations and many site visits are also made. One possibility for promoting knowledge transfer might be a partnership of the external neutral actor and the original innovator.

Currently, there are few competent knowledge-intensive service providers that have insight into the organisational complexity and dynamics of health care. There seems to be a consensus on the need to strengthen the market for high-quality expert services for health care sector in order to enhance organisational learning and diffusion of systemic innovation. Developing the market calls for long-term collaboration between customers and external service providers. In the long run, both health care organisations and KISA actors will benefit from collaboration. The qualifications of KISA actors will increase and the emerging market for high-quality service will benefit health care organisations. Building long-term innovative partnerships starts with preparing a clear business agenda, the commitment of both partners to change and investment by both parties. Among the expert services there could be, for instance, development of indicators to benchmark performance, to justify reforms, and to evaluate progress and results and methods and tools for health care process modeling.

Finland: seamless care for senior citizens in Kuopio home care

Scope and context

The case study deals with the use of expert services in developing seamless information transfer and co-operation practices in one municipality in Finland, Kuopio.

This city of about 90 000 inhabitants is located in central Finland. In 2000, the proportion of people over age 65 and over 75 was 13.4% and 5.7%, respectively (national averages are 15% and 7%).

In Kuopio, basic social and health services are provided by the Social Services and Health Department (SSHD). The SSHD was established in 1993 with administrative integration of municipal social and health care. SSHD is divided into eight divisions: open care, (community) hospital care, home care and elderly care, day care, social services, psychosocial work, dental care and administration. SSHD produces most of the basic health and social services by itself, but it also buys some services from private and third-sector service providers. Specialised care is bought from the university hospital. There are two community hospitals, which provide short and long-term care for patients not requiring specialised care.

The reasons for selecting Kuopio as a case are multiple. Providing care for senior citizens requires extensive co-operation between primary care divisions and between primary and specialised care. There are also many private and third-sector service providers participating in the provision of care. In the last part of 1990s the city experienced big economic difficulties, losing nearly EUR 60 million of state benefits and leading to a large budget deficit. Cuts in specialised care increased pressure in primary care. An external evaluation showed that the service structure was too institutional, home care needed to be developed and existing old technology modernised. In order to do this, a comprehensive strategy work to re-organise care for senior citizens was initiated in Kuopio's SSHD together with private, public, third-sector service providers and representatives of senior citizens. The initial strategies concentrated on structural change and later on service processes. Simultaneously with service strategies, a data management strategy was created for SSHD, which was based on service strategies. The strategies emphasised co-operation of different service providers. The role of municipal home care providers was seen to develop more towards a that of a co-ordinator, who would be responsible for integrating the services needed by senior citizens.

The aim of the case study was to see how the organisational, technical and functional changes had contributed to seamless care for senior citizens in Kuopio: which actors had supported the change, and what had been the carriers and barriers to change. At the local level, the aim was to support Kuopio in its change process. At the national level, the study provides information about implementation of a nationally important innovative idea, that of seamless care.[4]

4. Seamless care refers to a model of activity, where social and health service processes provided by different organisations are combined into one client-centered plan that is then carried out in an integrated fashion.

Research method, data and analytical procedures

The change has proceeded in Kuopio through several projects, many of which ran simultaneously. Of these, two were selected for the case study. The first of these projects, PALKO, aimed at changing work processes. It was an action research project to develop home care-driven care chains. In PALKO, a generic co-operation model was implemented in primary care and university hospital. The other project, VEGA, focused on the implementation of a common electronic client information system for SSHD's management and five of its divisions.

The innovative idea in Kuopio is seamless care: flexible, client-centered provision of services across the boundaries of service sectors. Administrative documentation such as strategies, interviews and seminars for the workers were used to build an organisational picture of the change process towards seamless care. Project documentation, interviews and queries were used to shed light on project processes and the role of experts in them.

Specific issues

The results showed that the development of seamless care for senior citizens was only in its infancy in Kuopio in 2004. The systemic change required has been realised not by a radical shift from old to new, but by many small steps implementing minor innovations and spanning over a decade. The journey has still only just begun.

The projects did not co-operate systematically to support each other in reaching a common goal. The strategic support for seamless care was also not explicit. No radical changes in services could be detected. SSHD and the university hospital had established joint meetings for planning integration of their services. Co-operation also improved within SSHD's divisions. The objective of PALKO, to develop home care-driven seamless care chains, was not fully met. The VEGA project tackled another aspect of the system — that of technology. A patient information system improved access to and timeliness of the client data, and reduced double-recording and the need for phone calls. Data quality began to improve when joint practices for recording had been set. None of the actors have done away entirely with the old systems because they still have features that do not exist in the new system. Implementation of new technology as such has also not been enough to change the system of care for senior citizens.

Main findings – KISA in innovation

Three types of KISA were found, which all played an important role in the steps taken. External KISA and KIBS were important for generation of practical concepts related to change in work practices and personnel training. In both projects the idea and concept for development came from external KISA experts – in PALKO from a research organisation and in VEGA from a consulting company. The role of external experts was important in training related to project work and implementation of the idea. External experts were also used in the evaluation of the outcomes.

Internal KISA were important for tailoring the new working concepts to fit the context and for transferring knowledge within the organisation.

Network KISA were required for obtaining new ideas and benchmarking information. Networks proved important for learning from others. In PALKO, there were 10 municipalities implementing the model and which could exchange experiences. In VEGA, Kuopio representatives travelled to Turku to see how a comparable ICT project had been imple-

mented there. In VEGA, a network between other municipalities with the same client information system was also established in order to develop lacking features and functions.

Some carriers and barriers to change were identified. There was strong support for development in the SSHD as well as in the city administration. National policies, programmes and related funding also offered strong support for implementation of seamless care. There was an active and open culture seeking change and feedback. The personnel were committed to improving services. The strong networks with the local university, research organisations, other municipalities and also national policy makers were another carrier. This helped in keeping up with developments and comparing services and developments with those of others.

Perhaps the greatest barrier was the lack of cross-sectoral support for seamless care, which was not an explicit goal in Kuopio's strategies for care for the elderly. The 12 projects, as well as the two that were studied in more detail, did not co-operate in a systematic manner to exchange information and support each other. Overcoming barriers in strategic learning and changing management skills is necessary in municipalities and hospital districts in order to look beyond any single project's or organisation's point of view and map the whole system, its key problems, and to envision an improved system which can manage change from old to new. There would perhaps also be a need for a regional strategy and action plan, which primary and specialised care providers' own strategies and action plans would follow.

There were also other obstacles, *e.g.* the dependence on political decision making. As a result of elections, there are changes in emphasis every four years in the city council. Coupled with dependence on short-term national funding, this makes long-term planning quite difficult. A third obstacle that was found was related to concrete co-operation between external and internal experts. Lack of common language, conception of change process and differing expectations about the co-operation delayed implementation. It seems that within social and health care, more expertise may be needed to act as a demanding client for external experts such as system providers, with clear requirements and terms for purchasing the systems. Within external expert service providers, deeper knowledge is required about social and health service system and the practices, which are to be supported.

The findings suggest that the need for integrated services has been recognised, but that the strategic support and action plan to implement them has so far not been systematic. Administrative and technical integration has been achieved, but this has not been enough to bring about a systemic change in care for senior citizens in Kuopio.

It seems that developing seamless care requires a mix of different types of KISA in order to succeed. Foremost, it requires strong internal expertise and networking in order to induce the concrete changes required at the technical, functional and administrative levels. External services may be necessary especially to support the management of change. In addition, integration between the national, regional and local innovation system and strategies appear necessary in order to get the steering mechanisms to offer long-term support for the change.

National support for innovation has been strong but challenging for local actors. The study suggests that there may be a need for external support of a wider strategic learning and change management approach, which crosses project boundaries and organisations from local to national level. It also seems that local networking and a larger regional strategy may be required to promote the implementation of the studied systemic innovation (seamless care) in practice.

Japan: services for the health promotion in a local community

Scope and context

The case study describes a new health promotion system, in which knowledge-intensive business services (KIBS) are provided to local authorities. The KIBS provider is a university spin-off company, Tsukuba Wellness Research Ltd. (TWR).

Research method, data and analytical procedures

The study is based on information surveyed through Web sites, brochures and the media. Additionally, interviews wereconducted with key persons at TWR.

The president of TWR, Dr. Shinya Kuno, is an expert in physiology and biochemistry. In 1996, he was working at the Centre for Tsukuba Advanced Research Alliance (TARA) (*www.tara.tsukuba.ac.jp*) at the University of Tsukuba. TARA's policy is to co-operate with university, government and industrial research organisations. It seeks to:

- Promote the most advanced interdisciplinary scientific research.
- Emphasise basic research.
- Exploit university research in the form of new industrial technologies.

In Japan, the Health Insurance System for the Elderly (*ro-jin hoken seido* in Japanese) is financed through payments by insurance associations, government, local authorities and patients. Local authorities, such as Taiyo village with a high proportion of elderly people, have to pay more into the system although there are fewer tax payers. The mayor of Taiyo village had been implementing a project of health promotion to the elderly since the early 1990s, *e.g.* holding exercise classes and distributing brochures in an attempt to curtail medical expenses. He contacted Dr. Kuno to set up a partnership to create an exercise programme for the elderly based on sports and medical sciences.

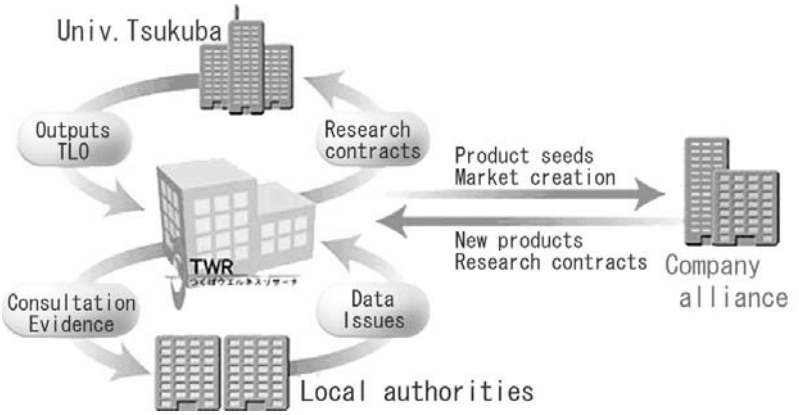
They began planning for a new project, called SAT (Successful Aging in Taiyo). Dr. Kuno and his colleagues checked muscle condition using medical and physical exams. On this basis, each participant was provided with an individual exercise programme and asked to do exercise at classes and/or at home. The programme is revised every six months following muscular examinations and physicals.

After four cycles (two years), significant changes in muscle and hypodermic fat volumes emerged in exercise programme participants compared to non-participants. The average increase in participants' medical expenses was a quarter of that of non-participants over the two-year test period. The participants said that they could notice the effects of the exercise and also made friends at the classes, which encouraged them not to drop out of the programme. This successful project received media attention.

The media exposure attracted growing attention from other local authorities all over Japan. There were many offers for partnerships, lectures, site visits, and so on. Dr. Kuno began to consider creating a spin-off company for the nation-wide outreach of his research.

This was supported by several factors such as spin-off promotion by governmental policy, financial support from the university and Ibaragi Prefecture and a decision of Mr. Nakase (who worked for health industry) to become a vice-president of TWR.

Figure 4.3. Tsukuba Wellness Research Ltd (TWR) business scheme



TWR Web site: *www.twr.jp* (in Japanese).

TWR was set up in July 2002 as the first spin-off company from the TARA centre. TWR's business scheme, depicted in Figure 4.2, brought Dr. Kuno a recognition of merit from Minister of Science and Technology Policy on Industry-University Co-operation in June 2003. TWR has four main activities:

- Wellness promotion projects: TWR consults local authorities about the evidence-based wellness promotion in the local community. TWR provides data on the exercise of the elderly and supplies the individual exercise programme for each participant to the local authority. Through these activities, TWR can collect new data and improve its skill base.
- Training and certification: TWR holds workshops to develop human resources on planning, management, and exercise of wellness promotion in the local community. The participants are from local authorities, companies and other health service institutions. They are certified as wellness managers after the examination, and work for health promotion, mainly in local communities.
- Research and development: TWR can provide information of product seeds and markets for new products to companies based on a rich data set gathered from local authorities. Using this information, companies can produce exercise tools, monitoring devices and software, and help promote wellness in local communities.
- Study group management: TWR runs study groups with companies. Each company must pay annual dues of JPY 1 575 000 to participate and must continue to participate for three years in order to obtain information on product seeds and business priorities regarding those seeds. There are opportunities for exchange among participating companies and introductions of TWR partners of TWR.

TWR members consist of university staff (professors, lecturers and secretaries) and experts on R&D, consultation, management and finance who have worked for companies, and have thus provided KISA internally before. Dr. Kuno is now involved in the policy making process through six public committees related to the health services.

Main findings – KISA in innovation

TWR is a KIBS company providing consultation, training, R&D and management services. In that they also make use of external KISA from the University of Tsukuba, the private companies, and individual experts in R&D and management.

TWR has been advertised by the mass media owing to the success of the SAT project. The health promotion system in a local community created by TWR always requires the existence of agencies such as TWR. Thus, TWR rarely advertises.

The services of TWR are therefore a regular KIBS and the TWR system can be called a knowledge-intensive service system.

Current policy implications

Current policy implications for innovation with KISA drawn from the present health care case are:

- Intensive public support for the creation of a new business model: Practical experiments (such as the SAT project) seem to be effective, especially in the case of business for social infrastructures.
- Creation of a new business environment and/or conditions: Systems with rigid frameworks or many regulations would be innovated through a change of environment and/or conditions.
- Practical advice and/or help: The existing services for entrepreneurs and start-ups should be more practical and/or hands-on.
- Diverse incentives: There are many ways and means of innovation that require diverse incentives.
- Human resource development: Recruitment is especially important in developing sectors. To this end, it is better to spread explicit success stories in those sectors.

Norway: KISA and innovation in home-based services for the elderly

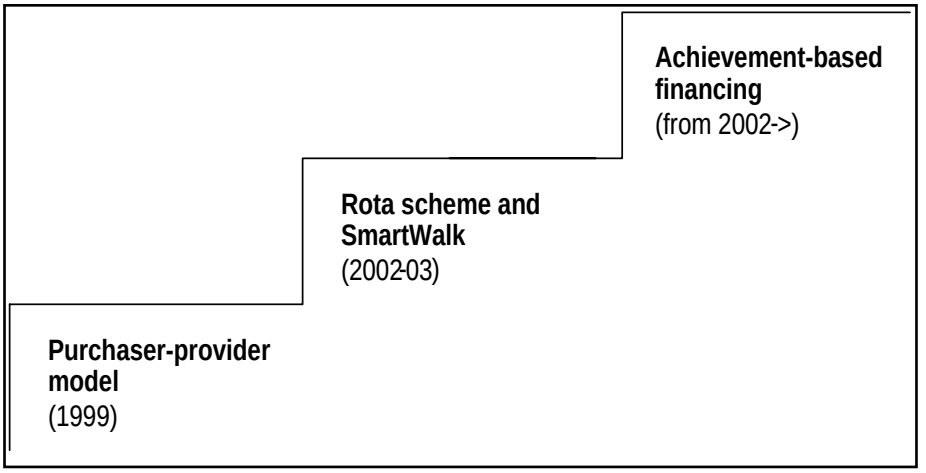
Scope and context

The focus of this case study is in home-based services for the elderly in a city district in Oslo, Norway. One of the main objectives of the study is to provide insights into how public sector organisations maintain and develop innovative capabilities through utilisation of KISA provided by internal and/or external sources.

This city district was chosen because it constitutes an information-rich case, and because studying how innovation processes occur in home-based services requires a case in which innovation really has taken place.

The case study follows the innovative developments in the city district of Manglerud since 1999, when it was the first city district in Oslo to prepare and implement a purchaser-provider model. The development proceeded to a re-organisation of the provider activities by introducing the Rota scheme and SmartWalk, and eventually to the development of a model for achievement-based financing, which, however, has not yet been implemented. The studied renewal processes can be presented as a ‘staircase’ model (Figure 4.4).

Figure 4.4. The innovation processes studied in the city district of Manglerud/Østensjø



Research method, data and analytical procedures

The main data source of the analysis was in-depth interviews with a set of actors having participated in the innovation processes studied.

Specific issues

An important general principle in the purchaser-provider model is to make an organisational distinction between *1)* those employees involved in defining the service requirements, performance control or attention to the carrying out of the services (the purchaser function) and *2)* those employees that are in fact executing the production of the services (provider functions).

One objective of introducing the purchaser-provider model in Manglerud was to achieve a more impartial assignment of home-based services for elderly in the city district according to an equality principle. Another was to shield the providers of home-based services to the elderly from the storm of demands and requests for services put forward by the elderly users or their relatives. A third objective was to professionalise the case work of executing the individual assignments required for each user to receive home-based services.

In 2002, Manglerud undertook a first-time mapping exercise based on self-registering of the service providers of the home-based health and care services in the city district. The main goal and objective of the time mapping was to increase the amount of direct time spent in the homes of the service users. The idea of increasing the direct user time was based on perceived good practice in other innovative municipalities regarding home-based services for elderly. The question was how to improve the organisation of the home-based services to be able to offer improved services to the elderly living at home.

One innovative measure was the development and introduction of the ICT-based steering system of SmartWalk that controls who performs what in the home-based service system. The system gives the managers more flexibility as regards optimal utilisation of the human resources needed at any time. Another closely related innovation was a rota organisation of the various home care provider units of the city district. Rota organisation allows increased flexibility in the use of the various home service providers. As a result

of the re-organisation, a staff deployment plan can be worked out according to the assignments of the users of the city district. The required deployment can be closely estimated according to the various needs for either home helpers, trained nurses and enrolled nurses at various times of day.

Finally, Manglerud has also been engaged in an innovation project on achievement-based financing of services, where the main focus has been to estimate the prices of the service products being offered to the elderly living at home. The fundamental principle of achievement-based financing is that the city district receives funding according to the costs connected to the actual service provision of the city district, not a lump sum budget as is the case today. The innovation process was triggered by the introduction of the purchaser-provider model, the challenge of dimensioning the provision of services as well as budget cuts from the city district management responsible for home-based services.

In relation to the innovation processes followed in the case of Manglerud, some important factors influencing and determining the innovation processes of the city district emerged. These include:

- Top-down innovation by management.
- Innovation barriers at the service level.
- Barriers at the political level.

The case study indicates that new ideas and the innovations or renewal activities mostly originate at management level. The services offered to the elderly at home have been executed very much in the same manner by tradition without particular needs for change and innovative thinking. However, less available financial resources in the last years have prompted a more innovation or renewal-focused culture in the sector. A general view in the sector seems to be that a high degree of adjustment and adaptation ability at all levels of the sector now prevails, upholding a great tolerance for change amongst the actors of the system.

Also at the service level there appear to be certain barriers for innovation, many of which are related to the stock of employees of the home-based services for the elderly. One hampering factor pointed out by interviewees at the managerial level is the fact that the service-providing employees are often very focused on executing their specifically assigned service tasks. The employees are not really focused on improvements or innovation activities that might renew the service provision in particular and the system of home-based services in general.

One hampering factor related to innovation in home-based services for the elderly seems to be the political split regarding planning processes and longer-term priority setting at the local government level (*i.e.* disagreement amongst city district or municipality politicians). Home-based services for the elderly is subjugated to a bureaucratic assignment system and many actors must come to agreement in order for renewal processes to take place. Another hindrance to innovation in home-based services to the elderly are the many rules and regulations that must be taken into account in this area of activity. Rules and regulations often contradict and overrule one another, which creates barriers to innovation and renewal activity.

Main findings – KISA in innovation

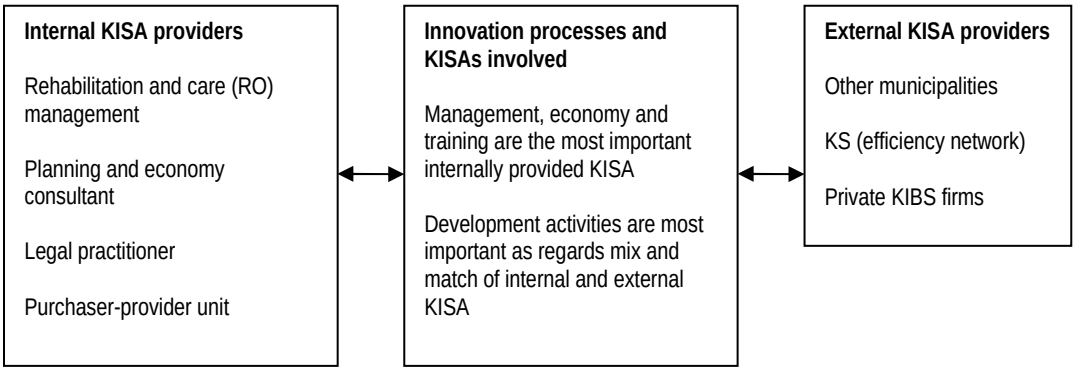
In the introduction and implementation of the purchaser-provider model mostly internal KISA were used. The internal providers of KISA include the rehabilitation and care management (RO management), the planning and economy consultant, and the city district manager as well as employees of the purchaser unit. The knowledge-intensive services they provided into the innovation process were related to development, legal, and administrative/management activities. In the interaction with external KISA providers a mix and match of services occurred, including training and information activities. The external KISA provision has not played an important part of any of the phases in the development and implementation of the purchaser-provider model in Manglerud. The internal KISA providers, however, contributed significantly in all the phases of the development project.

The process of introducing the rota scheme and the development of SmartWalk was also rather inward-looking as regards the KISA actors involved. The internal knowledge-intensive services important for the innovation process were again related to development and information activities provided by the RO management. Also of importance was ICT development for internal use and accounting or economic KISA, provided in particular by the person in charge of internal ICT development in Manglerud city district. All of the internal KISA personnel were involved in every stage of the innovation project's life cycle.

The rehabilitation and care (RO) management team has also been the active development agent in introducing achievement-based financing. The RO management has provided development KISA, accounting/economic KISA, training KISA as well as strategy/planning KISA. The ideas for introducing the achievement-based financing model were, however, provided by external KISA providers. The external KISA providers so far include The Norwegian Association of Local and Regional Authorities (KS) and the Kristiansand municipality. The external providers contributed significantly in at least the early phases of the project life cycle (since the project is still in the development phase). Whether the use of external KISA providers will increase or decrease in the project phases yet to come is still not possible to evaluate.

It seems that Manglerud to a large degree uses internal KISA resources in all phases of this innovation sequence. External supply of knowledge-intensive services occurs mostly in the idea and development phases, and to a lesser degree in the implementation phases (Figure 4.5).

Figure 4.5. Role of KISA in innovation in home-based services for the elderly



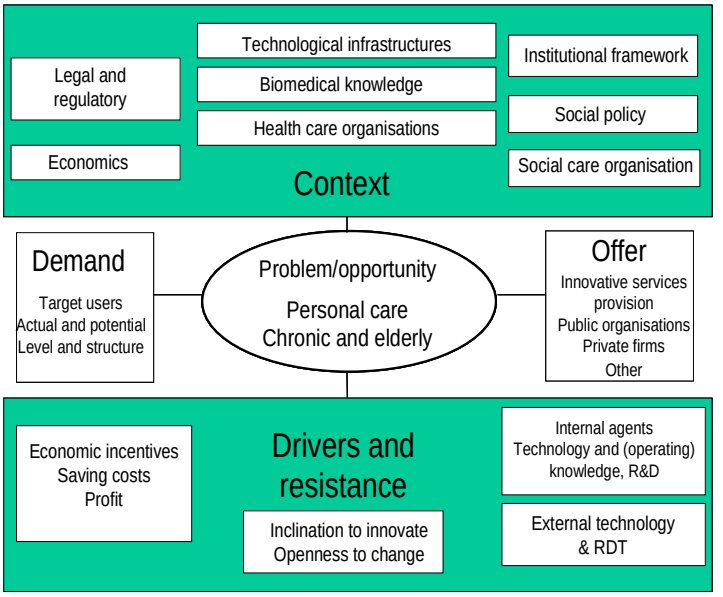
Spain: Personal services for the elderly and chronic patients with ICT - eCare

Scope and context

The Spanish case study centers on the role of KISA in the development of innovative health care services for the personal care of elderly people and chronic patients in home and mobile settings. The focus is on an innovation system based on a problem-area opportunity originated by actual user needs that are addressed by a cluster of innovative emergent health care services provided by a mix of public-private organisations (Figure 4.6).

This innovation scenario has been selected because of its social and economic importance, the growing demand of more and better solutions, the potential for using new mobile and Internet technologies that are at the fore of development policies, as well as for the perspectives of possibilities for KISA providers with the expected market development.

Figure 4.6. Reference model for the problem area/opportunity approach



Source: Adapted from Tether and Metcalfe (2003), "Services and Systems of Innovation", CRIC, University of Manchester, p. 28.

The main objective has been to analyse and characterise the innovation system by identifying actors, their interdependencies and relationships in order to learn how they develop their innovative capacities using KISA obtained from internal and external sources. Other objectives refer to the identification of the main driving forces and the observed barriers concerning the utilisation of KISA.

Research method, data and analytical procedures

The study is based on information collected from several sources:

- Review and analysis of the literature, official documents and reports.
- Structured interviews with 16 key persons directly involved in the innovative system under study
- Consultation meetings in Madrid, Barcelona and Seville with high-level experts representing different stakeholders and interests, and from different agencies and sectors: health professionals, hospital management, geriatric specialists, health services authorities, medical insurance firms, telecommunications sector experts, nursing homes, telemedicine firms – new companies in a new economy, SMEs, experts in the field of research and universities, Internet health specialists and social/health management.
- Discussions and exchange of opinions with other colleagues in conferences, scientific committees and working groups.

Specific issues

The case study focuses on the provision of new ICT technology-based care services to chronic patients and elderly people. Critical issues in these services include quality of life and quality of care, personal responsibility, independent living, entitlements, homes of the future, and the organisation of care systems.

The blurring of the boundaries between health, social and personal care is directly influencing the new models for service provision to the elderly population. eCare is emerging as a valuable and comprehensive approach to cope with the need to co-ordinate social, personal, and health care provision. Supported by ICT, eCare has the potential to improve the overall quality of life of citizens while reducing the management burden.

The demand for those products, processes or services that will help the elderly lead a more independent life cannot be met by technology alone. Technology needs to be embedded into services (processes and systems) providing added value to users. The quality of the service is important, as well as provision of personalised care. Users also demand systems that preserve confidentiality. In all cases, physicians are the most influential mentors for patients.

The current offer of services is insufficient, irregular and fragmented. Public authorities use a range of models. One is to provide services by their own care services. Another is to rely on subcontracting external care providers, either private for-profit or non-profit. Co-payment schemes are under intense discussion. Private providers include traditional companies with experience in health and social care services provision and new emergent firms or consortia addressing the new market opportunity. They include telecom operators, ICT vendors, insurance companies, medical device companies and the pharmaceutical industry. New services must be integrated through the already existing structures. Innovative technology must provide an added value for the end user, but also for the provider. In this context, traditional care service providers must devote much effort to the re-engineering of processes and the implementation of new procedures.

Equity requires a reduction in the variance in business models and in the demarcation between social and health care services.

Technology is a key driver of emerging eHealth applications. The potential of the Internet, mobile phone communications, portable devices and electronic instrumentation in the development of eHealth services for patient monitoring and follow-up is evident from the study. Innovative enabling assistive technology may exploit ambient intelligence, embedded computing and wearable devices.

Emerging and innovative new care services for homes, nursing homes, collective residences, assisted social facilities, etc. create the need for a new range of KISA to support care professionals and organisations. New models of services for personal management and independent living support must be conceived and put into practice. New developments relating to wearable devices, presence technology, pervasive computing, smart sensors, jointly with electronic fabrics, batteries, and wireless body and personal networks should make it possible to overcome some of the current limitations on implementing services for personal ambulatory care, follow-up and monitoring independently of place and time.

Main findings – KISA in innovation

The growth of the market analysed in this case study would stimulate KISA usage and transmission at all levels. On the other hand, the success and diffusion of the new services will benefit from a proper KISA supply system. Thus two approaches can be envisaged: one addressing 'market development' (top-down) and the other promoting KISA production, transmission and usage (bottom-up).

Factors that influence the successful adoption of innovations by the marketplace include:

- Roles of senior management and clinical leadership.
- Extent to which changes in organisational culture are required.
- Amount of co-ordination needed across departments or organisations.

In today's cost-conscious and highly regulated environment, there is growing concern over the limited resources available to ensure the adoption of effective and beneficial health care innovations. Evidence, peer review, etc., of improved quality and/or benefits are needed. A business case needs to be presented to people who control the buying capability. It is essential to show how the innovation, if successfully adopted and sustained, fulfils the strategic business goals of the organisation.

Adoption of the innovation often means altering beliefs, norms, and values embedded in the traditional organisation of a particular services provision in a particular place under long cultural roots. Staff members have to think differently about their roles, their goals, and their interrelationship with other departments and disciplines, but what is more important with patients? The process of embedding new methods takes a long time. There should be a plan in place from implementation to sustain the service. Operating a new care service that requires organisational change is a full-time effort that must be backed by substantial resources. Barriers are higher when the implemented services require co-ordination across disciplines, departments or organisations.

The development of integrated eCare services requires a blending of technology and health service expertise and it will depend on strategic partnerships between provider

organisations and technology companies working in joint projects or establishing interactive links for KISA transfer. The development of business models requires the sharing of a common know-how between the technical companies, the organisations, the patients and the health care professionals.

R&D is one, but not the only KISA to consider. Training, management and administration, human resources management and planning are equally important in the implementation (adoption) phase of eCare services. It must be noted that most of the innovation promotion programmes (nationally and internationally) are focused on R&D activities. Policies should be refocused to widen the scope to also cover these areas.

With regard to R&D, one of the issues is the low level of R&D capability by the private companies in Spain. The level of innovation at the firms is lower than the mean of the 15 EU countries. In addition, R&D expenditure is even lower.

These points can be summarised as the following suggestions:

- Increase funding for services modernisation programmes in health/social care based on health and telemedicine services.
- Support to organisations that have or can develop strong senior management support for adoption of innovations. A connected action should be to educate opinion leaders and high-level managers on the potential of ICT innovations for their business operation.
- Identify and support clinical champions who can enhance buy-in from patients and consumers. Success is linked to one or more strong champions, who act as change agents, were central to the initial adoption, sustained implementation, and diffused the innovation to additional organisations or settings.
- Development of simple methods of collecting and reporting data that will be credible to the health care and social services organisations, and that demonstrate that the electronic service is fulfilling the organisation's strategic goals.
- Prospective research anticipating changes in the external environment and demonstrating how the innovation can help the services providers adapt to market and regulatory pressures.
- A plan for sustainability from inception, and adequate investment in the infrastructure needed to manage the dissemination and diffusion process taking care of the characteristics of each particular case.
- Good data of the demand in both the public and private market. Studies are needed to evaluate and quantify the market (analysis of the demand). Data should be made available to users, the health administration and health services, given their purchasing capacity and promotion of innovations.

Discussion of the findings from health care case studies

This section discusses the policy-relevant issues that emerge from the analysis and synthesis of the health care case studies. The discussion focuses on KISA that are relevant in health care innovation. These are referred to as renewal KISA elsewhere in this report. The two other types of KISA (routine and compliance) are not considered here as they are not relevant in the context of the health care renewal.

Awareness of and ability to make use of KISA

Health care is a special sector where services are provided by a mix of public, private and third-sector actors. The environment is highly regulated and organised. At a very high level of abstraction, the innovation climate is set on one hand at the national level by general and health care-specific policies and incentives and on the other hand, at the level of health care service providers who must adjust their operations to meet the various, often conflicting demands. A third dimension to the innovation climate comes from the global factors for continuous innovation in medical practices, pharmaceuticals and medical devices. Their adoption requires constant upgrading of the knowledge and skills of health care professionals through training and education.

The market conditions for KISA in the health care sector can be characterised as follows:

- Health care experts are usually curious and eager to learn new things due to the global nature of medicine and continuous progress in the field, which calls for an outward-looking and open environment.
- A further incentive, also characteristic of expert organisations, is that experts are evaluated and valued by their peers mainly based on their skills as professionals.
- Consequently, quality management as a principle is embraced as continuous improvement is part of the best practices. But in reality, QM is not fully accepted as its main thrust is in organisational improvement at the cost of losing part of the autonomy on health care that experts enjoy.
- For the same reason, management is not considered important in comparison with the main function of health care, treating ill patients. As with QM, management functions are viewed as taking decision power away from the experts and putting it in the hands of managers, administrators and politicians.
- Adoption of an innovation often means altering beliefs, norms and values embedded in the traditional organisation of a particular services provision in a particular place with deep cultural roots. Staff members have to think differently about their roles, their goals, and their interrelationship with other departments and disciplines, but what is more important with patients? Barriers are higher when the implemented services require co-ordination and re-organisation across disciplines, departments or organisations.
- Use of external services varies. ICT is one of the easiest KISA categories as there is not much ICT expertise in house. The same applies for education and training services. The more difficult categories relate to strategy formulation and implementation and development of management practices.

- The nature of expert organisations favours the approach of learning by doing instead of adopting existing practices developed by other health care organisations in their developed format.
- The structure, organisation and relationships between health care actors (arising from the way the national health care system is set up) are very important in the diffusion of innovations.
- In the public sector reaching agreement can be surprisingly difficult both internally and externally.
- The KIBS and RTO actors have to be very close to their customers in order to create the required trust conditions.
- Networking in all forms is the existing practice.

Mix of internal and external KISA

Internal and external KISA are connected to organisational learning and knowledge transfer. The encouragement and development of internal KISA is expected to lead to organisational learning. Similarly, the encouragement and development of external KISA should lead to knowledge transfer and diffusion of innovations. The question is, is there an optimal mix of internal and external expert services?

Systemic innovation is a process that takes place inside an organisation and has to be led by internal resources. Using in-house resources for problem solving and implementation leads to organisational learning, and the organisation will be better positioned against competition and changes in the marketplace. The requirement for internal leadership does not exclude the use of external expert services to facilitate the change process.

What services the organisation decides to use depends, of course, on what is available and what services it needs to complement its internal capabilities. The question of what is available creates the chicken-and-egg problem. If there is no demand for expert services, there is probably no supply either. And as a corollary, there are no market conditions for such expert services to be created and maintained external to the organisation and therefore the organisation itself is always more capable than outside services. The only way to end this dilemma is for the organisation to make its expertise available to the outside.

Developing the market calls for long-term collaboration between customers and external service providers. In the long run, both health care organisations and KISA actors will benefit from collaboration. The qualifications of KISA actors will increase and the emerging market for high-quality service will benefit health care organisations.

Policy relevant issues emerging from the health care cases

The objective of policy targeting KISA is to improve the innovation capability, competitiveness and efficiency of private firms and public organisations. The focus on knowledge-intensive service activities is not an aim in itself. In the health care context it is a means to achieve the objective of reforming health care systems to better respond to the changing needs with the available resources (human, organisational, services, technology, etc.).

KISA policy should be targeted to *supply* to stimulate KISA inside organisations, and to create favourable conditions for the development of KISA suppliers; to facilitate *networking* of KISA internally and between health care organisations and external KISA providers; and actions that support the *demand* for internal and external KISA.

In order to support the *role of KISA* in systemic innovation and in building innovation capability, policies may target the following areas:

- Systematic training and skills development is the most important measure to improve health care organisations' abilities to make use of KISA.
- Another domain is the strategy development and implementation processes needed by health care organisations to respond to change pressures arising from external and internal forces. This includes the need to align internal R&D activities with the aims of the strategy, and as part of that, to increase funding to internal innovation and KISA-related competence build-up.
- Strengthen the awareness of the need for knowledge-intensive services in management activities. One particular measure could be to support training of internal management and key personnel in new and innovative ways of organising and administering health care services. Another could focus on the further development of indicators that enable health care providers to measure their performance objectively.
- Integration of all people at all levels of health care organisations to stimulate bottom-up innovation and develop capabilities for change. This may be achieved by quality management programmes, training and in-depth information on all actors, and by incentives that stimulate innovative thinking.
- Awareness building on the potential benefits of using internal and external experts and cultivation of a culture that favours the use of experts to stimulate the demand for KISA.
- Encourage networking to learn about new systemic ideas and solutions being experimented elsewhere and to create an environment that supports forward and outward-looking activities and exchange of experiences and opinions. Possible networking measures may comprise:
    - Benchmarking of performance, productivity, costs, quality, etc.
    - Measures to extend co-operation between health care actors and KIBS and RTO actors in order assist health care actors in locating suitable external KISA providers.
    - Designating someone as an experience mediator of innovation and KISA practices in a nation. This could be based on a Web site acting as a clearing house.
    - Exchange of KISA personnel across organisations.

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Chapter 5

THE ROLE OF KISA IN THE TOURISM AND LEISURE INDUSTRIES[1]

What the two industries have in common – and how they differ

Tourism and manufactured leisure are very different sectors, but their common features mean that it is useful to group them together in a study of knowledge-intensive service activities in innovation. Both industries have emerged as a consequence of increased affluence, education and leisure time. Both depend on knowledge of intangibles such as cultural trends and tastes, and of what they will be rather than of what they are. Both are leading to the emergence of a new kind of knowledge-intensive service activity, which produces this kind of knowledge.

The tourism and leisure industries are industries where spending is, to a great extent, discretionary. The product is marketed direct to consumers. The products and services marketed are 'superior' goods: that is, as incomes rise, people spend more on them. Because goods in these industries are nonessential, the aesthetic and experiential elements are very important, and marketing – analysis of markets, creation of markets, and presentation to the consumer – is crucial. These industries demand of their consumers not only that they pay money, but also that they invest time. When consumers spend their money in these industries they are often consciously defining themselves and identifying themselves with lifestyle choices and markers.

There are also differences between the two sectors, as they are treated here. Whereas tourism does have fashions and fads, and does alter with technological change, many destinations rely for their appeal on remaining – or appearing to remain – unchanged. This is true both of established resorts offering 'old fashioned service' and a quiet pace, and of new trends such as environmental tourism. Many tourism experiences, though by no means all, are first and foremost experiences of rest and relaxation. Often consumers are buying a package put together for them with minimal effort or input on their part.

The manufactured leisure industries, on the other hand, depend on novelty almost to the point of gimmickry; and in general their styling is modern. Their marketing depends on being ahead of the trend. Many elements of the leisure industries demand a good deal of input from the consumer, in terms of learning how to do things and also disciplined application, whether it is in home-based crafts or outdoor sporting activities. These industries are very sensitive to marginal changes in consumer tastes.

Tourism relies heavily on physical and human infrastructure: a destination, transport systems, accommodation, and a supply of trained staff. Many 'manufactured leisure' products are objects which are owned and used by an individual, although groups of users do emerge and rely on communications infrastructure.

1. This chapter was prepared by Anne Holmes based on country studies. A complete list of the full-length country studies prepared by national experts can be found in the Annex.

Tourism has generated other industries, like the software producers discussed in the Australian report. Leisure products are more likely to be a by-product or a development from another industry.

It would not be helpful, however, to make too clear a distinction between the two industries, as there is both overlap and synergy between them: one buys a T-shirt as a souvenir of a visit, one may engage in strenuous outdoor activity like canyoning and kayaking, using equipment which is a product of the leisure industries, while on holidays, and so on. This chapter draws on information from a study on the leisure industry in Finland and two country studies on tourism: Australia and Spain.

Tourism industry

Tourism is a thriving sector. As the world economy grows, consumers are willing to spend a greater share of their income on tourism. World tourism has grown faster than real GDP in the past 25 years and this trend will continue in the foreseeable future. Torres Marques (1998) estimated that world tourism expenditures would double and that expenditures in Europe would increase by 30% in the next fifteen years. Recent data and trends support this estimate: economic growth, the ageing of European and American populations and the increase in time devoted to leisure in developed societies will foster tourism. In Europe, the European integration process will also contribute to tourism growth and provide competitive advantages to the area.

Spain is today one of the world's top tourism countries. As an international tourism destination, Spain ranks second in terms of number of arrivals worldwide. In 2001, the number of international tourist arrivals was equal to 50.1 million; that is, Spain yearly receives more tourists than it has inhabitants. In terms of receipts, Spain also ranks second in international tourism receipts. Tourism accounts for as much as 11% of Spain's GDP, and so is a major determinant of national economic performance. The importance of tourism in the balance of payments is even greater. From the 1950s to the end of the century, tourism receipts provided the international means of payment needed to finance industrial imports.

The Australian tourism industry has experienced strong growth over the past 20 years. In 2002-2003, the tourism industry contributed 4.2% to Australia's gross domestic product. Unlike the Spanish industry, the demand for Australian tourism goods and services comes predominantly from domestic sources. Tourism is a significant contributor to the local economies of regional Australia. In 2002-03 Australian residents consumed 77% of tourism output, with international visitors consuming 23% of output. Even so, tourism constituted 11.2% of Australia's exports.

The labour force in tourism is relatively unskilled. In Spain, only 47% of tourism employees have secondary or higher qualifications compared with 73% of the total work force. Travel agencies, where 94% have secondary or higher qualifications, were the exception. The majority of jobs in the tourism industry are in retail trade, the accommodation sector, cafés and restaurants, and transport. Spending on research and development in tourism is lower than in other industries, and the industry is not generally regarded as innovative. Indeed, in some cases the competitive advantage of a destination depends on its predictability.

More than half of the firms in tourism-related sectors in Australia employed four or fewer employees, and a further 30% were small businesses employing between five and nineteen employees. In Spain, 97% of businesses were micro businesses employing nine or fewer employees (above the average of 94% for the whole economy), but this varied by sector. The proportion of micro businesses was well below the average for the whole economy in the hotel and travel agency sectors, and well above it for restaurants and passenger transport firms.

In the new knowledge economy, innovative activities are at the core of economic growth and competitiveness in any industry. Understanding how innovation and knowledge-intensive service activities are developed in an industry may help in designing policies to enhance the contribution of KISA to innovation. Tourism is an interesting industry for studying KISA in innovation because of its importance in some modern economies.

Other studies of innovation, including most of the other KISA studies, have tended to focus on high technology, either its development in new industries or its application in more established industries. There has also been a tendency to focus on businesses which supply inputs to other businesses. This study of tourism is a departure, in that it is focused on a long established industry which deals directly with its retail customers, and which, although it uses new technology extensively, in general does not focus directly on technology.

The innovation system in tourism

Tourism firms are not consciously innovative, in the way that, say, firms in the information and communications technology industry are. On average, tourism firms have a low level of R&D spending, and much of the R&D that is reported is market research. Many tourist operations are, however, based on a major innovation, and in general the firms are conscious of the need for continuous improvements to their operations – that is, they are incremental innovators.

Most firms in this study report some innovation, in product, process, procedures or management. For example, they may experiment with new brands or seek out new markets, develop completely new products or (more likely) new ways of packaging or bundling products, find new ways of getting customer feedback, adopt formal procedures such as accreditation frameworks, or change the role or training of members of staff.

One interesting form of innovation which occurred in at least two of the Australian case studies is the packaging of services which have been developed in-house for sale as standalone products. One of the firms had branched out into construction services on the basis of experience in building a chairlift in an environmentally sensitive area; another had packaged its online accommodation booking service for sale to other providers.

The most important motivations for innovation in tourism are cost reduction, demand from customers, meeting competition, interactions with another innovation such as online booking, and a general corporate culture of continuous improvement. Technology push is also effective in leading to new or improved products or processes.

Innovation in tourism is often embodied in new ICT equipment and software. The industry has been changed profoundly by computerisation, Web-based booking services, and e-commerce. This emphasis on ICT is a major contributor to the observed difference in innovativeness among sectors in the Spanish industry. Travel agencies are intensive users of ICT and are also the most innovative sector, followed by hotels, with restaurants last. The data show a similar pattern for training activities, which are also most used in

travel agencies and least in restaurants – although they are still important there, with 31% of restaurants reporting training related to innovation. Both these variables are also related to size: the bigger the enterprise, the more innovative it is, and the more innovation-related training it undertakes; but which sector a firm is in is a better predictor of innovation and training than its size.

Significantly, the Spanish study showed that the most ICT-intensive sector was also the sector which reported the greatest 'technology gap', that is, technology that firms could use but did not have, usually because they could not fund it. This suggests that there is still profitable innovation to be done by way of further take up of ICT.

An important vector for innovation in the tourism industry is movement of staff. Qualified and experienced staff contribute to the dissemination of good practice whenever they change jobs. The firm that hires them is buying their expertise, and in doing so they acquire some of other firms' know-how.

Firms build their capacity by such management practices as benchmarking and adopting formal accreditation frameworks. Some of these are general quality assurance methods, but some have specific content, like certification of environmentally friendly practices.

As noted above, there is not much formal R&D. Tourism is a mature sector and firms acquire their new technology embodied in equipment – although there are exceptions, like the Australian firms mentioned above, which develop their own knowledge. Like other innovation variables, R&D spending is correlated with size, and particularly with belonging to a large industry grouping such as a hotel chain.

Leisure industries

The leisure industries considered here cluster around sporting goods and physically active pursuits. They must be considered from the separate points of view of the business and of the consumer, because they depend on discretionary spending and hence on tastes and appeal.

Recent consumer and welfare studies have indicated that as societies grow wealthier, materialistic values are replaced by more subjective concepts of well-being (for example, Inglehart, 1997). Markets for mass products are gradually saturated, and consumers start to search for more meaningful things to consume. The discussion on the 'experience' or 'dream' economy (Pine and Gilmore, 1999; Jensen, 1999) suggests products and services such as cafés, amusement parks, university education and nature as the new outlets for meaningful consumption. They also refer to ordinary products that are enhanced with an 'experience' or 'story-telling' aspect.

The stories that are built around such innovations are not always manageable, intentionally created stories, but they rather indicate that producers and users have 'met' and created a success story together. Products are designed for people who are active (wristop computer for outdoor sports enthusiasts) or who actively make their own aesthetic choices in interior design (a changeable colour part for a door handle).

Within the leisure industry cluster, this study focuses on products and services related to 'active, creative leisure', that is, activities that offer their users continuous challenges and personal fulfilment in their everyday lives. The focus in this study is on physical products (rather than services) that are linked to leisure time ('manufactured leisure'). Integration of style and technology makes customers feel that a product is able to enhance

their lifestyles, and directs it towards their goals or dreams, emotions and aesthetics. Products should be both stylish and user friendly.

Possibilities for a product innovation can be analysed by considering social, economic and technology-related factors (Cagan and Vogel, 2002). Most of the success stories of leisure illustrate a balance of the three. For example, the new custom of having breakfast on the run, and the trend towards enjoying coffee after or between long office hours created demands that were not fulfilled by fusty diners and their bad quality coffee. Starbucks, with designed interiors and furniture, air conditioning, and with better technology for making better coffee found a market among people having more money to spend for such an enjoyment as a coffee break. In the present study, the Suunto wristop computer exemplifies these factors: there was a trend towards valuing outdoor sports as leisure activity arising in North America and Central Europe, there was extra money to spend on sporting goods of high quality and there were technological solutions at hand for manufacturing a new product category.

These products, however, are not just physical products: they aim at developing experiences or other added value for the customers. For example, one of the case study firms, Suunto, 'creates sports instruments that allow the customer to measure, analyse, understand and improve one's performance – without having to rely on luck.' Products are thus designed to provide services – and experiences (Pine and Gilmore, 1999; Schmitt, 1999; Jensen, 1999). The focus on experience in turn leads back to the importance of consumers.

Elements of using customer feedback are present, for instance, in software design; but here it is the quality of the customer's experience that is important. The customer and user-centred approach involves new methods for product development and concept creation. In building up a scenario of the user it is important to integrate knowledge from different disciplines. Statistical data on markets is less important than a deep understanding of the abstract and often surprising customs and habits of people within a certain community. Methods for understanding can vary from interviews to field observation or even taking part in what potential users do. Needs, wants and desires are analysed more often with ethnographic methods following from anthropology (see Beyer and Holtzblatt, 1998). The knowledge needed is knowledge of lifestyle. It involves knowing about other products, about styles and about the activities people pursue or would like to pursue (Cagan and Vogel, 2002:191, 204).

Over the last two decades, Finnish adults have reduced the time they spend in paid work and on travel and shopping. The time spent on sports and outdoor activities has increased, especially for women. A survey suggests that, while simple idleness is still valued, many people want 'revitalisation' from their leisure time, with men putting an emphasis on hobbies and women on spending time in nature.

The available statistics do not identify sports and outdoor activities with any precision, but the annual value of the sports and exercise business in Finland appears to be EUR 1.5-1.8 billion, about 1.2% of GDP.

The innovation system in the leisure industries

Innovation in the leisure business revolves around consumers' leisure pursuits, so it needs to be based on an understanding of consumer lifestyles and everyday practices. Consumers have an active role in defining their leisure pursuits, and in refining the products that they will use in them. In most industries, technology developments are

mainly directed at improving functionality. There is less understanding of technologies that enable active practitioner-consumers to acquire new skills. In the leisure industries, successful innovations typically open up new challenges for consumers and enable them to pursue increasingly demanding and interesting hobbies. As the role of discretionary consumption grows in the economy, knowledge of consumers' lifestyles will be increasingly significant in creating new markets and gaining competitive advantage. It appears that businesses use both explicit techniques (for example, statistical research) and implicit techniques (for example, keeping a watch on lifestyle magazines) to create an image of the user.

Product innovations in this area of business are often handy or fashionable (or both) details, which make the product more usable, useful and desirable. The role of technology in these products is often crucial, but subliminal – that is, the products are built on technological innovations, but they do not become consumer products unless style and usability factors are thought through thoroughly (*e.g.* designer gardening implements, new sports equipment).

The innovation may also be the service linked to the product. Recently, an interest has been noted among consumers in building up communities of similar interests – a trend that is mostly an effect of internet communities (Berthon *et al*., 1999). For example, Suunto wristops have a PC-interface that enables analysis of sports results and communication with other enthusiasts via the internet. These kinds of innovations – products that combine physical and immaterial elements (information and services) – are likely to be more important in the future in the leisure business, as in other lines of business (see, for example, Davis and Meyer, 1998; Rifkin, 2000).

A market innovation means recognising, and even creating, new markets and transforming product concepts and products towards those markets. An example of such innovations is the Rollerblade skate, in which the wheels are arranged in a single line like the blade of an ice skate. It was developed in the Netherlands for racing on land and then adapted for summer hockey training in the United States. The enthusiastic adoption of these skates spawned a new line of equipment such as knee and elbow pads, and special helmets (Margolin, 1995:135–6). A similar Finnish example is the way in which Exel transformed the conventional ski-poles into Nordic walking poles, creating a new sport and form of physical exercise.

Process innovations are related to how to organise work in the manufactured leisure business in the most meaningful way. What we suggest here, based on empirical findings, is that an important part of the processes of product creation and distribution lies in creating images of the users and markets, and concepts based on that knowledge.

Three central challenges in innovations in consumer products for leisure are the integration of various kinds of expertise in product development, the integration of style and technology, and the role of the customer/user and the importance of understanding emerging lifestyles. All of these involve knowledge-intensive service activities.

The three studies

Three studies are reported here: a tourism study from Spain, a tourism study from Australia, and a leisure business study from Finland.

The Spanish tourism study

The Spanish study first discusses the tourism industry in general. It employs official statistics and data collected by a major economics agency to describe the important role of tourism in the Spanish economy and to highlight general features of innovation in tourism. Key questions that are investigated include the following: the types of innovations, the sources of innovations and the characteristics of the innovative process. This forms the basis for the analysis of the role of KISA in innovation.

It then analyses KISA in two major tourism sectors: hotels and travel agencies. These industries represent a significant share of tourism consumption in Spain and supply is mainly to visitors from other countries. The specific knowledge-intensive services that were investigated were strategic management, training, recruitment, ICT-related services, quality assurance and environmental management, and legal, accounting and tax services.

In order to investigate the role of KISA in tourism, eight in-depth interviews of Spanish tourism firms (hotels and travel agencies) were conducted. Four experts from the hotel business and another four experts from travel agencies were asked their view about the use of knowledge-intensive services in the tourism sector, their influence on innovation and their opinion concerning the main obstacles firms face when they engage in innovative activities.

The Australian tourism study

The Australian study begins with an overview from secondary sources of the tourism industry, and a summary of government policies on the industry. It presents the results of a survey of knowledge-intensive service activities in 44 firms in the industry: 24 tour firms, 15 accommodation firms, three transport firms and two retail firms. There are six case studies of tourism businesses, covering a similar range: two tour operators, one accommodation firm, and a tourism destination in each of the categories ‘cafes and restaurants’ (a winery), ‘other transport’ (a chairlift operator) and ‘entertainment services’ (an Aboriginal cultural park). While the small numbers surveyed mean that the data cannot be claimed as representative of the industry, and the case study firms are certainly not representative as they were selected on the basis that they were innovative, the analysis provides information for understanding the role of KISA in innovation in tourism.

The Australian study dealt with the services covered by the Spanish study, but also covered industry development advice, research (including market research) and product development, and marketing and promotion.

The Finnish leisure industries study

In the Finnish study the leisure industry cluster is first identified and described. Two company cases are presented: the development by the Finnish company Exel of Nordic walking, which highlights the role of the external innovation network; and the wristop computer developed by Suunto, exemplifying the innovation process and its use of knowledge resources especially from the product development perspective. The Suunto case study used observations collected over a four-year period, as well as 15 interviews.

The role of some externally provided knowledge-intensive activities which are not yet recognised as knowledge-intensive business services is analysed with reference to two businesses involved in providing services to the industry. Sources of knowledge about consumers were explored through informal interviews with marketing managers in six diverse firms in the industry.

The Finnish study presents a focus on the consumer which is different from most of the KISA studies. In doing so, it focuses on activities to do with market research, knowledge about lifestyle and fashion, product development and design.

KISA in innovation in tourism: findings from the reports

Which services are most important?

The Spanish study

The Spanish study began by asking which knowledge-intensive services were used by tourism firms. Then it looked at which were important in innovation. Finally, it divided the services by the stage in the innovation process at which the service was called on.

By this method it concluded that strategic management was the first and most important service in innovation, partly because this was the source of the decision to innovate, and partly because the activity of the management built a culture which was innovative – or not. Almost by definition, strategic management at this level is internally supplied, although a lot of information may be obtained externally.

In the implementation of an innovative idea, ICT services were paramount. Much of the innovation was directly to do with ICT, for example in booking services and e-commerce as discussed above. But even when the innovative idea was not about ICT itself, there was almost always some management task related to it that required ICT for implementation. (In this dependence on ICT for management functions, tourism is probably no different from most industries.) Big firms tended to have their own ICT capacity, but small firms generally used external suppliers. In any case there was usually an interaction between externally and internally provided services.

Similarly, quality standards and environment-related activities were often the subject of innovation – often for marketing reasons – but even when they were not the focus, these services were important in implementing most innovations. Often these services were supplied by external consultants, especially as some required an independent audit or accreditation.

The third stage of the innovation process is the firm's adaptation to the new product or process. The main service required for this stage is training. Tourism firms use both external and internal training services. The biggest groups have their own trainers. In some cases they have even founded a tertiary education institution, but they also hire external services. Training in management, human resources and the firm's specific know-how and procedures is usually provided internally, while training in languages and computer skills and more standard skills is more often provided externally.

Several services which are knowledge-intensive, such as recruitment and legal and accounting advice, were identified as being used often but as not having any significant role in innovation. They were services that were purchased, and did not lead to knowledge-intensive service *activities*.

The Spanish study also looked at what type of KISA is more relevant for each type of innovation the industry has recently introduced. Strategic management has a general impact on all types of innovations, and indeed lies at the heart of the innovation process. In order to innovate, firms must have a managerial body that supports changes and related investment. Accordingly, tourism firms more active in strategic planning, through formal or informal means, are more likely to innovate (provided that the corporate culture is also favourable to innovation).

Environment and quality innovations and, to a certain extent, ICT innovations are supported by external consulting services. Such specialised external advice have a clear impact on the ability of firms to implement changes in products and processes, since they complement firm knowledge, which on its own would not be adequate. Meanwhile, the activity of integrating the knowledge builds capacity.

Training seems especially important for fully benefiting from ICT product and process innovations. Many innovations are introduced though purchases of new technology (mainly equipment and software). In order to fully benefit from them, workers need to adapt their abilities, so as to transform a potential innovation into an effective one. This affects mainly innovations in ICT equipment and software.

Firms attached little importance to research and development. As discussed above, they get their technology embodied in the equipment they buy and they develop very little technology of their own. In this sense, tourism may be considered a mature sector.

The Australian study

The results from the Australian study were fairly similar to the Spanish findings, although the comparisons have to be treated with caution as the list of services examined and the general approach were different – and indeed this did cause one major difference in the results.

Strategic management services (comprising industry development advice and business development advice) seemed to operate in much the same way in Australia as in Spain. They were internally produced, and were the main source of ideas for innovation. New businesses tended to use them more than most other services. A large number of firms used ICT services, especially the longer established ones, which perhaps corresponds to some extent with the notion that it is in implementation activities that these services are required. Accreditation and compliance services were regarded as very important. Training services, too, were used by many companies. These tended to be tailored to the needs of individual companies rather than simply acquired from a publicly available programme. In addition, legal and accounting services were widely used.

The Australian survey and case studies also asked about research and product development services and marketing and promotion services. Both of these categories were regarded as highly important, and the case studies showed that firms tended to use externally provided services which were tailored to the particular needs of the firm.

The Australian survey noted that businesses in the mature and expansion phases used many more services than starting and new businesses, and that many small businesses are constrained in their use of services by lack of resources. Even internally provided services use resources, though the constraint is particularly evident in expenditure on outside services. In the Spanish study, too, small firms found that everyday business absorbed almost all their resources, leaving little margin for innovative efforts.

Eighty per cent of respondents to the survey reported spending less than AUD 10 000 a year (including 14% who spent nothing) on externally purchased KISA. (For purposes of comparison, AUD 10 000 would be about equal to one-third of the cost of employing one unskilled worker full time.) Interestingly, this did not appear to be related to the size of the firm.

Use of internally vs externally provided services

In both studies, most firms sourced most services internally. Even when they used external services, it was in conjunction with internal services. The Australian survey calculated an average number of providers for each service (including internal provision). On average firms sought industry development advice from 2.42 sources, but used only 1.33 providers for ICT services. There is a mixture of sources for all services.

Most external providers were private sector KIBS, but industry associations (which in Australia are often regional tourism bodies partly funded by governments) were important sources of industry development advice, research and product development, marketing and promotion, accreditation, and business planning advice – that is, of the services that firms found most important.

Informal networks were also important, especially for market intelligence. In the Australian case studies, in particular, the role of national and international networks of like-minded business people running similar operations was emphasised. These were sometimes developed through visiting trade shows. For niche operators, the relevant operators were not necessarily in the tourism industry itself. For example, Goana, a firm which sold self-fly air tours, related more closely to the aviation and pilots' associations than to the tourism networks. The members of the companies' boards of management often gave access to other networks in different industries, and these could be the sources of new ideas.

Customer feedback was very important for generating ideas for improving products. Almost all tourism firms had some systematic way for collecting feedback, ranging from visitors books to a 'mystery shopper', a visitor who was briefed beforehand and asked to provide a report.

The two studies showed similar reasons for using external services. As the Spanish study points out, these are the same reasons for any firm's choice to buy or make anything. External services were used when the firm did not have the capability internally (often because it was too small), or when it was available more cheaply or at a higher quality externally. They were used when an outside view was required, either a creative, fresh approach or an independent compliance certification. External services are more flexible: they can be used when needed. This motivation is stronger in Spain, where the

labour market is more rigidly controlled, than in Australia, where casual employment is common. Also more important to the Spanish industry is the possibility of selecting from a wide rang of providers, including international ones: this possibly reflects the greater size of the firms and the greater presence of multinational corporations in the industry. In the Australian survey, no one reported acquiring a service internationally.

Whatever the economics, firms did not outsource services they regarded as handling critical information for the firm. For example, strategic planning is almost always done internally.

In the Spanish study there was some mention of not being able to find high quality services in the market place. This did not appear in the Australian study despite the remote location of some of the businesses. In general, the reason for not being able to use an external service was resources.

KISA and the firm's innovative capabilities

More innovative firms use more knowledge-intensive services, both internally and externally provided ones. Most regarded such services as essential to their innovations – and regarded innovation as the key to competitiveness.

Often when firms use external services it is because they do not want to acquire the capability. In this case, the firm does not engage in knowledge-intensive service activities. For example, they may engage a recruitment firm to recruit specialist staff, or a service provider to supply a physical installation or a report or text embodying the knowledge.

On the other hand, when the firm learns from the service provider in order either to produce the service itself in the future or to build on the service that has been provided, it is engaging in an activity. This is most evident in training, where the service provider aims to transfer enough information for the staff to use the skills gained in-house. It is achieved by both oral transfer of information (during training courses) and written transfer (through course notes and manuals). Some firms formed close relationships with selected service providers and these people contributed to the firm in the same manner as someone on staff. This happened most often with the introduction of new technologies.

Many firms put a lot of effort into developing their own services, with their staff learning by doing and refining the service over time. This seemed to be a common way of dealing with marketing, in particular, by the Australian case study firms. Often they used other industry associations – for example, those of inbound tour operators – to help make their work effective; and often they outsourced some part of the service, such as the printing of publicity material.

Customer feedback was often workshopped or used in other ways to allow learning by staff as well as to generate incremental improvements – and to tell firms when not to make changes. Many firms also had formal quality systems or standard procedures in place.

In some cases service providers became intermediaries between firms, spreading improved practice and putting firms with common interests in touch with each other.

In Australian firms, formal learning programmes were often confined to permanent staff. But many of the staff are casuals, and do not stay in a job for long. This may be an impediment in generating a climate of continuous innovation and improvement.

KISA in innovation in the leisure industry: key findings

The use of services

External business services and voluntary organisations have a central role in producing the lifestyle knowledge which is essential to innovation in leisure industries. Design agencies, advertising agencies and market research companies produce knowledge that can be used alongside the company's own product development, user research and media monitoring to produce lifestyle-related competencies. Sources of knowledge about lifestyle are discussed below.

Integrating various fields of expertise in the process of product development has recently gained much attention. In traditional, linear management models, the project is often seen as beginning with the 'product idea', which is followed by commercial evaluation, technical development, testing and commercialisation – tasks that are carried out by different departments (Buijs, 2003). The problem with this kind of thinking and practice is seeing and managing the innovation process in isolation and without contact between the different perspectives of engineers, marketers or designers. How the engineering, design (product design, concept design, design management) and marketing professionals' knowledge is integrated from the beginning of the product development process is a central question for sustainable innovation.

The role of the customer and user is approached by combining two orientations (Berthon *et al*., 1999; Slater and Narver, 1998). One asserts that customers prefer the products that generate the greatest interest and provide the best performance, features, quality, and value for money (a technical or innovation approach). The other suggests that identifying the needs and wants of a target market is the key to success (a market approach). Especially in the leisure business what customers consider value (even if it is 'irrational') is decisive. This requires involving the user in the process right from the beginning of product development, and understanding the user as part of a specific socio-cultural context of use. Understanding the customer does not only mean meeting today's consumer's needs, but also an ability to create products that anticipate future needs.

The case studies

The case study of Exel's Nordic walking sticks exemplifies the role of the innovation network in market innovations. The Exel company had a dominant position in manufacturing such sporting goods as ski poles. It had developed other products by introducing new activities in collaboration with partners. The walking poles are sold as part of a philosophy of healthy lifestyle, and have been followed by other products and services. They were developed in conjunction with Suomen Latu (Finnish Trail), an organisation which arranges and supports outdoor sports and health activities and pursuits to promote physical fitness, health and recreation and has about 72 000 members. It actively marketed the new sport and managed to turn it into a social movement. Another lead user was the Vierumäki Sport Institute, which was famous for its organised walking trips for ordinary people and now develops training, exercise and educational services in the fields of physical education and leisure, and is used by elite athletes. Exel is using the strategy of lead users in new markets; in the United Kingdom it is marketing through fitness centres which specialise in a particular exercise method.

The Suunto wristop computer is aimed at extreme sports enthusiasts, but has become a lifestyle statement and is worn as a fashion item. Many activities contributed to the innovation process. First there were technical resources and know-how in the company gained from previous projects in developing dive computers that enabled the creation of a new technology and thus a new product category (a technological innovation). The intended market changed considerably as the project developed, from professional sportsmen to users who wish to be like professional sportsmen. The new market was identified through explicit market analysis using data from market research agencies and test user groups; and implicit market analysis - studying the media and visiting trade fairs to capture 'something in the air'. A competitor's product which gained attention in lifestyle magazines and fairs also suggested a rethinking, and a design agency was asked to make new suggestions for the product design. An advertising agency built advertisements around the idea of a consumer who wants to be like a professional sportsman. Retailers gave feedback during the process of product development about consumers' opinions and comments on products in the product line. One model of the product line was later designed to look more like a digital expensive watch – an accessory signalling a culturally valued, sporty lifestyle.

Suunto has used a number of new design methods, including design probes, sets of questions about doing sports that are answered by enthusiasts. Probes are developed to give a deeper understanding of a sports community's culture. They help to detect sports communities' specific language and practices and their desired material environment. They go beyond the technology of an innovation to the context it will be used in. Getting deeply involved with the culture of a sport can, however, result in lock-in, which has to be guarded against.

Sources of lifestyle knowledge

Lifestyle knowledge which contributes to innovation in the leisure industries ranges from statistical market research to individual intuition on the part of a manager. Statistical information is often supplied by clearly identified standalone business services such as design and advertising agencies.

What is really wanted is information about future users rather than present ones. So, often starting with information about the existing state of affairs, businesses derive a lot of knowledge in-house. They use the knowledge of employees who participate in sports, anecdotal information about what other companies are doing, customer feedback, people who appear to speak for users, and personal experience as sources of information on what will please consumers. These techniques are becoming formalised, to the extent that an employee may actively go and seek information as a user, for example by joining an extreme sports club.

Personal social networks are important in this process. A new product idea will be enhanced by discussion within the firm, with employees' contacts, and with sporting enthusiasts or hobbyists. User communities are also important in diffusing the innovation, and in modifying it. Sometimes they have an additional role as cultural intermediaries, for example in redefining much of the 'fitness' and 'training' rhetoric into a healthy lifestyle rhetoric so that ordinary people can identify with a product originally intended for elite athletes.

The mass media are important in similar ways. They provide information on life-styles, they can create fashions, and they can contribute to changes in products and the ways they are used. The communication is thus two-way between the company and the user.

As a product moves from being a niche product to catering for a mass market, these processes need to become more formalised and explicit. This is particularly true when the move is from a national to an international market, because cultural factors are important in style. Because of the nature of the products, even the mass markets will still be fragmented, and it may be necessary to differentiate the product – or the way it is marketed.

A new category of KIBS?

In leisure innovation, a key question is the diffusion of knowledge. Companies require knowledge from different disciplines to understand the technology, the business perspective, the cultural context and the trends in the consumer market. A number of companies provide services to enhance and direct the product development process. These include market research companies, design agencies and advertising agencies. Yet companies often have difficulty in integrating, appropriating and strategically aligning this information (*cf.* Pfeffer and Sutton, 1999). For example, design teams may not have enough time to apply the existing research.

New types of knowledge-intensive business services (KIBS) are, however, emerging to work between client firms and consumer markets. These firms conduct activities that may be described as those of 'cultural intermediaries'. The concept of cultural intermediaries refers to a notion that originates from Pierre Bourdieu's (1994) extensive study on work and consumption in which 'the new petite bourgeoisie' has a central role in the production of symbolic goods and services. Cultural intermediaries are typically occupations of marketing, advertising, fashion, public relations and design. These occupations are in a central position, as Negus (2002:504) puts it, in explaining to consumers the use value of new commodities.

Two examples of KIBS firms performing this role were studied.

- **A brand analysis and development company.** This firm, focused on continuous (that is, including follow-ups) brand performance management, is a typical KIBS. The background of the employees is in law, psychology and economics. But the business branch is new in Finland. The core business idea is to help large companies to analyse the data they already get from sales, markets and trends and to help these companies base their decisions on these analyses. Often these data are not otherwise used, because of the hectic pace of business. The KIBS firm sees its advantage, compared with advertising agencies for example, in the depth of its analysis. On the basis of statistical work and interviews with employees and customers it can make recommendations about changes to the product or to the brand image. Often in the course of contact with the company the KIBS will bring in ideas acquired in other countries and from other customers.

- **A match-making company.** This firm offers strategic analysis and planning of sponsorship to its clients. Large companies often spend money on sponsoring different kinds of events for example, without a strategic perspective on the benefits gained from sponsoring. This KIBS firm offers strategic marketing specialised in sponsorships. One of the firm's employees has even been hired as a marketing manager for a period of time to the client company.

Formally, the knowledge that is sold to the client is of marketing consulting and finding business partners. But what makes this case interesting is the contextual nature of the knowledge that the company offers to its client. The KIBS firm offers analyses of the cultural trends that make sponsoring or marketing campaigns profitable or not. The employees of the KIBS firm have experience in working with different cultural contexts and understanding their specific nature. This knowledge is the basis of the offering to the client company.

Conclusion

The Finnish study of leisure industries demonstrates clearly that while innovativeness may be irrational in nature, innovation is a manageable – and managed – activity. The most important resources for innovation in these industries are aesthetic knowledge and 'alertness', contextual knowledge, and communicating with the client. Some of these services are supplied not through conventional KIBS but by design agencies, advertising agencies and market researchers. They are used alongside and integrated into the companies' own product development and market research to develop new, lifestyle-related competences. These are important activities for knowledge creation in innovation processes that leads to the development of important organisational practices and innovative business.

In respect of leisure industries, innovative activities have their own logic, but it is in a continuing and reflective process, not a chronological one. One of the most important areas for KISA is in integrating the knowledge and skills of a variety of experts in the innovation project. This has to be done from the beginning, but the involvement of the whole group must be continuous throughout the process: design, for example, is not a one-off contribution, it is a continuous, consultative process.

The suppliers of the knowledge-intensive services and associated activities in this industry form a role as 'cultural intermediaries'. They explain customers to firms, and new products to customers.

In the tourism studies, too, it was noted that in some cases service providers became intermediaries. They circulated between firms, spreading improved practice and putting firms with common interests in touch with each other. Service providers explained government, new technology, and economic developments to firms; and in turn collected information which they used to represent the concerns of the firms to government, research institutions and suppliers. They helped to build the networks that everyone agreed were important sources of innovation. The tourism industry is less innovative than the leisure industries, and service providers could help to build innovativeness into the culture.

Circulation of trained staff also helps to spread best practice and to build an innovative culture. Tourism firms often have difficulty in finding the resources for training. Even when courses are provided free, the staff time is a cost. So policy should be directed at building skills, both on and off the job. In Australian firms, formal learning programmes were often confined to permanent staff. But many of the staff are casuals, and do not stay in a job for long. This may be an impediment in generating a climate of continuous innovation and improvement.

Almost by definition, there will be information asymmetries between service providers and firms: it is difficult for a firm to know the quality of a service it engages. Signalling is a useful policy instrument in such cases: certification of service providers or publicly financed demonstrations can promote the use of knowledge-intensive services. Here, too, service providers can perform a role as intermediaries: they are a natural way to establish contacts with other service providers.

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Chapter 6

THE ROLE OF KISA IN RENEWING RESOURCE-BASED INDUSTRIES[1]

Introduction

Economies are still dominated by the production of goods, and without physical goods the society could not function and the lifestyles as we know them would not be possible. At the same time, production of goods is heavily dependent on service functions within these industries. All these material objects, services and labour are required to maintain economic systems. The ongoing division of labour (globalisation) has meant that the consumption of goods, and increasingly services, rely on actual physical production elsewhere — typically in India, China and other low-cost countries. This means that countries and businesses increasingly specialise in the production of services, activities that are sometimes considered only part of the supporting architecture of the production system (see Bryson *et al*., 2004:1-8). Case studies on the resource-based industries illustrate the vital role of service activities in manufacturing context, as part of the production process, in produced outcomes, and as catalysers/facilitators of innovation. Such intangible KISA as research and development, service and maintenance, diagnostics, design, aesthetics, control systems and numerous other are now vital part of the production process.

Table 6.1. Outline of the resource-based industries and clusters

Industry	Aquaculture Norway	Mining technology services Australia	FORENEL Finland
Function and role of the industry	Salt water fish farming.	Maximise returns from mineral exploration, extraction and processing.	Forest industry and products/services related to machinery, chemicals, electronics and consulting.
Export	Farmed fish counts for 40% of all fish exported from Norway.	2000-01 export sales were 20 % of gross sales revenue (AUD 3.1 billion).	Forenel products count for 20-45% of total world exports.
Employment	Around 3500 people in Norway.	17 300 people in Australia in 2000-01.	Around 170 000 people in Finland alone.
Location	Western Norway, central Norway and the northern region/global.	Australia/global. Often located in regional and remote areas/global.	Finland/global.
Education	General rise, especially in natural sciences.	The majority of employees in the sector have university-based science, engineering and technology qualifications.	60% of employees have engineering degree. In new mills, virtually all employees have engineering degree.

1. This chapter was prepared by Jari Kuusisto and Heidi Wiig Aslesen based on country studies. A complete list of the full-length country studies prepared by national experts can be found in the Annex.

Table 6.1 outlines the scope and nature of resource-based industries investigated as part of the KISA project in Australia, Finland and Norway. The table lays out a short description of the functioning and role, exports, employment, location and educational level of the examined industries. The following sections will first present the specific characteristics and key results of each industry studied. The final section presents a synthesis of policy issues that emerge from the analysis.

Norwegian aquaculture industry

The Norwegian economy relies heavily on natural resources, including oil, gas, hydropower and fishing. Norway achieved this competitive advantage in natural resources over time, and geography played an important role in developing these activities. Norway has a relatively lower share of high-tech (R&D-intensive) industries than the OECD average. In recent years much light has been shed on innovative behaviour in high-tech industries, how innovations are accomplished, and the effects these innovations may have on their surroundings. This case study focuses on an industry that is related to natural resources and that appears to be low-tech and less dynamic than R&D-intensive high-tech industries, namely aquaculture. Innovation statistics show that the average R&D intensity is low in this sector (Research Council of Norway, 2001:279). However, the knowledge bases underlying aquaculture activities in reality are complex and heterogeneous. The technologies employed are closely connected to several of the most dynamic areas of industrial technological change and scientific research. Aquaculture is an industry where advanced technology is assimilated and new applications developed.

The aquaculture industry has shown remarkable growth since some crucial innovations made large-scale salmon and trout farming possible around 1970. “Norwegian salmon” is probably Norway’s best-known export product, and the driving force behind Norwegian aquaculture industry. Today, Norwegian salmon is exported to over 100 countries, accounting for almost 40% of all fish exported from Norway. In the last 20 years, Norway has increased its market shares significantly in relation to the total supply of salmon. The aquaculture industry created value of NOK 11.6 million[2] in 2002. Innovations and change have occurred in all parts of the value chain over the years, continuously making the industry more efficient. There has been a consolidation in the industry, in 2001 the 10 largest companies accounted for 46% of total production. In the 10-year period from 1992-2002, there was a general increase in the education level within the industry. Both the number of employees with secondary education and employees with 1-4 years of university education has grown (especially in natural sciences). The aquaculture industry has reached a size and a level of maturity where business can no longer be run efficiently employing the ways and means that were successful in the past, and the industry is confronted with a series of new challenges. For one, the strong demand that has been experienced by the industry since its inception is no longer outpacing supply. The firms have increasingly felt price pressures. At the same time, customer demands are becoming more discriminating, and are not as easily addressed by the industry. The industry must respond to changing conditions which put pressures on the internal organisation of the production establishments and on the functioning of the entire industry value chain.

2. NOK 1 = EUR 0.1214 (as at 15 April 2005)

Mining technology services in Australia

Australia's mining technology services (MTS) industry is important to the Australian economy as an industry in its own right as well as for its contribution to the mining industry. MTS is an emerging technology-based industry. It is currently seen as a global leader in several specialist areas, such as software applications for the mining and minerals industries. Innovation in Australia's MTS industry supports the productivity and international competitiveness of the Australian minerals industry. Its function is to maximise returns from mineral exploration, extraction and processing. The main customers for the firms are the major Australian-headquartered mining firms, which have operations worldwide, and the so-called junior firms which are exploring and developing smaller deposits, mostly in Australia (Queensland, Western Australia, and to a lesser extent New South Wales). Thus MTS firms are more likely than businesses in other industries to be located in regional and remote areas, close to their main customers, the explorers and miners, and/or to have a capacity to travel to remote areas. Indeed, much of the increase in minerals industry productivity over the past 20 years can be directly attributed to the implementation of MTS innovation. The importance of this to the Australian economy is indicated by the fact that in 2001-02 Australia's mineral resource exports (excluding petroleum) represented 29% of Australia's total exports of goods and services (ABARE, 2002). While the MTS industry has not been much recognised or discussed as an industry, it is of vital importance that the innovation system within the industry works well. The MTS sector in Australia comprises over 500 companies and 10 or more are public research organisations. A number of firms which provide technology services to the mining industry identify themselves first by their activity, for example information and communications technology, so it is difficult to be precise about the size of the sector.

The gross sales revenue of the MTS industry in 2000-01 was over AUD 3.1 billion. Of this, approximately 80% was sales direct to exploration or mining companies; and the remainder was sales to contractors or to the trade. Exports sales were about 20% of the gross sales revenue. From 1995-96 to 2000-01, total revenues increased from AUD 1.24 billion to AUD 3.12 billion[3], which translates to an annual growth rate of 20%. Exports grew at an annual rate of 6% from 1995-96 to 2000-01, and were projected to grow at 25% a year from 2000-01. Thus while the growth rate of the sector as a whole is expected to decrease (while remaining high), the growth rate of exports is expected to increase. Like other Australian high-technology industries, the MTS industry is dominated by small firms[4]. The industry employed approximately 17 300 people in Australia in 2000-01. Of the firms, 53% employed five or fewer people; another 26% employed 25 or fewer. Only 1% employed over 500 people. Anecdotal evidence suggests that the majority of employees in the sector have university-based science, engineering and technology qualifications (MTSAA, 2002). All three discipline areas are necessary for innovation in the sector. As such, access to a pool of university trained science, engineering and technology graduates is essential to the sustainability of the industry. Firms in the MTS industry on average spent 12% of their sales revenue on research and development, according to the ABARE survey. Consistent with the large proportion of small companies in the industry, 41% of companies did not spend funds on R&D.

3. AUD 1 = EUR 0.5982 (as at 15 April 2005)

4. The Australian Bureau of Statistics generally defines firm size thus: very small firms, employing 0-4 persons; small firms, employing 5-19 persons; medium firms, employing 20-99 persons; large firms, employing 100 or more persons. Data were not available to apply these definitions, and firm size is discussed in terms of proportions of firms having particular levels of employment and turnover.

The Forenel cluster in Finland

This study focuses on the role of KISA in renewing the 'old' backbone of the Finnish economy, the forest industry, or more specifically, the Forenel cluster. The cluster consists of organisations that more or less directly deal with wood in its various forms. The forest industry itself consists of wood and wood products, pulp, paper and paper products. This industry employs approximately 70 000 people in Finland, and accounts for 5% of GDP. Another major group of actors includes forestry, engineering, chemical engineering, transportation, business services and printing. It is estimated that as a whole the cluster employs up to 170 000 people in Finland alone. Of these, 70 000 work in the forest industry, 24 000 in forestry, and 16 000 in engineering. Furthermore, 12 000 employees are involved in road transport and transportation logistics. Business services, such as maintenance, consulting, education and research and development employ 25 000 people. Some 24 000 employees are involved in the chemical engineering industry, furniture industry and printing. The overall competitiveness of the Finnish forest cluster is reflected in the export figures of the related industries. Overall, the share of Finnish forest products in the world's exports in printing and writing paper is around 25%. In the area of related machinery production, the share is even higher; in forest tractors 25%, paper machinery 30% and pulp machineries 40%.

Traditionally, the forest industries have been rather resource-based and low in knowledge intensity – at least when measured by their share of knowledge-intensive service procurements (such as R&D, computer and data processing, and ICT-related services) of all service procurements. This implies limited innovation potential through the use of external expert services. However, much of the influence of knowledge-intensive services and innovation comes to the forest industry via suppliers, in particular from the machinery and engineering industries. The argument that suppliers of equipment, materials, components and software have had a profound influence on the technological development of the forest industry is well founded. At present the Forenel cluster can be described as a highly knowledge-intensive business activity that will be increasingly so in the future. The drivers of this change include increasing complexity of products and systems, rapid technological changes (*e.g.* ICT, bio- and process technologies), and extensive outsourcing of various activities. The pulp and paper industry is increasingly outsourcing services such as ICT, project management, consultancy, logistics, technical design, engineering, and maintenance to specialised service providers and machinery manufacturers. Increasing liberalisation of world trade and the expansion of production abroad, development of information and communication technology as well as development of final demand of the products have shifted the core of the competitiveness to such elements as *ability to innovate* and *ability to use and exploit new technologies*, as well as *ability to establish to new markets*. What is typical to this stage as well is a significant increase in demand and supply of knowledge-intensive services (Hernesniemi *et al*., 1996; Viitamo, 2001).

Issues addressed in the resource-based industry cases

The aim of the resource-based industry studies is to analyse the role of KISA in innovation, and its ability to renew traditional resource-based industries. The following listing covers the main themes in the resourced-based studies:

- What types of KISA can be identified?
- Why do firms use different KISA, explaining what kinds of KISA are used.
- When do firms use different KISA?
- How do firms interact (co-production) with KISA?
- How do organisations incorporate them to create a dynamic of continuous innovation?
- How do organisations use KISA to increase their absorptive capacity for further new ideas?

An indicative list of knowledge-intensive service activities was used as a starting point for the research. The idea of the list was to serve as a starting point for the discussion and to provide a way to operationalise the KISA concept for the interviewees. The indicative list of possible types of KISA includes:

- Research KISA.
- Development KISA.
- ICT development KISA.
- Legal KISA.
- Banking and financial KISA.
- Accounting and auditing KISA.
- KISA related to organisational development and strategy.
- KISA related to marketing and sales.
- KISA related to management and training.

Once the different types of KISA were identified, the analyses focused on the organisations that were delivering knowledge-intensive services. An indicative list of different types of KISA providers includes the following:

- **Internal KISA**: service providers within the organisation, separate departments or units or individual persons providing services to different business units.
- **Enterprise level KISA**: provided by shared resources of the business group.
- **Knowledge-intensive business services (KIBS)**: defined as private sector firms providing knowledge-based services to other business and non-business organisations. The nature of the knowledge they provide is strategic, technical, and professional advice mainly employing the skills of information gathering, processing, and, in particular, interpretation of information.
- **Research and technology organisations (RTOs)** are public or semi-public organisations providing knowledge-intensive services as their core business.
- **Network KISA** represents actors that are part of businesses' vertical and horizontal linkages. Such networks include suppliers, customers and other firms within the industry. Also competitors can be part of such loosely structured networks.

Specific issues addressed in the Norwegian aquaculture analysis

The overall research question is what role knowledge-intensive service activities play in innovation in aquaculture firms. The investigation looks into how four main types of aquaculture firms (elaborated below) build their innovation capability through the use of knowledge-intensive services. Further on, the analysis seeks to identify which are the most important sources of KISA. Based on the earlier work undertaken by Aslesen *et al*. (2002) two different strategic approaches to innovation among aquaculture firms are identified:

- Innovation-related knowledge is gained through experience generated by effective operations and through practical solutions based on accessible practical and tacit knowledge in the field of aquaculture; *practical knowledge base*.
- Firms which base their innovations on interactive development, and the use of new scientific or technological knowledge; *scientific knowledge base*. Further on the study found that there is a surprising number of firms that have organisations marked by *ad hoc* solutions to structural problems. A number of other firms, usually more established ones, have a more structured management system with a formalised division of labour within the organisation. This line of argument provides the following table, as a tentative classification of aquaculture firms.

Table 6.2. Different types of aquaculture firms

Knowledge base / Organisation	Practical	Technological/scientific
Entrepreneurial, ad hoc	1) "The small family firm"	3) "Research-driven entrepreneurs"
Structured management system	2) "The coastal enterprise"	4) "Science-based process industry"

Source: Aslesen *et al*. (2002)

The investigation will use the different innovation strategies of aquaculture firms (Table 6.2) as background variables which will serve as a categorisation of the questions why, when and how firms use and interact with KISA for innovation purposes. The 'why', 'when' and 'how' questions presented above produce a profile for each one of the four different types of aquaculture firms; however, these categories as such do not provide a clear-cut way of categorising firms in mutually exclusive four groups. A number of firms will have features that fall into more than one category.

The study of aquaculture is carried out in three steps. Step 1 reviews national statistics of the Norwegian aquaculture industry using a variety of sources: *1)* the firm and enterprise register of Statistics Norway; *2)* national accounts of Statistics Norway; *3)* the 2001 Community Innovation Survey for Norway. Step 2 evaluates government and semi-public programmes and policies. The information gathered is based on findings on the Web sites of the various agencies responsible for the policies or programmes, telephone-based communication with persons responsible for the programmes as well as the EU commission Trend Chart database for Innovation[5]. Step 3 is based on in-depth interviews with 11 persons in eight Norwegian aquaculture firms. The objectives of the semi-structured interviews of the KISA aquaculture case study is to identify whether knowledge-intensive service activities have a role to play in developing capabilities to innovate in aquaculture.

5. *www.cordis.lu/trendchart*

Specific issues addressed in the Mining Technology Services Study

The key research questions in the mining technology study include, how firms organise themselves to obtain ideas, and how they make use of them so that it adds to their growth and profitability. A deeper understanding of how and why changes occur in innovative firms will provide a better understanding of the basis of innovation and how governments can encourage and support it. A useful framework for the analysis of innovation in and by firms has been developed by Koberg *et al*. (2003:3), drawing on earlier work by Herbig (1994). Koberg's definition gives a way of looking broadly at innovation. It provides a framework for categorising those internal processes within firms that lead to the changed products or services perceived by the consumer. Koberg's review of the differences between these two types of innovation highlights four key types of incremental innovation in:

- Manufacturing or production processes.
- Personnel management.
- Business's procedures and structures.
- Equipment, facilities and work units.

While Koberg's published model is limited to manufacturing, Thorburn and Langdale (2003) have extended it to encompass service industries. The current study has relied on this framework in the context of innovation within and by firms, but has added in new considerations of the role of knowledge-intensive services in innovation.

Firms were asked about their use of 21 different knowledge-intensive services, the remainder of this report uses the following definitions for the three types of services:

- **Compliance**, where firms use external service providers to ensure that they comply with regulatory or taxation regimes – in Australia, this usually relates to services provided by accountants, lawyers and auditors.
- **Routine**, where standardised services are purchased for routine matters – these include such services as: market research, legal advice (*e.g.* review of standard contracts), sales and ICT-related services, and accreditations (*e.g.* ISO system).
- **Tailored**, where the service was modified to suit the needs of the client. For example: tailored surveys, design of new equipment or installations that are one-off in nature, and legal advice on specialised contracts.

Six case studies were conducted in 2004 and 2005. Interviews were conducted face-to-face with the Chief Executive Officer or a member of senior management from the companies. Each interview was carried out using a prepared interview guide. This interview guide was developed following a review of the methodologies and issues covered by KISA studies in partner countries and uses some questions common to these studies. It was framed to gather data around innovative activity within the business, focusing on the generation and utilisation of knowledge. The interview guide was tailored to accommodate the particular circumstances of Australia. Names of potential MTS firms for interview had been generated by preliminary work for the ABARE survey and the MTS Action Agenda, and were supplemented by internet searching of firms that had won awards for export, customer and employee service as well as innovation. Despite the segmentation of the mining technologies sector in the ABARE report (ABARE, 2002), the businesses in the case studies delivered a very broad range of services. A number of firms sold software, either as stand alone packages or bundled with part of their services.

Several firms offered a range of exploration and other mining services, often related to determining the value of the ore body so that customers can obtain bank financing for further exploration, extraction and processing. Finally, each interview was written up as a case study and was cleared by the company prior to inclusion in this report.

Specific issues addressed in the Forenel cluster study

This study focuses on the KISA role in renewing the 'old' backbone of the Finnish economy, the forest industry and related electronics and engineering (Forenel) cluster. The research was conducted in collaboration with three research institutes that combine the most relevant aspects and associated resources to investigate the complex interaction between innovations processes, new business opportunities based on KISA and industrial competitiveness. The analysis is based on 64 personal interviews with experts and business practitioners, the Finnish innovation database (SFINNO) and statistical data. The Forenel study follows the research themes agreed upon by the OECD KISA focus group. More specifically, the Forenel study investigates the role of KISA in the manufacturing context from three different perspectives, as a *cluster-level* phenomena, as a contributor to a *value chain* and at the level of an *individual innovation*. In particular, it seeks to shed light on the following areas:

- What constitutes the Forenel cluster?
- What types of KISA contribute the development of the Forenel cluster?
- How do organisations use KISA to build and renew their capabilities and competitive advantage?

Other issues central to discussion include the questions of what causes a firm to develop knowledge internally as opposed to getting it from outside, and how does the firm manage knowledge once it has acquired it?

Research method, data and analytical procedures

Forestry/engineering/electronics cluster description

This study by ETLA presents a statistical overview of the forest industry and related cluster in Finland. The data have been mainly drawn from the OECD, ETLA, Statistics Finland and the Index of Revealed Technological Database by CHI. Forenel case studies are:

- **The evolving Forenel cluster and the role of KISA**. This study was conducted by ETLA and presents an analysis of the evolving role of ICT and R&D-related KISA in the Forenel cluster. This section is mainly based on 21 face-to-face executive interviews with forestry, engineering and ICT firms. Semi-structured interview outlines were used to guide the discussions.
- **New business models and the role of knowledge-intensive services**. This case study by SC Research analyses the role of KISA in the evolving business models within the Forenel cluster. This section draws information from 25 expert interviews with research institutes, forestry, engineering, consultancy and joint venture firms. In addition, a focus group interview was organised with forest industry executives. Semi-structured interview outlines were used and all interviews were transcribed to allow for systematic analysis.

- **The role of KISA in innovation process**: POM concept case. This case study by VTT analyses the role of KISA at the level of an individual innovation. Personal interviews and documentary material were analysed for this study.

KISA in innovation: main findings of the case studies

The Norwegian aquaculture industry

In the KISA study on aquaculture, we found it reasonable to categorise the interviewed firms according to different innovation strategies, since firms' innovation strategies (as a function of internal knowledge base and organisation of activities) may explain what kinds of interactive learning processes firms engage in with external KISA providers. Innovation strategies are therefore used as a tool to understand why KISA are used, the types of KISA used either internally or externally by aquaculture firms, when KISA are used, and how (Table 6.2). This model seems particularly relevant in order to understand the role knowledge-intensive service activities play in innovation. Since the aquaculture industry consists of many different types of firms, an aggregate analysis of the industry might fail to include important differences and developmental tracks *within* the industry. The stylized variants of aquaculture firms firstly include what kinds of competences are to be found internally, and secondly, which set of "significant others" firms co-operate with during innovation efforts. Important here is that the innovation process differs within each quadrant, and so does the innovation outcome.

The small family firm

The small family firm can be said to have a strategy of neither innovating nor using KISA. The degree of internal KISA is at the minimum and the different KISA functions often overlap, since these functions by and large obtain their knowledge from practical experiences. The implication of this is that the aquaculture technician, the management, and the operational personnel often are to be found in one and the same person (a "jack of all trades") who facilitates operational improvements and makes the administrative apparatus and internal KISA very small. The organisation is still in its infancy, therefore lacking organisational maturity and professionalisation. In interviews, firms emphasised that the practical and experienced-based knowledge of the workers is the most important input into processes of change in the firms. The correct question to ask Type 1 firms[6] is rather: why do they not use/use so little external KISA for their internal learning and innovation processes? The answer is that these firms engage in few innovation projects of a more profound nature. When these firms innovate it is through practical knowledge, they seldom encompass the internal resources (absorptive capacity) or the time or money to relate to a broad set of KISA actors. The firms' development efforts are mainly based on internal competence and on external relations that are part of the firms' vertical or business network. These firms use KISA on an *ad hoc* basis in relation to "fire fighting" in production and "must-have" activities, as well as in relation to banking and auditing, and seldom in direct relation to innovation. Personal ties, trust, and proximity to external KISA are important for the use of KISA.

6. See Table 6.2.

The external KISA that the 'small family firm' relates to are typically posed to them through mother companies (the enterprise level), through the market by their network of suppliers and customers, through 'must have' activities like accounting and banking services and through informal networks in relation to fire fighting. In interviews, it is obvious that these linkages do make valuable input into learning processes in the organisation, however, resulting to more incremental changes in technical solutions or business organisations, suggesting that external KISA do have some impact on innovation processes.

The coastal enterprise

The coastal enterprise has a more professional organisation and therefore does employ more internal knowledge-intensive service activities in middle management. This firm has moved to a more mature, permanent operational phase, with a more professional and functionally differentiated organisation, and permanent management. The most important reason for the changes appears to be that the size of the organisation has made a more formal structure unavoidable. Many of these firms are large multinational firms with departments worldwide focusing on different aspects of KISA. The firm has professional middle management, which to some extent also possesses practical experience. Even though the coastal enterprise has more internal KISA than the family firm, it still has a small and effective administration and a lean organisation with minimal "slack", meaning that they do not assimilate all needed KISA internally. Pressures towards increased efficiency and adjustment to lower prices mean that internal KISA has been regarded as a luxury that may be spared. It is hard to single out KISA that are mainly held internally in these kinds of firms, because there are several different strategies and reasons to both internalise and externalise all different kinds of KISA. One might say that "the coastal enterprise" relates to all different kinds of external KISA suppliers besides those that represent more formalised RTOs. The reason for this is that these firms do not base their activity on formalised codified knowledge, but on more practical and experienced-based knowledge. The middle management has enabled these firms to better relate to external knowledge providers and as such, they are more integrated into the production and innovation system of which they are a part than the small family firm. KISA acquired through the network of suppliers and customers and related firms are still the most important innovation input for these firms. The impacts of KISA go into a larger part of the value chain, and are still related to more incremental changes.

The research-driven entrepreneur

Research-driven entrepreneurs innovate through interactive learning processes with external KISA providers from RTOs and, as such, use external KISA as part of their innovation strategy. These firms are often in the research front within their field, and most of the firms specialise in areas such as feed and fish health, and some of the firms may even be categorised as biotechnology firms. "New" knowledge is the driving force of the firms' investments/business activities. The innovations resulting from these formal and long-lasting innovation projects are often radical and new to the market. However, research-driven entrepreneurs do relate to a few other professional providers of KISA since their organisation has outsourced most other KISA functions. The firms internalise research KISA in parts of the value chain over which they have control. It is important for these firms to protect their knowledge and technology through IPR protection. Some of these firms are part of an enterprise group, and receive valuable external KISA through these sources. However, some of these research-based entrepreneurs stand alone, and

many of the actors have too little focus on KISA linked to business development, such as strategies for commercialisation.

The science-based process industry

The science-based process industry firms are often part of a large corporate structure with all of the different KISA activities to some degree internalised or found within the enterprise structure (or holding company). These firms integrate KISA from the *whole* value chain, in innovation processes, and have the resources available to privatise and control both formalised knowledge generation and its practical application. The objective of knowledge development in such a company is to develop a competitive advantage, which needs to be protected from competitors.

The science-based process industry firm is highly integrated into the production and innovation system of aquaculture and use KISA in relation to learning processes in all parts of the value chain. KISA therefore make valuable contributions to innovation in all parts of the organisation, however, the respondents are eager to report that they themselves are the "agents of innovation" and are driving the innovation processes in the firm. The impact of external KISA towards innovation in the firms is said to be dependent on the quality of the services provided in the market.

Summing up the different strategies to use of KISA

The study of KISA in aquaculture showed that even if firms are categorised in the same industry, their *use* of knowledge-intensive service activities and KISA *role* in innovation differ according to firms' knowledge base and type of organisation. The dynamics of the interaction between KISA providers and aquaculture firms also differs along these dimensions, and policy directed at improving innovation capabilities by means of KISA must relate to these important differences between firms. The extent to which KISA are used internally by aquaculture firms generally determines the quality of interaction with external KISA suppliers. Many of the interviewed firms focus on minimising fixed costs and internal KISA are often very slim, making it hard to have the appropriate knowledge management practices to maintain new knowledge in the organisation – if external KISA are used in the first place. As such, the ability of external KISA to influence aquaculture firms' knowledge-generating processes might vary enormously.

One can say that there is a general scepticism about the use of external KISA as a source of innovation; however, external providers are now being employed to a greater degree than was previously the case, especially in the fields of development activities (also moving towards more scientific knowledge milieus) linked to product and process innovations (often incremental), in relation to ICT projects and in relation to banking and financial assistance (often linked to mergers and acquisitions). The external actors used are primarily other parts of the business group, the network of suppliers and similar firms, and KIBS-supplying services linked to regulatory and taxation regimes. In general it may be argued that the focus on "soft innovation" inputs is starting to gain ground in the aquaculture industry. When the firms themselves start to focus on the need for knowledge-intensive services, one can expect that the supply and quality of external KISA will increase.

Table 6.3 summarises the findings regarding why, when and how KISA are used in relation to innovation. The table shows that both the set of actors these different firms relate to, and the different KISA that they perceive as relevant for innovation and the innovation result, differ.

Table 6.3. Why, when and how KISA are used in relation to innovation among interviewed aquaculture firms

Ad hoc organisation					
Practical/learning by doing			**Scientific knowledge base**		
Type 1: "Small family firm"			**Type 3: "Research-driven entrepreneurs"**		
Most important KISA for innovation:	**KISA provider:**	**Types of innovation:**	**Most important KISA for innovation:**	**KISA provider:**	**Types of innovation:**
Development of KISA and ICT development KISA Banking and financial KISA Accounting and auditing KISA	KISA from enterprise level Network KISA "Must have" local KIBS (auditing, finance)	Organisational and strategy innovations Incremental technological innovations Incremental change of business strategy	Research KISA Legal KISA Banking and financial KISA (venture capitalists)	Network KISA KISA from enterprise level RTOs	Product, process, market Radical science-based innovation (in parts of the value chain)
Professional management					
Type 2: "Coastal enterprise"			**Type 4: 'Science-based process industry"**		
Most important KISA for innovation:	**KISA provider:**	**Types of innovation:**	**Most important KISA for innovation:**	**KISA provider:**	**Types of innovation:**
Development KISA ICT development KISA Banking and financial KISA KIAS related to marketing and sales Organisational development and management and training	Network KISA National/global KIBS (finance, strategy, training)	Incremental innovations in the whole value chain Organisational and strategy innovations	Research & development Organisational development and strategy ICT development KISA KISA related to banking/financing, accounting and auditing Management and training Legal KISA Marketing and sales	RTOs Network KISA National/global KIBS (finance, strategy)	Radical science-based innovation in the whole value chain Incremental and radical changes in all parts of the value chain Organisational and strategy innovations

By looking at the different types of firms in Table 6.3, it seems obvious that there are certain prerequisites regarding the internal knowledge base and degree of professionalisation in management that must be in place, if a successful learning process between KISA providers and aquaculture firms is to happen. This certainly challenges the view of KISA providers as *always being* an "innovation agent" (Metcalfe and Miles, 2000).

KISA and innovation in the Australian mining technology services

The research starts by identifying different types of innovations in analysed firms. Most case study firms reported that their incremental change spanned all four areas identified by Koberg *et al* (Table 6.4). However, *most firms' innovation was concentrated on enhancement of service delivery*. Means to improve service delivery include development of new products, services and the procedures necessary for effective service delivery. Table 6.4 presents the identified incremental improvements by category in the mining technology service firms.

Table 6.4. Incremental innovation in mining technology case studies

Name	Product/service	Procedural	Personnel-related	Structural
Advitech	Risk management software, environmental noise services	Quality management system (ISO 9001 accredited)	All personnel trained in new products `	Computer-based project assessment system
Ausenco	New technological processes	Formal quality management system	Formal positions in health and safety, environment, business development	Internet-based presentations to clients
Lakefield Oretest	Hydrometallurgical testing processes	Standardisation of testing procedures in house	Incentives for meeting budget	Online tracking of projects by clients
RSG Global	Introduction of metallurgical services	Development of induction manual and formal timesheets	Change in divisional structure	Customers can download time-limited demonstration versions of software
Runge	Range of software packages	Work to a very formal strategic planning framework	Employee share options programme	Remote delivery of training programmes
Softrock Solutions	Automatic slope monitoring equipment	Standardisation of information collection to build database	Appointment of training manager	Remote monitoring of mine site slopes via Internet, new equipment

Source: Thorburn (2005).

The scope of improvements covers a wide range of KISA-related issues. The next sections will provide a further analysis on how firms seeked to achieve these improvements.

Use of external knowledge-intensive services

A key finding in the case of mining technology services is that the use of external knowledge-intensive services was rather limited. Firms outsourced from 24 to 57% of knowledge-intensive services discussed during the interview (Table 6.5). Only a few per cent of turnover was usually spent on these services. Those services rated of high importance ranged from 11 to 50% of the services outsourced. Services that were tailored ranged from 20 to 60% of those outsourced. The most commonly outsourced services included legal, accounting and financial services (largely compliance), capital raising and ICT/networking. A number of firms had outsourced various aspects of business planning. Several also outsourced recruitment to some extent, although not always successfully.

Table 6.5. Use of external services by mining case studies

	Advitech	*Ausenco*	Lakefield Oretest	Softrock	RSG Global	Runge
Planning	tailored	tailored		tailored	tailored	ROUTINE
Legal	ROUTINE	routine	tailored	tailored	TAILORED	tailored
Accounting/financial	compliance	compliance		compliance	compliance	compliance
Capital raising		TAILORED				TAILORED
Tech. awareness						
Tech. trends				routine	ROUTINE	
Formal R&D						
Market research		tailored				tailored
Product development				TAILORED	ROUTINE	
Project management						
Operations	tailored	tailored			TAILORED	
Marketing	routine				TAILORED	
Sales						
Export strategy					tailored	
Establishing o/s offices		routine			routine	compliance
Benchmarking						
ICT/networking			routine		TAILORED	
Recruitment	routine	tailored	routine		routine	tailored
Accreditation	compliance		COMPLIANCE			
Standards						
Training	routine	routine	routine		routine	routine
Total outsourced	8	9	5	5	12	8
% outsourced	38%	43%	24%	24%	57%	38%
Of those:						
% high	13%	11%	20%	20%	50%	25%
% tailored	25%	56%	20%	60%	50%	50%

Notes: Words in CAPITALS indicate outsourcing was of high importance; words in lower case indicate outsourcing of medium importance; blanks indicate no outsourcing. N/A indicates not relevant to that firm.

Source: Thorburn (2005)

Supply of KISA to mining technology services firms

Personal networks

Personal level networks have an important role in an expert-driven industry such as mining technology services. Senior management in all case study firms had a significant role in identifying potential new areas for innovation and the decision to respond to new opportunities. All CEOs relied heavily on their personal networks to assess market trends, to confirm or test the results of formal market surveys or other sources of quantitative market data and to find people to deliver services when these were not available inside the firm. Also managers had excellent personal networks and they used an informal approach to seeking advice and ideas from their peers. These firms were largely reliant on national scale networks but those firms that did export also had a range of international links (often also through technical staff). Most firms obtained their export projects through links with major Australian miners (customers) who were operating in these

regions. Board members of the MTS firms often maintained international-scale networks. The MTS firms have relatively high proportions of tertiary-qualified technical staff. As professionals, they are expected to use their professional networks to obtain information from outside the firm. This usually related to information on technology awareness and technology trends, both of which were important to these firms in fast-moving markets. These firms are supplying custom-made services to large firms. In order to communicate with customers and to benefit from referrals, the firms tend to locate near their customers; then this co-location in turn increases the possibility of communication and its importance.

Role of R&D institutions, industry associations and government bodies

Links with *R&D institutions* were surprisingly limited given the technical nature of the case study firms. Thus MTS firms, while relying heavily on R&D, contained it largely in-house. This was partly for commercial reasons (keeping ahead of competitors) and partly because some saw R&D institutions as competitors. Further, with the exception of software development, the R&D performed by mining technology firms was probably more 'D' in nature and relied on the skills of staff to develop existing technologies, rather than develop new technologies from basic research. None of the case study firms was a spin-off from an R&D institution, so the longstanding industry – research links observed in other high technology industries were not present. There were no significant linkages with or involvement in *industry associations*. Most case study firms reported that these associations were not relevant to their innovation. Advitech, where the senior staff are actively involved in local Hunter valley industry groups, was the only exception to the rule. These industry groups are, however, seen to play a major role in broader knowledge acquisition. Firms had limited links with *government bodies*. In one case government was a customer to a mining technology services firm. Also, two of the case firms had found that their state industry development departments and federal Austrade staff were extremely helpful. Austrade had also provided some export assistance. One of the service providers based several of its innovations to close working relationship with regulatory agencies. In general, the firms seemed to have limited awareness of government grant programmes.

Capability building in the mining technology service firms

Learning by firms

Marketing. All case study firms had Web sites and were active users of on-line technologies to promote their firms. However, marketing was largely by word of mouth so these sites were more general promotional tools, with the exception of businesses that used Web sites to promote software packages through trial downloads. Formal market research seemed to play a relatively minor role.

A combination of new technologies and customer feedback appears to be the main driver for innovation. Customers provided feedback not only on the content of services but on the manner of their delivery. The processes in place to obtain feedback from customers were largely informal. A firm had completed formal customer surveys but these were not regular. The other case study firms had tried a variety of ways to obtain feedback but these were not always successful. Several firms reported that feedback from customers had led them to launch new services, mainly software, which had been developed to solve in-house problems and were later marketed.

Quality systems, customer service and intellectual property. Smaller firms often had less formal quality systems in place but three of the larger firms had well developed quality systems and highly structured internal procedures. Ausenco was the most structured and had also introduced new staff positions that were designed not only to improve internal systems and structures but were aimed at raising awareness amongst customers of its quality system. Advitech has an extensive quality management system and has been accredited for the most recent version of the ISO 9001 standard. Although all the mining firms have considerable intellectual property in the form of in-house developed software, scientific know-how, project processes, etc., there has been little patenting of this IP because of concerns about revealing in-house secrets. Intellectual property was largely held through the skills of staff and only one firm had any patents. The competitive advantage of these firms was centred on their ability to bring together teams of experts to solve particular problems, which varied from customer to customer. All case study firms employed *expert technical staff* who acted as the main gatekeepers for new information coming into the firm and were responsible for much of the environmental scanning. The firms were in direct contact with customers and had largely informal systems for obtaining customer feedback. All case study firms also have mechanisms in place to capture ideas suggested by staff and to ensure that customer feedback heard by staff is passed on to management. *In terms of knowledge management*, firms relied on their own technical staff for bringing in many new ideas. Lack of internal capacity and need for complementary skills for their ongoing operations and innovation were the main reasons for using external expertise. The main system for managing knowledge was through management meetings. Mainly knowledge management was fairly informal but some firms were moving towards more formalised systems, through changes in business planning and more developed internal staff structure and information flows.

Innovation activity and KISA in the Forenel cluster

The role of KISA as a renewal agent of the Forenel cluster is crucial. Until recently the Finnish forest industry has based its competitiveness on technological innovations and highly effective production processes. In these terms, the Forenel cluster is among the most competitive in the world. However, the future success cannot be solely based on following the path of technological innovation. It can be argued that the core of the industry's competitiveness is shifting toward a new type of competences. This is due to increasingly open international trade, expansion of overseas production capacity, development of information and communication technologies as well as the shifts in demand for the industry's products. The way forward is to become more open, more experimental and to embrace the unknown. Forenel cluster cannot afford to turn inward or to be too risk-averse. Striving towards highly value-added, integrated solutions has resulted in a significant increase in demand and supply of new types of knowledge-intensive services within the Forenel cluster.

Identified KISA activities within the Forenel cluster

Customer and end user-related KISA are an emerging area which is appearing to gain importance as solution selling and life-cycle services take a more prominent role in the business. KISA within the Forenel cluster can be divided into upstream and downstream services in relation to the paper and board producers. Upstream services (*e.g.* service and maintenance) are typically closely connected to the manufacturing firm, and hence, more or less part of the production process. On the contrary, the downstream services (*e.g.* logistics and sales) are far less connected to the manufacturing firm, and the production

process. Table 6.6 presents different types of KISA which can act as catalysts of change, having various roles in the renewal of the industry. Outsourcing signifies the evolving division of labour within the cluster, and many of the external KISA do exist as a result of this development. KISA in the following fields seem to be particularly important for the development of the Forenel cluster: research and development, technical design, ICT, logistics, services and maintenance, and management consulting.

Table 6.6. Indicative list of identified KISA in the Forenel cluster

KISA	Description of activity
R&D	Research and development activities related to: forestry, logging, fibre research, chemicals, process development and logistics. Services are provided by: suppliers, universities, research institutes, RTOs, engineering firms and consultants, public and private seed financing, the National Technology Agency, expert networks, piloting with a potential customer.
Service, maintenance and facility management	Plant maintenance, servicing and plant level R&D. Key service providers include: equipment suppliers, chemical suppliers, facility management firms, industrial service firms, service and maintenance joint ventures, local and regional service suppliers including educational institutions.
Expert services	A wide variety of techno-economic, environmental and forestry-related services mainly supplied by: engineering firms and forest industry consultants, equipment suppliers and their contractors, universities and research institutes.
ICT services	Process control and automation, business management systems and global infrastructure mainly sourced from: ICT equipment suppliers, software developers, software service firms, and telecommunication operators.
Marketing, logistics and customer interface-related services	Solutions selling, integrated systems and marketing services mainly supplied by: research institutes, consultants, a wide variety of experts providing specific knowledge for projects requiring cross-disciplinary knowledge, experts from customer firms.
New business venturing	Business incubation and new business venturing type of services provided mainly by: innovation units, inventors, SMEs, business development experts, legal experts (patenting), financing experts and researchers.

Typically, KISA activities that are sourced from external experts are relatively specific in nature. Forest businesses are very keen to maintain the overall control of the key processes in-house.

Integration of internal and external KISA

The effectiveness of knowledge exploitation depends on the firm's absorptive capacity and other parties' transfer capacity. Knowledge flows also require a sufficient knowledge base, which the Finnish Forenel cluster apparently has in many areas. However, the analysis indicates that there is a need to build new knowledge in incorporating new technologies in paper-based products (electronics and biotechnology). Another area where the knowledge base needs to be strengthened is value chain orchestration, and closer integration with customers. Table 6.7 provides an indication of the ways in which businesses seek to secure effective co-production of knowledge with external experts.

Table 6.7. Integrating internal and external KISA

- By employing experts who can build up their knowledge base and absorptive capacity
- Multidisciplinary research teams are a way to broaden the knowledge base required in selling solutions
- By making use of personal level connections with industry experts and other experts
- Setting up innovation units that scan the business environment and develop new types of expertise and business opportunities
- Through business acquisitions which bring in new knowledge and innovative thinking within the firm
- By participating in networks which offer multifaceted opportunities for incorporating internal and external knowledge
- By engaging in close co-operation with suppliers and setting up joint development projects
- In joint ventures which typically (*e.g.* service firms) represent a further step in institutionalising co-operation and integration of KISA with other firms
- By buying integrated product-service bundles, bringing external KISA within the firm
- Engaging in close co-operation with customers so that internal and external KISA can be used in new solutions development
- BY establishing joint projects with research institutions, research KISA is brought into practical context
- By using outsourcing as a way to integrate former internal KISA with the external expertise
- By purchasing services from KIBS businesses and working with them

On the business process level the integration of internal and external KISA needs to overcome a number of challenges. As product-service solutions are becoming ever more complex and involve a wide range of external and internal experts, there is a need for integrating services. Hence, some negative effects of knowledge fragmentation can result from an extensive use of external KISA. Interviewees recognise the mounting challenge of managing increasing numbers of external experts who represent numerous different disciplines. This indicates a need for improved management skills among experts as well as at the R&D management level. Some of the consulting firms have realised this market opportunity and are taking a role as integrator, offering turn-key innovation services. Such integrated packages seek to avoid knowledge fragmentation problems by offering complete R&D service solutions.

Features that characterise KISA and their role in the Forenel cluster

Outsourcing, networking and co-operation between organisations. The competitiveness of the forest industry is becoming more dependent on a combination of contributions made by various forest cluster actors. In research and development, the focus is increasingly on developing solutions that integrate different technologies, materials and knowledge. Hence, effective use of external R&D resources and management of cross-disciplinary networks and teams has become a key capability in the field. Public organisations provide an important framework as well as resources for various forest cluster actors. In their long-term research and development, pulp and paper firms increasingly rely on public research and technology organisations, whereas their internal R&D focus is on projects with close links to business activities and markets. The role of private expert service firms (KIBS) (*e.g.* in the fields of engineering, ICT, and consulting) is typically to find a technically and economically optimal solution to a certain project. In mill-level service and maintenance, new business models are based on outsourcing of maintenance and related service functions to full-service industrial firms, equipment suppliers and joint ventures. Overall, such new partnering relations can bring improved performance for the mills and new innovative maintenance solutions, disseminate knowledge and competence, and make

maintenance a more business-oriented, higher profile activity within the mills. Again, the biggest challenges are related to co-ordination of effort between the parties involved. As paper and cardboard firms are moving into the provision of integrated solutions to their customers, new concepts are developed jointly with the key customers, KIBS firms, other horizontal partners and research and technology organisations. Typically, solutions that add most value to the customer require a network of partners in different industries or branches. The aptitude to introduce value-adding solutions to markets calls for the ability to co-ordinate and make use of existing and emerging knowledge in different technological fields as well as market developments. It is evident that these different bodies of knowledge cannot be entirely mastered by in-house KISA, and external providers of knowledge-intensive services are needed.

The need for co-ordination creates new 'integrator' KISA. As indicated above, the increased importance of co-operation between the forest cluster KISA providers leads to new requirements in building and managing such networks. The management of relations with external partners necessitates a high level of co-ordination skills and tools, capacity to manage contract relationships, and potentially, new management roles. Progressive division of labour between the organisations raises the question of who co-ordinates the overall processes. Here, new integrator roles are emerging. Equipment suppliers are taking a more extensive role in mill development (provision of equipment, engineering, maintenance and project management services – and potentially other operational services and financing in the future). Paper and cardboard firms are adopting integrator roles in their own provision of integrated solutions to their customers. Some KIBS firms are aiming at integrator roles in building and managing of partnering networks as well as in providing integrated, 'turn-key innovation' services.[7]

Businesses rely on internal KISA in the core business areas. Despite the general trend towards networking and distributed innovation, the role of internal KISA is strongly emphasised in those areas which businesses consider as their core competence. For instance, in the development of new business models and concepts, pulp and paper companies want to keep such core competences as creative input, the integrator role, and overall process control within their own organisation. These are considered as important areas for the control of future business potential. Intellectual property rights are a significant issue in contractual relations and a way to secure the development of internal KISA. Business acquisitions are also an important means to get new in-house expertise in the core business areas.

Knowledge of markets, end-users and consumers is vital for the paper manufacturers. There are signs that the balance is shifting from supplier-driven innovation towards user-driven innovation, and technology alone is no longer a source of meaningful competitive advantage; it is a minimum requirement to be in the game. As part of this process, different actors are migrating downstream in the value chain closer to the markets and towards consumers. Key drivers influencing the downstream migration include:

7. Integrator KISA extends the role of KIBS in innovation support to areas like creating links between different actors, and building and maintaining networks. New types of innovation process management include training, documentation, and systematisation of the process. There are also 'turn-key innovation' services where the service supplier identifies technologies, creates new applications and builds a network of partners, as well as providing analysis of business strategies and market potential.

- Higher margins at the consumer end of the value chain (*e.g.* packaging for electronic goods, food and medical purposes).
- Power based on intimate market-related knowledge, now available as a result of rapidly developing ICT.
- Need to secure future markets for fibre-based products.

Close following of consumer markets benefits the Forenel cluster by providing early signals on the changing markets and demand for fibre-based products. Thus external KISA can be used to provide new non-technological, cross-discipline scientific knowledge on customers' needs and requirements (behavioural, psychological, socio-economic fields). At the same time these firms are also building up their own internal KISA in cross-disciplinary R&D teams focusing on the key customer industries.

The credibility of the innovator and his/her ability to build necessary networks are essential in the case of an individual innovation. Many innovations originate from individuals with special insight into the production or markets of the Forenel cluster. Even if network-based innovation activity is vital, the role of strong individuals is crucial in initiating and advocating innovation in the organisation. Such an innovation champion needs to have credibility as well as persistence in developing and lobbying the invention within one's own organisation. Public sector financing can have a critical role as such, but it can also be helpful in attracting complementary private sector financing at the early stages of the innovation process.

Main findings from resource-based industry studies

The following discussion will highlight policy-relevant issues that emerge from the analysis and synthesis of the studies on resource-based industries. The discussion will first present a typology of the types of KISA that have been identified in the studies. In this regard the types of innovation typical in connection with different types of KISA will also be addressed. The discussion will then move on to present a typology of businesses' awareness of knowledge-intensive activities, and their ability to interact with, and make use of, various types of KISA. The value chain provides one more perspective to discuss the role of KISA in the resource-based industries. One central issue here is the choice of whether to develop internal KISA, or make use of available external expertise. Outsourcing provides a perspective for this discussion, as it seems to offer an opportunity to re-configure value and renew competitiveness of the resource-based industries. The role of KISA in different parts of the value chain is discussed in terms of KISA positioned upstream and downstream of the value chain. This perspective highlights the role of supplier-driven and customer-driven innovations in the investigated industries. Finally, the emerging policy issues are presented in a matrix bringing together different types of KISA and some ideas of how to make better use of them.

Types of KISA and innovation emerging from the industry cases

Table 6.7 provides an overview of the types of KISA and characteristics of innovations that emerged from the case studies analysed.

Table 6.7. Types of KISA and innovation

Types of KISA	KISA characteristics	Innovation characteristics
'Renewal' KISA: improvements that can help firms maintain their position and enhance competitiveness on the markets.	KISA directed towards renewal, research and development of aspects of any part of the value chain (upstream and downstream).	Innovations in products, processes, services, organisation, markets and value chains. Incremental and radical.
'Routine' KISA: help firms maintain their internal processes.	KISA for routine matters (ICT, maintenance of services, ISO accreditation, market research).	Innovations in company procedures and structures.
'Compliance' KISA: help firms meet their legal obligations.	KISA helping firms comply with regulatory systems or taxation regimes (*i.e.* tax returns, corporation law, auditing, environmental regulations, etc.).	Incremental innovation in procedures, processes, product/service, structures, equipment, facilities and work units.

In terms of the innovation potential, the typology highlights three different types of KISA that typically lead into somewhat different types of innovation. The *compliance KISA* help firms to operate within the legal and regulatory framework, examples of such KISA include lawyers and accountant services. Nevertheless, these types of KISA can also lead to innovations, especially if they are extended beyond the compliance management. For example, contracts between buyer and supplier can be innovative as such, and such contracts may initiate new innovative practices within and between firms. *Routine KISA* involve those kinds of services that help businesses maintain and develop their internal processes, *e.g.* quality management services (ISO certificates), and service and maintenance functions. *Renewal KISA* bear the most potential for innovation and they often inspire significant changes in organisations, their products, services and value chains. Strategic management consulting, as well as various types of research and development services, are examples.

Awareness of and ability to make use of KISA in the analysed industries

Becoming explicitly aware of the significance of KISA is an important starting point for businesses' use of knowledge-intensive services. Mining technology services and the Forenel cluster studies found that awareness of the significance of KISA is well developed. In the case of the Norwegian aquaculture industry, there was more variation in this respect. The following sections will first discuss the mining technology services and Forenel cases before exploring the KISA-related variation in the aquaculture case.

Mining technology services firms and Forenel cluster firms are very conscious of the need to use knowledge-intensive services to build their capabilities. Mining technology service firms are service providers themselves, so they have a good understanding of how interaction with the provider of a knowledge-intensive service can enhance business operations. Their work force is highly educated, so they understand how to learn and to build on their existing skills and knowledge.

The description above also applies very well to the Forenel cluster. Manufacturing is its core activity but support and development services play a key part in overall productivity and in the quality of its products. Furthermore, most Forenel firms are striving to develop more business around integrated product-service solutions.

The MTS case studies present several examples of innovative knowledge management, *i.e.* firms which have developed tools for particular tasks and then commercialised them as stand-alone units, or realised that the way they do something in-house has value which can be packaged and sold. Also, Forenel cluster firms have realised the value of knowledge development on the business and cluster levels. Businesses are making

extensive use of automation and at the same time they are able to build their knowledge base on the complex production process. Businesses are re-organising their research efforts to more effective cross-disciplinary research units that seek to combine both technological innovations and softer types.

The culture in the mining technology service firms is innovative, and it comes naturally to staff to integrate the knowledge of others into their own operations. Several firms had formal knowledge diffusion arrangements, *e.g.* seminars to share the knowledge gained by staff who had been to outside conferences. In Forenel firms the culture strongly favours innovation but so far the meaning of innovation has been very technology-oriented. Technology-driven production development and economics of scale have been the basis of competitive advantage. However, future competitiveness will be based more on an effective customer interface and understanding of customer segments and key markets. The culture is changing, though in such large-scale industry the cultural change towards softer types of innovation will take some time. Nevertheless, the need for various types of non-technological KISA is increasing within the Forenel cluster.

The Mining Technology Services Action Agenda identified a fragmentation of the sector which might indicate that there are gains to be made from better communication between firms. Collaborations have long been considered to be a mechanism for the development of competitive advantage in business, but they are not common in the MTS sector, perhaps because firms fear that in collaborating they would risk their competitive edge (DITR, 2002). There are too few case studies to generalise, but in the interviews there were very few references to learning from other firms – whereas in other sectors there appears to be a good deal of learning from peers, and even from competitors (Australian Government, 2004*a*, 2004*b*; Martinez-Fernandez *et al.*, 2004). This suggests that while individual firms are engaging in useful KISA, the sector's performance could be improved by inter-firm co-operation in sharing knowledge and services. Within the Forenel cluster, more or less informal network KISA have been and still are an important channel for information sharing. Various types of industry and professional organisations play a key part in this network building and maintenance. Since the forest firms are in increasing competition against each other the role of these informal networks is changing and perhaps becoming less important. Another negative impulse for traditionally strong informal horizontal networking comes from competition law, as firms and individuals are considering carefully which common activities they can engage in.

Firms' capability to make use of KISA

The Norwegian aquaculture study is able to illustrate how businesses' ability to make use of KISA varies between different types of firms. The following will present the typology of different types of firms and dimensions that influence their capability to make use of KISA. Key dimensions influencing firms' absorptive capacity include: the size of the business, division of labour within the firm, knowledge base and resources available for knowledge development.

The "small family firm" – with a low level of internal KISA and disconnected from external KISA, limited resources and division of labour and a lack of a forward-looking strategy – is typically characterised by limited resources and a low level of innovation activities. These firms have very few if any outspoken strategies and this is also true for their internal and external learning processes. The level of internal knowledge-intensive service activities is low, and these firms have very few formal linkages with external knowledge providers. Most often these firms become involved in KISA in connection

with the purchase of products/services from the markets. The profile of these firms implies that the interactive learning processes and KISA are related to incremental innovations. The market is the most important knowledge transfer channel. The dominance of practical and experienced-based knowledge means that these actors only purchase 'compliance type' KISA from the market. These services tend to not have great impact on innovation activity within the firms. Besides the limited internal knowledge base, financial and time constraints are factors which limit the purchase of knowledge-intensive services. Public policy might help this type of firm overcome the above-mentioned constraints in a number of different ways. Motivating and stimulating of the internal innovation activity could build up the businesses' internal competences first, and thereafter the policy could help in expanding links to external KISA, for instance through mediators. Upgrading of the innovation potential of compliance KISA is another way to influence these low performance businesses.

The "coastal enterprise" – with more internal and external KISA, still mostly connected to compliance and routine KISA, but nevertheless challenged by the need of renewal KISA linked to downstream activities: The coastal enterprise is more integrated into the production and innovation systems of aquaculture through a larger and more professional organisation and due to greater integration into the value chain. However, the focus on innovation is still weak, due to financial and competence constraints. The coastal enterprise firms are challenged by a broad set of external demands that they need to relate to through customers and the market in general. Internal KISA must therefore be continuously developed and upgraded. These actors are also forced to develop business models with a larger focus on marketing and sales. This can be targeted through public measures. The firms themselves also demand better quality of KISA supply from external suppliers, especially in the field of organisational development and marketing.

"Research-driven entrepreneurs" – strong in research-based knowledge, short of business-related knowledge and skills: The aquaculture and Forenel studies both highlight the importance of individual innovators as champions of new ideas, especially in the early stages of innovation. These innovation champions have a key role in initiating the process and pushing it through the first critical stages. Typically, such individuals have unique insights into the technology and production in the area of the innovation but they desperately need external resources and commercialisation-related KISA. Renewal KISA are the driver of innovation in these industries. Knowledge as such is not the bottleneck in these cases but there is an imbalance in terms of research-based knowledge and the knowledge and resources required to commercialise research results. These firms need access to KISA to enable them to identify potential opportunities to start the process of commercialisation of inventions. Lack of KISA related to management, business strategy and marketing skills might be perceived as a barrier. Internal or external KISA linked to such resources are of great importance to these firms, suggesting a focus on more routine KISA linked to these activities. These businesses are also in need of long-term and knowledge-intensive capital to be able to pursue an R&D-intensive innovation strategy. These are relevant policy areas for research-driven entrepreneurs.

The "science-based process industry" includes firms that have an innovation strategy for the whole value chain. There are good examples of such firms in the Forenel cluster, but few in the aquaculture industry. These firms are making use of a diversified set of both internal and external KISA, and the service providers are of utmost importance to learning and innovation within the organisation. In this case the important policy issue is how government R&D policies could be more suited to such leading-edge firms in the industry. Policies should take into account both basic research and more applied market-

related R&D. Policies should cater to the needs that large R&D firms have in terms of: *1)* developing internal KISA; *2)* sufficient supply and quality of external KISA – particularly R&D, including innovation programmes focusing on 'soft innovation'; and *3)* facilitating businesses' shift towards 'soft innovation' projects, which includes greater focus on both organisation and market research, as opposed to technological innovation projects.

Topics related to KISA derived from the industries investigated

External KISA: an outsourcing perspective

The Forenel cluster study indicates that businesses seek to maintain their core competences within the firm and that they rely on external KISA in well-defined areas only. However, it is not always clear what constitutes the core competence, and over time the focus of the business may change. Whereas some businesses are able to make decision whether to make use of external KISA, or develop internal competences, others do not have such a choice. Aquaculture and mining technology services analyses show that those businesses that either have low levels of expertise within the firm, or are poorly linked with external KISA, are often unable to use external expertise.

Use of external KISA and outsourcing are related concepts with a number of common features. Outsourcing is always a strategic decision since it means to some extent re-focusing business activities. Outsourcing can also be seen as a way to cope with increasing complexity as it opens up possibilities for specialisation, combination of cross-disciplinary internal and external expertise and more effective division of labour. As the Forenel case indicates, outsourcing can also bring in new and effective business-oriented thinking in the support services. Along with growing internal expertise the need for external KISA is clearly increasing. Use of external KISA can also be seen as outsourcing that brings some complementary knowledge within the firm. Ideally, it can inspire development of totally new knowledge and capabilities that lead to significant innovations within the organisation. On the other hand, external services may have little if any wider impacts, or extensive use of external services may also substitute internal KISA and be an obstacle for knowledge accumulation within the firm. External KISA can have various roles depending on the business model. They can be a key element in:

- Solutions buying/selling as part of the tailored package.
- Creating cost savings and flexibility.
- Value chain orchestration where all production comes from external suppliers while the main business concentrates on marketing, design and brand management.

It is not always easy to weigh the pros and cons of the use of external vs. internal KISA, particularly when it is a question of activities that are closely related to the core competence area of the organisation. For instance, while some forest industry firms outsource all their service and maintenance KISA, other similar firms consider it as their core competence and will keep it strictly within the firm. Such reluctance is linked to process-related learning that takes place through service and maintenance functions[8]. As

8. Hundreds of different types of service and maintenance-related KISA are necessary for effective running of the mill and in the constant upgrading of the production process. In the end, constant improvements make the difference between R&D and production vanish (Zysman, 2002). As a result, paper mills are able to gradually increase production output, as much as 50 % over 10 years. Moreover, at the same time mills are able to improve the quality of their production through out their life cycle. Such highly significant increases

long as the production process remains rather stable, outsourcing would seem to be a safe option. It will allow learning to take place in limited ways in supplier firms. The problem is that nobody knows when a radical change will happen and then it is important to bring the production learning in-house (Zysman, 2002). Undoubtedly, ICT and a number of other technologies represent potential for significant and rapid changes in forest industry and many other industries as well. While the use of external KISA can be an important element of business competitiveness, it is also clear that there is still a lot of learning ahead in this area.

Effective organisation of R&D-related KISA

Public and private sector R&D KISA ought to complement each other. As the private sector refocuses its R&D towards more applied, near-market research, the public sector should not follow the same path as this will lead to erosion of basic research and related knowledge development. There is also a need for new ways of organising the interaction and collaboration between business and public sector R&D. Effective use of R&D resources creates a need for constant refocusing of activities and resources. This process can be clearly recognised as part of the dynamics of the business sector. In the Forenel case the research is becoming more targeted, better organised, and overall, business R&D is becoming more applied and closely related to the business activities. Perhaps most importantly, government is now more responsible for long-range, strategic research projects that are increasingly beyond the reach of the private sector. In interviews with the Norwegian aquaculture sector, firms were critical about how large-scale public R&D programmes and initiatives were created. In the current situation, the public sector is responsible for R&D initiatives on behalf of the industry. Some respondents were critical about the public sector's ability to assess the knowledge needs of the industry, and felt that this was not the correct way to define the needs of industrial R&D. Other respondents felt that the demand for knowledge and information may exceed the capacity of the existing public R&D system. However, private R&D efforts in Norway are considered to be low, a matter which has become an issue of intense public debate. If the public R&D system continues to be the dominant KISA supplier, there will be a need to find new means of interaction and collaboration between private and public R&D KISA.

Changes in the R&D field create a challenge for public sector KISA in Finland as well, and there is still an inability to fully respond to the situation. According to the Forenel case, better division of labour between universities and targeting of long-term basic research are issues to be addressed. There is also an increasing need for basic research that targets the consumer end of the value chain. Such research can facilitate the key element of future innovation – ability to address the market need with a complete solution. Overall, strong basic research was raised as an important element defining the future competitiveness of the Forenel cluster. On top of these issues are the IPR issues where the public and private sector needs have to be balanced and clear rules should be agreed upon.

in production output and quality come through process upgrades that increase accuracy of the process control, accelerate paper making technology, and increase efficiency capacity or improve sensing and control from the wet end up to the final product. Overall, effective use of technology and maintenance services that minimise down time are highly important elements of success in such a capital-intensive industry.

The role of KISA in different parts of value chain

KISA exist and play an important role in all parts of the value chain. It appears that KISA at the consumer end of the value chain will have an increasingly important role. KISA can be divided into upstream and downstream services depending on the organisation investigated. Upstream services (*e.g.* supplier-provided services) are typically closely connected to the production process, and hence, tightly connected to the organisation. On the contrary, downstream services (*e.g.* logistics and retail sales) are far less connected to the production process, and less under the firm's control. It appears that many businesses with sufficient resources are seeking to extend their value chain downstream so that they can gain better control of the business at this end of the value chain as well. Such control can include issues related to quality of the downstream operation (*e.g.* access to customer information, marketing, branding, retail outlets, logistics) as well as pricing. Also of importance is the fact that margins at the consumer end of the value chain are often higher than in the other parts of the value chain. As solutions selling based on customers' needs is becoming increasingly important, so is the role of downstream KISA.

Supplier-driven technological innovations

Technological competence continues to be the cornerstone of the forest and aquaculture industries, and *supplier-driven technological innovations* have been typical in these industries. Technology influences the Forenel cluster in numerous different ways at every stage of the value chain from R&D, to the building and upgrading of mills, to more effective logistics, and enhanced interaction with the customers. KISA are a very significant element in all of these areas along with technology. Suppliers have been the main source of new technologies and related KISA for the forest industry. This has also been the case in the Norwegian aquaculture industry. However, due to lack of resources for R&D projects, both among the aquaculture firms and technology suppliers, the situation today is that neither the suppliers nor the aquaculture firms initiate resource-consuming innovation projects with uncertain outcomes. This leads to a situation where the supplier industry adopts to a large degree a defensive innovation strategy which in the long run will have consequences for the development of the whole cluster.

The question in the Forenel cluster is for how long equipment suppliers will continue to supply the latest technology if they are facing decreasing returns. It also seems that often suppliers are expected to provide expert services free of charge in connection with equipment delivery. This is a cause of frustration for them as at the same time buyers are willing to pay for similar services if they are provided as stand-alone services by the consultants. Such a situation can undermine the potential benefits of KISA, and both suppliers and buyers need to seek solutions that in the longer run are acceptable for both parties. Win-win type partnerships can be seen as possibility to speed up horizontal as well as vertical innovations within the Forenel cluster. Suppliers need to be more effective in service 'product' development and be more transparent in order for buyers to appreciate the added value of product-service bundles.

The increasing importance of user-based innovation

The influence of user-driven innovation is growing and technology alone is no longer a source of meaningful competitive advantage; it is a minimum requirement to be in the game. Moving forward successfully will depend on an effective customer interface which facilitates customisation, flexibility, speed and innovation, and not competing in a low-

wage, mass-production system. In the industrial context, the world used to be divided into 'producers' and 'consumers', with the former in control. Today the centre of gravity is shifting as innovation increasingly occurs on both sides of the cash register (see *e.g.* Council of Competitiveness, 2004). For manufacturing firms that have operated on the business-to-business markets, this new type of R&D situation is a challenging one. Even if the firm is performing very well in technological 'back office' innovation, it takes many new skills before businesses can effectively move in the area of 'front office' innovation in close co-operation with customers. Besides new types of non-technological knowledge, new types of management practices also need to be adapted accordingly. As firms pursue customer-oriented solutions, there is increased need to develop teams that can create solutions for complex situations. This calls for internal and external expertise which firms need to integrate into competitive customised solutions. Effective co-operation within teams requires well-developed partnerships and transparency of operations. For instance, there is a need to have clearly specified rules for intellectual property rights, and mutually agreed revenue sharing. Such co-operation and open discussion can increase chances for multifaceted user-driven innovations.

Policy-relevant issues emerging from the resource-based industry cases

The ultimate goal of the KISA project is to come up with new ideas for policy making. This section will present a tentative framework to structure this discussion. The objective of a policy targeting KISA, provided either internally or externally, is to improve innovation capability, competitiveness, and the effectiveness of private firms and public sector organisations. The focus on knowledge-intensive service activities is not an aim in itself; it is a means to achieve the objective of greater innovation, competitiveness, and success. The target groups for policy are:

- **Supply of KISA**: The supply side policy objective is to stimulate KISA inside organisations and to stimulate efforts to create favourable conditions for the development of KISA suppliers.
- **Networking**: Network policy seeks to facilitate networking of KISA internally within firms, and between businesses and KISA providers.
- **Demand for KISA**: Demand-side policy includes actions that support the demand for internal and external KISA.

The aforementioned issues can be presented in a framework that can facilitate systematic discussion on policy issues. The horizontal dimension in the matrix relates to the three policy areas (presented above); the vertical dimension presents different KISA categorisations: innovation and renewal-related KISA, routine development KISA, and compliance type of KISA. The following matrix (Table 6.8) brings together and categorises policy issues, forming a synthesis of the findings from three separate studies. The aim is to identify the most relevant areas for policy intervention and give some idea of relevant policy instruments in different types of situations.

The responsibility for internal KISA development is mainly a business-level issue, and related policy measures are mostly indirect in nature. Training and skills development on relevant areas are among the most important measures that can improve businesses' ability to make use of KISA. Soft elements of innovation, organisational learning and knowledge management, and staff motivation for idea generation, are among areas where skills upgrading can facilitate the innovation and renewal-related KISA. In the case of routine internal KISA export capabilities, commercialisation, marketing and effective use

of ICT are areas that could be identified as having a need for skills upgrading. A well articulated and well communicated company code of practice is an area where skills upgrading can facilitate internal compliance type KISA. Internal KISA networking can be developed through cross-disciplinary training, horizontal development projects and training multi-skilled staff. All these can facilitate the development of an effective division of labour between experts working within the firm. Awareness building about the potential benefits of using internal and external experts and the cultivation of a culture that favours the use of experts are also among the measures that can be used to stimulate the demand for KISA. Overall, a high level of training improves employees' ability to analyse upcoming situations and to make use of KISA.

In the case of external KISA, public policy measures can have a direct influence in a number of different ways. There appears to be a need to develop soft innovation-related KISA, especially in the areas of marketing, sales and logistics. Overall links with external KISA providers can be developed through public policy measures. For instance, research institutions ought to have good connections with KISA that can apply and package theoretical knowledge for more practical purposes. Effective use of IPR regimes and ICT are again important areas where external KISA can be utilised more effectively. Most notably, public sector institutions should facilitate the development of private sector KISA, not substitute for it. Finally, public sector compliance KISA could adopt customer service charters more widely so that there would be a clear direction and motivation for constant improvement of service delivery and quality. External network KISA can be stimulated by organising brokering services that introduce potential customers to service suppliers. Overall, soft elements of innovation should figure more prominently on the agenda of public sector research and development organisations. Solution selling requires supplier-side network KISA that function well, but development of such KISA is still insufficient and could be targeted by policy measures. Integrator KISA have a particular role in this context, as they can package product-service combinations to provide complete solutions for customers' needs. External compliance KISA could be further developed by creating framework conditions that favour effective division of labour between internal and external experts. High-quality compliance KISA can benefit a wide range of businesses, especially the vast number of SMEs that do not use any other types of external KISA. Electronic delivery channels provide an important way to develop various types of compliance services, *e.g.* e-government, banking, financial and tax-related services.

Demand for external KISA can be developed effectively by using government procurement practices as a tool to create markets for services. Tax incentives and service vouchers could be targeted to create demand for soft innovation-related services. Outsourcing skills development will be needed when external suppliers deliver increasingly demanding KISA. In an outsourcing context, clearly regulated IPR is an essential element as an increasing share of KISA is purchased from external suppliers. Easy access to external KISA is the starting point for the development of a more effective division of labour. Here, individuals providing expert services can be an important first access point to external KISA.

Table 6.8.

KISA/ policy issues	Policy directed towards:	Supply and quality of KISA	Stimulation of networks	Stimulation of demand for KISA

Innovation and renewal-related KISA	Internal KISA
	
	Functional experts (financing, operations, logistics, marketing, legal) researchers, managers, directors, R&D departments, innovation units, venturing units
		• Public sector risk sharing in high-risk projects
		• More focus on building competence related to 'softer' innovation inputs (as opposed to technological)
		• Create conditions for effective organisational learning and knowledge management
		• Incentives for knowledge sharing
		• Systematic motivation of staff for idea generation & submitting them into screening process
			• Cross-disciplinary working capabilities, cross departmental jobs, circulate staff between tasks
			• Horizontal projects that break barriers between departments/business units
			• Train people to master multiple skills, *e.g.* ICT/programming in health care services
			• Develop skills in managing cross-disciplinary R&D teams
			• Facilitate development of regional KISA networks, *e.g.* service and maintenance
				• Raise the level of absorptive capacity of the firms:
				  o Sufficient supply of graduates with appropriate skills
				  o Management training in relevant areas
				  o Develop managements skills in the use of external experts/outsourcing

	External KISA *Consultants, KIBS firms, RTOs, trade bodies, various types of networks, professional organisations, government agencies*	• Stimulate development of KISA linked with downstream activities in the value chain (marketing, sales, logistics). • High quality and sufficient scope of public R&D complementing business R&D. • Public R&D has agility to respond to businesses needs, facilitating their competitive advantages • Create effective IPR regime • Institutions should not obstruct the development of private sector KISA	• Brokering between firms and relevant KISA providers • Programmes linking public RTOs and businesses need more focus on 'softer' innovation and 'downstream' topics at its agenda. • Stimulate the development of solutions selling networks • Facilitate the development of integrator KISA	• Incentives (*i.e.* tax breaks) for use of KISA in softer innovation and 'downstream activity' • Public sector procurement practices favouring the use of external KISA • KISA vouchers for SMEs • Develop outsourcing skills • Create effective IPR regime

Table 6.8. ***(continued)***

KISA/ policy issues	Policy directed towards:	Supply and quality of KISA	Stimulation of networks	Stimulation of demand for KISA
Routine KISA	Internal KISA *Functional experts (financing, operations, logistics, marketing, legal, service & maintenance, HRM) managers*	• Need to develop export capabilities • Incentives to strengthen business competences especially in commercialisation and marketing • Facilitate effective use of ICT in routine KISA	• Cross-disciplinary working practices, cross departmental jobs, circulation of staff between tasks • Cross-departmental projects	• Awareness building among potential network partners
	External KISA *Consultants, KIBS firms, RTO's, trade bodies, networks, professional organisations, government agencies*	• Develop and expand links with external KISA suppliers • Public sector KISA should not substitute private sector KISA	• Proactive broking that links firms to KISA that combine routine and development KISA	• KISA workers for hire (technology attachés)
Compliance KISA	Internal KISA *Management and staff dealing with accounting, HRM, quality, health and safety, ethical issues, environmental regulation*	• Develop company code of practice • Produce and update a company manual regularly • Ensure that every employee is aware of the company code of practice • Compliance information package for SMEs	• Create conditions that favour effective division of labour between specialists	• Improve awareness of the legal framework, regulations and obligations
	External KISA *Government and trade- and professional organisations, lobby groups*	• Professionalisation of local KISA suppliers • Effective use of ICT • Customer service charter for governmental organisations, *e.g.* tax office	• Create conditions that favour effective division of labour between internal and external KISA • Develop e-government, data banks, financial and taxation-related e-services	• Publicise the availability of compliance services • Create easy access to services

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Annex

COUNTRY STUDIES

Nineteen country studies on KISA in software, health care services, tourism and leisure, and resource-based industries were conducted by a network of experts over the course of the project. The following tables set out the titles and authors of the full-length reports presenting results from the country studies.

The reports are available at *www.oecd.org/sti/innovation* under the heading "Sectoral Case Studies in Innovation".

Country reports on KISA in the software sector

Country	Reports
Norway	***Knowledge-Intensive Service Activities and Innovation in the Norwegian Software Industry: Partial project report from the OECD KISA study*** Marianne Broch and Arne Isaksen, NIFU-STEP (Broch and Isaksen, 2004)
New Zealand	***Knowledge-Intensive Service Activities in the New Zealand Software Industry*** Julian Williams, Ministry of Research, Science and Technology, New Zealand (Williams, 2004)
Korea	***Knowledge-Intensive Service Activities in Korea's Innovation System*** Kong-rae Lee, Sang-wan Shim, Byung-seon Jeong and Jung-tae Hwang, 2002 Strategic Research Partnership of KDI and Science and Technology Policy Institute (STEPI) (Lee *et al.*, 2003)
Ireland	***Knowledge-Intensive Service Activities in the Irish Software Industry: Country report for the OECD KISA project, 2002-2005*** Laura E. Martinez-Solano, Majella Giblin and Edel Walshe, Centre for Innovation & Structural Change (CISC), NUI Galway, Ireland (Martinez-Solano *et al.*, 2005)
Finland	***Knowledge-Intensive Service Activities: Facilitating Innovation in the Software Industry: Final report of the KISA-SWC Finland Project*** Minna-Kaarina Forssén, Matti Heikkonen, Juhana Hietala, Olli Hänninen, Jyrki Kontio, Software Business Research Group, Helsinki University of Technology; and Risto Rajala, Mika Westerlund, Arto Rajala, Seppo Leminen, Kristian Möller, Mervi Rajahonka, LTT Research Ltd, Helsinki School of Economics (Forssén *et al.*, 2004) ***Policies and Programmes Targeting KISA in the Finnish Software Industry*** Jari Kuusisto and Soile Kotala, SC Research (Kuusisto and Kotala, 2004)
Australia	***Knowledge-Intensive Service Activities in the Software Industry in Australia*** Dr. M. Cristina Martinez-Fernandez, Dr. Claudine Soosay, Professor Krishna Venni Venkata, Professor Tim Turpin and Merete Bjørkli from the Australian Expert Group in Industry Studies (AEGIS)[1] at the University of Western Sydney; and Lyndal Thorburn of Innovation Dynamics Pty Ltd. The final report was prepared by the Australian Government (AG, 2004).

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Country reports on KISA in health care

Country	Reports
Denmark	***Minimally Invasive surgery in Denmark: A case study contributing to the OECD KISA study*** H. Vondenling, University of Southern Denmark, Institute for Public Health, Department of Health Economics, (Vondenling, 2004)
Finland	***Knowledge-Intensive Service Activities in Health Care Innovation: Case Pirkanmaa*** S. Kivisaari, N. Saranummi and E. Väyrynen, VTT, Research Notes 2267 (Kivisaari *et al.*, 2004) ***Knowledge-Intensive Service Activities in Health and Social Care Innovation Process: Towards Seamless Care for Older People in Kuopio Home Care*** H. Hyppönen, U. Saalasti-Koskinen, M.L. Perälä and K. Saarikalle, National Research and Development Centre for Welfare and Health (Stakes), (Hyppönen *et al.*, 2005)
Japan	***The TWR Case: Services for the Health Promotion in a Local Community*** Y. Saitoh and S. Kobayashi, Ministry for Economy, Trade and Industry; University of Tsukuba (Saitoh and Kobayashi, 2004)
Norway	***Knowledge-Intensive Service Activities and Innovation in Public Home-based Services to the Elderly in Norway: Partial project report from the OECD KISA study*** M. Broch, STEP - Centre for Innovation Research, Report 04-2004 (Broch, 2004)
Spain	***KISA Health Care Study in Spain: Personal Care Services for the Elderly and Chronic Patients using Information and Communication Technologies*** P. García-Santesmases and J.L. Monteagudo, Institute of Health Carlos III, Telemedicine and Information Society Research Area (Garcia-Santesmases and Monteagudo, 2004)

Country reports on KISA in the leisure and tourism sectors

Country *Theme*	Reports
Finland *Leisure*	***The Leisure Business and Lifestyle*** Tanja Kotro, Päivi Timonen, Mika Pantzar, Eva Heiskanen, National Consumer Research Centre, Helsinki, Finland (Kotro *et al.*, 2005)
Spain *Tourism*	***Knowledge-Intensive Service Activities in the Spanish Tourism Sector*** Juan Carlos Collado, Centro de Estudios Económicos Tomillo, Madrid, Spain (Collado, 2005)
Australia *Tourism*	***Knowledge-intensive Service Activities in the Tourism Industry in Australia*** Australian Government, with input from Dr. M. Cristina Martinez-Fernandez, Dr. Claudine Soosay, Professor Krishna Venni Venkata, Dr. Phillip Toner, Professor Tim Turpin, Merete Bjørkli and Navin Doloswala from the Australian Expert Group in Industry Studies (AEGIS) at the University of Western Sydney[2]; and Dr Lyndal Thorburn of Innovation Dynamics Pty Ltd (AG, 2004)

2. See note 1.

Country reports on KISA in renewing resource-based industries

Country *Theme*	Reports
Norway *Aquaculture*	***Knowledge-Intensive Service Activities and Innovation in the Norwegian Aquaculture Industry*** H. Wiig Aslesen, NIFU STEP Studies in Innovation, Research and Education (Wiig Aslesen, 2004)
Australia *Mining technology services*	***Knowledge-Intensive Service Activities in the Mining Technology Services Industry in Australia*** L. Thorburn, Australian Government and Innovation Dynamics Pty Ltd., (AG and Thorburn, 2004)
Finland *Forest and related engineering and electronics industries (FORENEL) cluster*	***Knowledge-Intensive Service Activities in the Finnish FORENEL Cluster*** The report combines results from four research projects (Hernesniemi, Lindström, Juntunen, Kuusisto and Hyvönen, 2005): ***- Forest-Engineering-Electronics Cluster Description***, ETLA, H. Hernesniemi and M. Lindström ***- Evolving FORENEL Cluster and the Role of KISA***, ETLA, H. Hernesniemi and M. Lindström ***- New Business Models and the Role of KISA***, SC Research, A. Juntunen and J. Kuusisto ***- The Role of KISA in the Innovation Process***, VTT, J. Hyvönen

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From research and development to legal and marketing services, a wide range of knowledge-intensive service activities (KISAs) enables firms and public sector organisations to better innovate. KISAs are both sources and carriers of knowledge that influence and improve the performance of individual organisations, value chains and industry clusters across all sectors of the economy. Yet little is known about KISAs or the ways in which they improve the ability of private and public sector organisations to develop, absorb and apply knowledge in their innovation processes.

This publication examines the contribution of knowledge-intensive services to the acquisition and growth of innovation capabilities in firms and public sector organisations. It focuses on KISAs in four industy sectors: software, health care, tourism and leisure, and resource-based industries such as mining technology services, aquaculture and forestry. The analysis derives from a series of surveys and case studies undertaken in nine OECD countries: Australia, Denmark, Finland, Ireland, Japan, Korea, New Zealand, Norway and Spain.

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Governance of Innovation Systems, Volume 1: Synthesis Report, OECD (2005)

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