KNOWLEDGE TRANSFER AND THE SERVICES SECTOR IN THE CONTEXT OF THE NEW ECONOMY

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Executive Summary

This study *examines whether existing knowledge transfer mechanisms, focussing mainly on manufacturing, are also appropriate for knowledge transfer in the growing services sector, especially in the context of the new economy*. This comparative analysis assumes: 1) both manufacturing and services are heterogeneous in that each of them comprises a whole spectrum of industries with diverse characteristics; and 2) there are both important similarities and important differences between the sectors which influence the processes of knowledge transfer.

The most pertinent ways that services differ from manufacturing are the *intangible nature of their output, a larger participation of customers in the production process and a higher degree of simultaneity between production and consumption.* These peculiarities of services affect knowledge transfer, in particular with regard to: 1) the nature of innovative activity (less formal R&D, a central role for information and communication technologies, and difficulties of intellectual property protection); 2) the degree of *consumers' knowledge involvement* in the delivery of certain (especially knowledge-intensive) types of services; 3) sources of consumer information about services; and 4) employee profiles.

The analysis of the knowledge transfer channels in this study reveals that service firms can and do use the same channels as do manufacturing firms, getting knowledge through *suppliers, foreign direct investment, licensing/franchising, links with academy, training, intra-firm strategic knowledge management, producer-consumer two-way knowledge transfer, knowledge intensive business services (KIBS), human capital mobility, patents and the Internet.* However, the degree of appropriateness and intensity of use of some of these channels differs between the two sectors. Moreover, the channels' importance for knowledge transfer may evolve over time. A notable example is the use of patents which as a knowledge transfer channel is currently more relevant for manufacturing. However, the use of this channel in services is subject to the impact of two somewhat opposing groups of factors. The first group is related to the growing convergence between manufacturing and services under the impact of information and communication technologies (ICT) and the resulting commodification of some of the services (software, for instance). This can eventually lead to a more extensive use of intellectual property rights (IPRs) in services, although we would expect the service sector will evolve its own mix of various forms of protection (patents, copyrights, trademarks, etc.). The second group of factors concerns the current debate on the optimal design of the protection of innovations largely focused on the (potentially) detrimental effects of intellectual property rights in the form in which they exist now. One encounters here, for example, concerns over the danger of policies emphasizing the value of patents in the rich spectrum of other appropriation strategy factors like secrecy, lead-time advantages and so on (see, for instance, Arundel 2000) and over the restricting effects that too rigid intellectual property rights may have on access to reliable and up-to-date information and data, and therefore impede systematic accumulation of scientific knowledge on a global scale (with reference, in particular, to the European Commission's 1996 Database Directive) (David 2000). Given these complex and often controversial developments, the exact "shape" of the final system to stimulate innovative activity in services is yet an unresolved issue. At this stage one thing seems clear, however: in relation to these issues governmental bodies and public knowledge institutions should be concerned with elaborating a regulatory framework that provides a balance between innovators' aspirations to appropriate economic benefits of their innovations on the one hand, and societal welfare, requiring constant renewal and improvement of the stock of knowledge, on the other.

A *systemic* approach to the analysis of knowledge transfer channels requires that they should be analysed as a component of a larger system — the "knowledge transfer landscape". Apart from the channels themselves, this includes characteristics of knowledge holders, knowledge recipients and the institutional settings for transfer.

The institutional settings for knowledge transfer have three main dimensions: *international* (the General Agreement on Trade in Services, the World Intellectual Property Organization and international conferences), *European* (*eLearning* initiative and research networks of European experts) and *national* (different forms of the national government's involvement). National policies related to knowledge transfer in the services sector should take into account this sector's specificities and should be focused on carrying out activities, mainly related to effective innovation policies, creating a modern and efficient ICT infrastructure, encouraging knowledge exchange between Dutch nationals and foreign experts (in the form of the formers' internships abroad and the admission of the latter into national research programmes and activities) and maintaining liberal and transparent trade and investment regimes. Knowledge transfer in the new economy is significantly affected by the use of new technologies (mainly ICTs) in several ways: the emergence of *new types of expertise* (especially related to new occupations in e-commerce such as web-consultants, web-site designers, and so on); *growing codification of knowledge* (that is, the increasing possibility to "pack" knowledge into codes transmittable through information infrastructures); and improved inter- and intra-firm communication. The major conclusion of the study is that the embeddedness of the two sectors in the same economic and knowledge generating systems, certain "universal" characteristics of knowledge as a social phenomenon and a growing convergence of the goods and services under the impact of ICTs can explain the existing similarities in the knowledge transfer channels between manufacturing and services. However, complete convergence between goods and services is unlikely, and some transfer channels will remain more relevant for services than for manufacturing. The task for policy-makers is thus to integrate the application of traditional (manufacturing-related) forms of government intervention into the processes of knowledge transfer in services and at the same time to be attentive to nuances arising from the remaining differences between the sectors.

Such peculiar features of the services sector as its heterogeneity in terms of size and service content, client profiles, sources of technical change, and the degree of technical sophistication of producers and users, combine to create several challenges for knowledge transfer and innovation. Many small enterprises have no resources to devote explicitly to innovation; we observe many examples of "non-technical" innovation; vigorous debate over reforms of the intellectual property rights regime; and a shortage of ICT skills.

The rapid emergence of online business technologies has brought both new market opportunities (truly "global reach" for digital service providers) and new problems (in particular concerns about copyright violations and consumer privacy on the Internet). Government policy in response to these challenges should involve a complex of economic, technological and legislative initiatives, aiming at supporting innovation in small and medium-sized service firms, identification of priority areas for intellectual property and personal freedoms protection in the emerging digital dimension, and continuous support for ICT infrastructure including ICT education and training policies. For services with high technical content (software, engineering, telecommunications) strengthening links with academic research can be beneficial. Governments can promote the formation of "techno-economic networks" between public research institutions and knowledge-intensive business firms. A 1992 OECD study gives as policy examples tax incentives for employers to hire researchers linked to the network of university researchers; or providing support for creation of "science parks" within which the links between public research centres and private firms can be fostered. Such measures seem especially relevant today when the emphasis in innovation activities has shifted from so-called "linear research-to-marketing" model to "interactive" models, which presuppose the existence of "feedback effects" between different stages of innovation process. Feedbacks and knowledge flows among agents located in different parts of the innovation web are crucial for good innovation performance. Thus links between science and technology, research and innovation, design and production, not to mention links among science, technology and society, all deserve attention from policy makers. In the Netherlands, where the institutional structure of science policy is characterized by a high density of organizations mediating relations among government, society and science (Van der Meulen 1998), these organizations can be assigned special tasks for strengthening

links between technical service providers, academic researchers and governmental bodies. These functions can be given to existing advisory research councils.

The general recommendations for policy-making in relation to the knowledge transfer in the Dutch services sector in the context of the new economy include:

- ensuring (largely through the Bureau voor de Industriele Eigendom) that the country maintains its sound[1] intellectual property protection regime for both national and foreign businesses and maintains it in accord with international and European developments in this area;
- carrying out regular innovation surveys in the service sector;
- investing further in the country's ICT infrastructure in the broadest sense, including emphasis on ICT training at school and university levels;
- supporting the participation of national scientists in international networks of experts and the activities thereof; ensuring the diffusion of new knowledge gained through such networks to service businesses (by acting as an intermediator to strengthen links between private business and academy);
- training of *future* scientists is also an issue of no small concern for policy-makers - student internships abroad, practised by Dutch universities, should be considered as a welcome and indispensible part of enhancing the nation's general stock of knowledge capital and that of the services' sector in particular; Dutch embassies abroad can help Dutch universities to establish contacts with foreign firms and organizations which would be interested in having Dutch students working for them during their internships.
- knowledge transfer is a two-way process; therefore not only the foreign (academic, research and business) experiences of the *Dutch* nationals, but also participation of *foreign* scientists and innovators in national scientific endeavours and programmes should be encouraged; foreign specialists are often the carriers of specific tacit knowledge and their presence in the country can be conducive for successful introduction of inventions (technical or otherwise), because in many research and business fields "show-how" is needed to supplement "know-how" (Roberts 2000). Government policy can be directed towards providing tax and other financial incentives to foreign specialists, speeding up some of their visa procedures (where applicable), carrying out systematic information campaigns (in mass media and on the Internet) on the investment and research possibilities in the Netherlands.
- public knowledge institutions may consider the possibility of publishing information on legal procedures, probation opportunities (including "Most Needed Skills" page) and other matters of interest for foreign knowledge holders in a special Newsletter "Knowledge Transfer in the New Economy" or the like.
- maintaining liberal and transparent trade and investment regimes.

[1] The precise meaning of "sound" in this context is explained in section 4, taking into account the current debate on the forms of the intellectual property protection in services.

Introduction

Keeping afloat in highly competitive markets requires that the companies in any sector of the economy should be able to access and use new knowledge that is relevant for their activity. The sources of knowledge are many and they are usually accessed by means of knowledge transfer. Improved accessibility of knowledge is especially important nowadays, when mankind has entered the new century characterized by increasingly *"knowledge-driven"* (European Commission 2000) and "*learning*" (Lundvall 1996) economy -- there are estimates that more than half of GDP in the major OECD countries is based on the production and distribution of knowledge (World Bank 1999).

In this study the "knowledge transfer" phenomenon will be taken to mean "the process by which knowledge travels from a knowledge holder (a person or organization possessing the knowledge) to a knowledge recipient (a person or organization receiving the knowledge) through one or a greater number of transfer channels". Transfer of knowledge, just like the transfer of any good, can be seen as having two main aspects - a mere "physical movement" and an "economic circulation" (involving transfer of ownerships) (Gallouj 2000, p.63). A "transfer channel", in its turn, will be seen as "a connection or a set of connections between the knowledge holder and a knowledge recipient, enabling the knowledge 'transportation' between them". A knowledge holder and a knowledge recipient can be separated geographically (two companies in different countries); or they may be involved into different types of activity (academic research and business); or they may be at different levels of hierarchy in one and the same company (a manager and a trainee). By enabling knowledge transfer between such diverse actors transfer channels help to lessen these – geographical, occupational, authority-based and, possibly, some other - types of expertise asymmetries, which leads to an increase in general-knowledge level and in the number of knowledge holders (which become potential sources of knowledge for other potential recipients), and improves accessibility of knowledge when and where it is needed. This study aims at *examining whether the existing instruments and mechanisms of knowledge transfer (which focus mainly on manufacturing) are also appropriate for knowledge transfer to the growing services sector, especially in the context of the new economy*.

There are three features of knowledge transfer that take on increased importance in the context of the new economy. First, it is taking place under considerable *uncertainly* resulting from constantly and sometimes radically changing scientific and technological realities. Second, the level of knowledge required to manage successfully many of the modern industries is so high that even competitors choose to collaborate; there are many alliances of companies formed with the primary purpose of combining their complementary competencies. Third, the sectoral composition of output and thus the sectoral importance of innovation and knowledge creation are changing rapidly as the new economy expands. In particular, in the Netherlands the share of services in the country's value added had grown from 54.3% in 1980 to 60.7% in 1994 (OECD 1997b); the average annual civilian employment in services has increased approximately 1.8 times during 2 decades, comprising 5150 thousand in 1996 as compared to 2829 thousand in 1976 (OECD 1997a).

Knowledge transfer channels are many and the choice of any of them by a particular firm is determined by a variety of considerations including cost and speed of transfer, accessibility, scope for intellectual property rights protection, the quality of the past experience of using different channels and, possibly, some others. Economists now emphasize the fact that "the view of innovation as recombination of existing knowledge indicates that variety in diffusion of and access to knowledge must be seen as vital…" (European Commission 2000, p.3). Diversity in knowledge transfer channels can be seen as one of the factors providing this much needed variety as different channels are naturally suited to transfer of different types of information. It will be shown in the study that although the *sectoral specificity* of the knowledge

recipients does matter for the choice of the channel, it does not preclude firms from different sectors (manufacturing and services in our case) from using the same channels.

It must be emphasized at the outset that both goods and services are heterogeneous[2] and constantly evolving economic "species". The former can be subdivided into "high-tech" (computers) or "low-tech" (flower pots) goods, producer (industrial robots) or consumer (toys) goods, durable (fridges) and non-durable (bread) goods and so on. As far as services are concerned, Miles (1993), for instance, defines this ("tertiary") sector as comprising "those industries which effect transformations in the state of material goods, people themselves, or symbolic material (information)" and suggests subdividing it into: "physical services", "human or person-centred services" and "information services" (p.657-658). Apart from the criterion of the object, towards which the effort of the service provider is directed (goods, people or information) as in the previous example, there is a variety of other criteria for classification of services: whether they are provided by private firms (private services) or by public sector (public services), whether they are offered off-line or on-line, whether they are producer or consumer services and so on.

One can currently witness the shaping of what can be called "new economy services" which have a significant impact on the sectoral composition of the economy, employment and (what is most relevant for the present study) on development of knowledge and skills. "New economy" services are those for which one or more out of the following characteristics hold true: extensive use of new technologies (ICT) in the service delivery, relatively high innovative activity and on-line provision. The examples are: financial services, software services, R&D, engineering and some others; however, where such services as, for instance, shopping or entertainment are offered on-line, these can be seen as "new" (digitalised) services too. This is not to say that more traditional services (like, for example, cleaning or footwear repair which rely mainly on manual skills and do not require fast technological upgrading) become of somewhat inferior importance, but rather to emphasize that the emergence of new types of knowledge and knowledge transfer is likely to be observed in these services in the first place. Thus, an important source of demand for new knowledge and skills are e-commerce-related services. The OECD study (1999) shows that e-commerce often demands rare skills, where "network programming abilities need to be coupled with strong business applications skills"(p.119) .

Another important differentiation in services is the one between business-to-business (b-2-b) and business-to-consumer (b-2-c) services. The former implies that "both the sellers and buyers are business corporations", whereas the latter means that "the buyers are individual consumers" (Turban et al. 2000: p.199). Personal services (beauty parlours, dentists and alike) are within the business-to-consumer group, whereas business consulting, engineering, accounting and some others refer to the group of business-to-business services. In the new economy b-2-b and b-2-c services are increasingly offered on-line. Some online services can be of interest to both business and individual consumers; these include, for example: online hotel reservations, electronic payments, online car rentals, online employment agencies. More 'business-to-business' - oriented online services are electronic auctions, online advertising, online consulting and some others.

Section 1 begins by comparing manufacturing and services sectors along 3 main dimensions: *nature of output (degree of tangibility); the degree of customer participation in the production process; and the degree of simultaneity of production and consumption*. It also addresses the main implications of the revealed peculiarities of services with respect to knowledge transfer. In section 2 the knowledge transfer channels in manufacturing and services are analysed as well as 3 other elements of the knowledge transfer landscape: knowledge holders; knowledge recipients; and institutional settings. In section 3 the impact of information and communication technologies on knowledge transfer in services is investigated, since services use these technologies on a large scale. Section 4 draws conclusions and contains some recommendations for policy decisions.

[2] The OECD study (Pilat 2000) underlines, for instance, that "there is as much variety among manufacturing industries as between services such as computer and household services" (p.6).

Section 1. Services versus manufacturing: the main criteria for comparison

Both manufacturing and services have specific features related to the inputs into the production process, the nature of the process itself and the resulting output. In manufacturing one observes that output is tangible (material goods), participation of consumers in the manufacturing process is rather limited and time lags between production and consumption are more or less lengthy. In the services, by contrast, the output is intangible, consumers often participate actively in the service delivery process and there is a higher degree of simultaneity between production and consumption. This specificity of services has important impact on such aspects of knowledge transfer as: the nature of innovative activity, consumers knowledge involvement, the sources of consumer information and employee profiles.

1.1. The specificities of services

The services / manufacturing dichotomy can be analysed from different angles. In this study we concentrate only on those particular differences most relevant for the comparative analysis of the knowledge transfer channels used by them.

Nature of output (degree of tangibility)

One of the "classical" features of services is their *intangibility*.[3] This lack of material, physical "substance" and of explicit presence in space accounts for the fact that "consumers cannot have the luxury of examining a service before its purchase" (Melvin 1990: p.729). The immaterial nature of services has long been one of the factors which formed the perception of them as "low-tech, low-productivity industries with little impact on a country's economic performance" (Preissl 2000: p.125). However, the impressive input of services into the economic development of many countries, including the Netherlands, has put it on an equal footing with manufacturing as an object of attention on the part of both academic and non-academic (policy-making and business) communities. Elaboration of national and international economic and innovation policies often takes the specificity of services into consideration. Recent service-oriented innovation surveys in several OECD countries are just one example.

Degree of customer participation in the production process

Customer participation in service operations can take many forms. Some of them are not uncommon in manufacturing. For instance, a customer can participate in or even control "*specification* of the service" (Normann 1996: p.80) or participate in the "diagnosis of the problem" (p.81), which are analogous to a client making technical specifications for an order she places with a manufacturing company. However, there is one form of participation, which one does not typically encounter in manufacturing, namely that of "*coproduction*, whereby the client does some of the (physical) work which could conceivably have been done by the service company" (for example, self-service retailing or banking). Restaurant and motor gasoline

[3] Intangibility refers to the "inability of services to be seen, felt, tasted, or touched in the same manner in which goods can be sensed" (Zeithaml 1981, p.186).
It must be noted that intangibility as the criterion for making distinction between goods and services is not accepted by all scholars. Hill (1999), for instance, points out to the "fast growing class of intangible products" (p.426) recorded and stored on paper, films, tapes, discs (for instance, a '"new musical composition", "a new computer programme" and some others) and argues that "the traditional dichotomy between goods and services should be replaced by a breakdown between tangible goods, intangible goods and services" (p.427).

industries are also examples of services where self-service is widely used (Phillips and Schutte 1988: p.263).

Some service companies are known to "manage customers profitably as part-time employees" (Pitt, Berthon and Watson 1999: p.14): for instance, Federal Express enables customers to participate to some extent in the delivery of their own shipments by granting them access to the company's Web site: a customer can "track a shipment traveling through the system, request a pickup, find the nearest drop-off site, and request invoice adjustments" (p.15).

The scope for coproduction, however, is not the same for all service industries. Some services require expertise which a consumer may not possess (for instance, that of a surgeon, a singer, an interpreter), so possibilities for coproduction in such services are minimal.

Degree of simultaneity of production and consumption

Simultaneity of production and consumption does not always imply a customer's active role in the service delivery (as is the case with self-service). Simultaneity is caused by inability of services to be stored (which is a feature often cited alongside their intangibility, and, in fact, closely connected to the latter). This is gradually changing today, as new technologies offer broad opportunities for new (electronic) means of storage.

However, even in the new economy some services show a higher degree of simultaneity of production and consumption than goods, especially in cases when simultaneity is a part and parcel of the service delivery process: emergency operations in hospitals, air travel and others.

1.2. Implications of the specificities of services for knowledge transfer

In terms of knowledge transfer, the nature of services has effects on innovative activity, consumers' knowledge involvement, sources of consumer information and employee profiles. The connection between the main features of specificity in services and the main effects thereof are presented in figure 1.

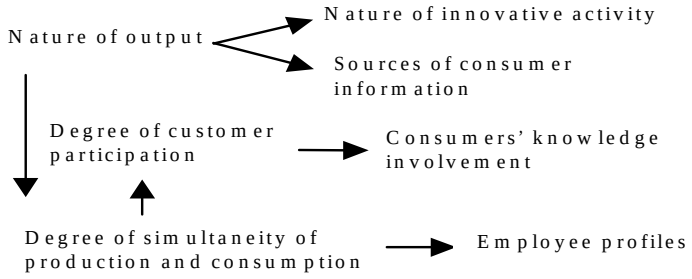

Figure 1. The impact of specificities of services on different aspects of knowledge transfer

We now consider this set of relations in more detail.

Nature of innovative activity

The nature of services demands a special approach to innovating. In fact, new services are not produced in laboratories, as their highly intangible nature prevents them from being stored, weighed or manipulated by other means in the same way as physical ingredients of the potential new goods are. This leads to the fact that R&D in services is *less formal* in both its content and *forms of organisation* and that the output of R&D activity has traditionally been *less*

patentable than in manufacturing.[4] Another interesting feature of services innovation is its *large ICT base*.

Less formal R&D

Most service industries are known to engage in less formal R&D (or, in other words, in "innovation without formal research") as compared to manufacturing (European Commission, 2000), and most innovation in services is known to be linked to "changes in processes, organisational arrangements and markets" (OECD 2000: p.140). This specificity of the type of innovation is reflected in the forms of its organisation. In large service companies R&D is performed in "operations research, strategic planning or IT departments", and in smaller ones it is organized by ad-hoc project teams (Preissl 2000, p.138). Thus, a study of Danish service companies (in financial services, tourism and management consultancy) has demonstrated that service firms do not set up R&D departments and that innovations are "either made in ad hoc project groups or as a collective process in which the total organization is engaged" (Sundbo 1994: p.257).

Central role for information and communication technologies (ICT)

ICT and ICT-related technology (for instance, high-speed communication networks) are known to be highly important for innovative activities in software, banking and insurance (Van Ark et al. 1999: p.28). However, other industries need these technologies as well. In Germany, for instance, even in the least IT-active sector (retail trade) 87% of innovating companies consider information technology to be important for innovations introduced (European Commission 2000, p.50). In Danish service industries 69.8% of innovative firms use mobile phones for innovation, 69.3% use electronic mail and 41.8% use Internet homepages (one-way WWW) for this purpose (Van Ark et al. 1999, p.31). It is possible to observe the impact of computer use on innovation in services in at least two respects.

First, *the use of Internet to offer services to customers* is considered as an innovation. The Internet can be used by service firms as a "shop window", for transactions (orders/sales), payments, after-sales services and some other purposes. There is a general trend towards *e-services*: the increasing delivery of "functions" including the maintenance of goods, through on-line services. Witness to the growth of such services is undoubtedly the emergence of call centres which represent now in many countries a substantial share of employment in the business services sector. The further development of such services including the improvement of the security of delivery over electronic networks is likely to allow for the increased delivery of goods and services that can be described as network goods. Goods in which the independent functionality, given the speed of renewal of such functionalities (e.g. software virus scanners), is being replaced by continuous service delivery. It opens the possibility for further development of network goods (e.g. the network computer) in which the core value is shifting towards service delivery.

Second, the shift from 'stand alone PC's' to 'linked PC's' can be seen as an innovation as well, since "networks facilitate communication between different kinds of users with different kinds of data". The 1996-1998 data for Dutch services shows that the average annual percentage change in the use of stand alone PC's comprised *–10.9%*, whereas the same indicator for network PC's comprised *12.0%*, which from the service innovation point of view is a positive development (See: Van Ark et al. 1999: p.36-38).

Since ICT is important for innovation in services, a country's level of ICT infrastructure development may help to assess prospects for innovative activity in its services sector. Table 1 shows the position of the Netherlands amongst several developed countries in terms of three standard indicators of ICT and ICT infrastructure. According to these data, the Netherlands can be said to be doing well, occupying an upper-middle position in each of

[4] It is worth noting, however, that over the last half decade the trend has appeared for more service processes (for instance, e-commerce) to be patented. Patenting is for a service process within its technological set-up (for example, Amazon.com is known to be patenting the electronic shopping cart, not the on-line book-store).

them. It is difficult to compare it against such a giant benchmark as the United States, but relative to other European countries its positions are good.

According to the Netherlands Foreign Investment Agency (NFIA), the Netherlands has "the highest Internet connectivity rates in Europe, one of the top cable penetration rates globally, and one of the largest Internet Exchanges in Europe (the Amsterdam Internet Exchange)". It also has a "100% digital, advanced fiber-optic network in place" and "offers the largest bandwidth on the European continent".[5]

It can be concluded that the strong ICT base of the Netherlands creates a favourable environment for the knowledge transfer in services, because it enables relatively inexpensive transfer of large amounts of information (and knowledge) at a very high speed and is conducive to formation of producer-user, producer-producer and consumer-consumer networks which are capable of generating considerable knowledge spillovers to the service industry and a society at large.

	Information technology and telecommunications expenditure as a percentage of GDP, 1997	PCs per 100 inhabitants 1997	Internet hosts per 100 inhabitants January 1998
United Kingdom	6.3	27	1.7
Sweden	6.2	36	3.6
Switzerland	6.1	44	1.6
Ireland	6	15	1.1
Netherlands	**5.8**	**34**	**2.4**
Denmark	5.4	36	3.1
Finland	5.2	28	8.8
Norway	5	39	6.6
Portugal	4.9	13	0.4
France	4.8	20	0.6
Germany	4.6	26	1.2
Greece	4.1	6	0.3
Austria	4.1	22	1.4
Italy	3.9	12	0.4
Spain	3.8	11	0.4
United States	7	49	7.8

Table 1: Some ICT - related indicators for the developed countries
Source: World Communication and Information Report 1999-2000 (1999). Paris: UNESCO, p.262, 269, 271.

Intellectual property protection

[5] http://www.nfia.com/html/industry/in0.html

An important specificity of services is that patents are a less important instrument for intellectual property protection in this sector. There are two main reasons: a) much of innovative capacity of service firms resides in human experience and expertise, which are difficult to codify (European Commission 2000), and b) innovation cycles are too short for "lengthy patenting procedures" (Preissl 2000, p.138). Most service industries employ some other forms of intellectual property protection like copyrights, trademarks and so on (OECD, Op.cit.). "Ensemble" protection (i.e. the use of the ensemble of methods, including copyright, patenting and trademark legislations), short innovation cycles (attempts to reduce the risk of copying and imitation by cutting the "lead times" so drastically that competitors find themselves being late for imitation and "firmware" (protecting one's software by embedding it in microchips) are also quite common as IPR strategies for innovating service firms (Andersen and Howells 1998, p.14). A study of Canadian service firms, for instance, found that over 40% of innovators in communications considered copyright to be an effective way to protect intellectual property rights,[6] and over 50% found trademarks effective; also, most service companies surveyed considered that "first-to-market" strategies were the most effective ones for protecting their innovations (Andersen and Howells 1998).

Given the growing convergence between goods and services under the impact of ICT (which manifests itself in increasing storability and tradability[7] of services), patents may gain in importance as the intellectual property protection tool (what one already observes in software). This would mean that just like in manufacturing the problem of the impact of the disclosure requirement in patents on firms' incentives to innovate will become increasingly relevant in services.

Consumers' knowledge involvement

Customers in services can possess valuable expertise which makes their role as co-developers and co-innovators possible. For instance, in the technology-related knowledge intensive business services[8] the process of "selling a knowledge service" requires a "learning dialogue between supplier and customer" (Skogli 1998, p.9). IT-support services, management consultancy and technical engineering are known to be working with their clients in "highly interactive ways"-- through this interaction "the client's knowledge base changes, while the KIBS provider also gains more experience, learning more about the characteristics of a specific industry" (den Hertog 2000: p.86). The same is true in regard to advertising agencies and auditors who are said to have little chance of achieving "genuine excellence" in their services if they don't work with "knowledgeable and demanding" clients (Normann 1996, p.82).

Sources of consumer information

Intangibility of services makes it difficult to assess them, therefore consumers in this sector pay attention to the whole "service delivery system", and " 'hard' features in concrete, brick and marble may be displayed in abundance to reassure the client, as a substitute for the more intangible 'soft' ingredients" (Normann 1996, p.89). The interior design of service companies, the display of company awards (for quality or otherwise) and some other components of the service delivery system become important factors of customer evaluation of the service in question.

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[6] It is interesting to note that service firms' reliance on the copyright system brings them advantage over manufacturing firms reliant on patenting: the former do not have to register the copyright (they "only activate it when they see it being transgressed"), so they "do not alert potential competitors to what new technologies they are developing" (Andersen and Howells 1998, p.15).

[7] See: Petit and Soete (1998).

[8] Technology-related knowledge intensive business services (T-KIBS) include (in statistical terms): "computer and related IT services"; "the private part of "research and development"; "architectural and engineering activities and related technical consultancy" and "technical testing and analysis" (Skogli 1998: p.1-2).

An interesting comparison with manufacturing companies emerges here with respect to the customer service centres. These centres deal with information and other procedures which are of concern to customers. Since "service companies can not show physically what they are selling" these centres "are the first areas to be developed", whereas in manufacturing they are developed "as a final step" (Rubalcaba-Bermejo 1999, p.267).

The enhancement of employee expertise in "people-to-people" communication is so important that policy recommendations in relation to innovation in and economic performances of services advocate active role of governments in skill formation. Thus, Pilat (2000) suggests that "a broad education policy" (with an emphasis on "multidisciplinary, lifelong learning") must focus more on "working in teams, dealing with customers, maintaining interpersonal relationships, communicating effectively, networking and adapting to change" (p.31).

Employee profiles

In many services (for instance those provided by banks and hospitals) the customer "receives the service instantly as it is produced", and the service provider is "in direct contact with the consumer", whereas in the case of manufactured goods "the manufacturer will seldom contact his clients directly" (Rubalcaba-Bermejo 1999, p.262). Therefore, communication and interpersonal skills in general rank very high in most services jobs.[9] Chase (1978) for instance, while distinguishing between high- and low contact service systems (using the criterion of *the extent of the required customer contact in creation of the service,* proxied by the *percentage of time the customer must be in the system relative to the total time it takes to serve him*) (p.138), argues that in terms of worker skills required for *high* contact service systems (health centres, hotels, public transportation, restaurants, schools and personal services) the service employees "must be able to interact well with the public" (p.139). An OECD study using data from the Australian Service Sector Review finds that service employees' skills underlying the quality of the service provided are "creativity, resourcefulness, ability to communicate and strategic thinking" (OECD 2000, p.147).

Let us take a salesperson profile as an example. There are at least two important aspects of the salesperson behaviour: a) the fact that this behaviour "tends to elicit both positive and negative emotions in the consumer" and b) that "the salesperson response to these emotions may determine customer satisfaction" (Menon and Dubé 2000b: p.276). It has been found in an in-class survey of 126 young adults registered in a Canadian University on their emotion experiences in retail outlets (either clothing or electronic goods stores) that consumer's emotion such as *anger* was elicited by the following major categories of negative behaviour of a salesperson: 42% of cases were related to "rudeness", "unhelpfulness", and "ignoring behavior" by a salesperson; 23% of cases were related to "various attempts by the salesperson to apply sales pressure"; 13% of cases were due to the "problems with exchange or refund of products that were either defective or incorrect"; 10% of the cases were caused by "uninformed salespersons". The study concludes, therefore, that about 88% of cases causing anger were related to salesperson's actions (Menon and Dubé 2000a: p.295 – 297). Another interesting finding of this study is that contrary to respondents' expectation that the salesperson would apologize, compensate them or would stop applying sales pressure, in 33% of cases the salespersons "did not respond" to customer anger and in 25% of cases they responded by "being rude, hostile and insensitive to their needs"; an admission of mistake and apology took place only in 15% of the cases (p.299). The authors of the study, therefore,

[9] It is worth noting that one can speak of the impact of simultaneity of production and consumption on the employees' communication skills only on the condition that the customer is *being present* during the service delivery, since not all services with the "simultaneity" dimension have this feature. Desmet, Van Looy and Dierdonck (1998), for instance, quote the examples of home-banking or phone-banking when no face-to-face contact with the service provider is required.

underline the need for training salespersons "in techniques of self-monitoring and fostering of empathy" (Menon and Dubé 2000b: p.276).[10]

In the business-to-business environment management and negotiation skills are of high importance in addition to interpersonal skills. In the online services computer skills are also required (more or less sophisticated - depending on employees' tasks).

[10] Interestingly, a majority of the cases did *not* stem from the salesperson's inability (or unwillingness) to provide the desired service, such as accept a return, but rather from the salespersons (lack of) social skills.

Section 2. Knowledge transfer landscape

The most typical knowledge transfer channels in manufacturing are those emerging from interaction with suppliers, foreign direct investment, licensing operations, links with academy, training, intra-company strategic knowledge management, producer-consumer two-way knowledge transfer, knowledge intensive business services, human capital mobility, patents and Internet. In services these channels are used as well. However, channels such as foreign direct investment, training and producer-consumer two-way knowledge transfer have a greater significance in services than in manufacturing.

The study of the channels alone is not sufficient, since their efficiency is largely dependent on 3 other elements of the knowledge transfer "landscape": the properties of knowledge holders, knowledge recipients as well as on the institutional settings for the transfer.

2.1. Knowledge holders and knowledge recipients

In both manufacturing and services it is necessary for both knowledge holders and knowledge recipients to possess certain characteristics which facilitate the knowledge exchange between them. Knowledge holders must be willing to share their knowledge, whereas knowledge recipients must have sufficient absorptive capacity (technical capability, expertise of employees, adequate firm strategies) and must be open to new influences that are potentially capable of increasing their efficiency. Both service providers and service customers are considered as potential knowledge holders and knowledge recipients.

This study employs the systemic approach[11] to the analysis of knowledge transfer channels by seeing them as an element of a larger system (knowledge transfer landscape) consisting (apart from the channels) of three more components: the knowledge holders, the knowledge recipients and the institutional settings. A full landscape of the knowledge transfer is shown in figure 2.[12]

Knowledge Holders

The characteristics of the "point of departure" of the knowledge being transmitted are important to consider, since they can influence knowledge flows. Indeed, it is usually within the power of the knowledge holder to regulate the amount and quality of what she shares. These are referred to as the "transmission qualities" of the source of knowledge and they "denote the cognitive aptitudes, the technical conditions and the attitudes of a source, which may be more or less favourable to the transfer or, conversely, retention of knowledge" (Gallouj 2000, p.64). These qualities are known to increase when knowledge is codified and to decline when knowledge is perceived by the source as "strategic", or when the application of the knowledge is likely to "call into question" the source itself (Gallouj 2000, p.64). Rangan and Yoshino (1996), for instance, underline the problem of protecting one's core competencies in

[11] This approach holds that "everything, whether concrete or abstract, is a system or a component of one or more systems…" (Bunge 2000: p.403).

[12] There is a similar representation of the knowledge transfer process specifically tailored to description of the "KIBS transaction as a form of knowledge processing" (Gallouj 2000). It includes *the source, the receiver and the processor* of knowledge. Our scheme is more general and can be applied to any service industry and in fact, to any knowledge transfer.

strategic alliances[13]: they show that in "competitive alliances" (those in which partners are competitors such as, for instance, the joint manufacture by GM and Toyota of compact cars in the United States) "protecting core competencies" is one of the major concerns of managers. The higher the competitive threats on the part of the business partner, the less inclined will be a knowledge holder to release its knowledge and the more elaborated will be its strategy for protecting its core competencies.

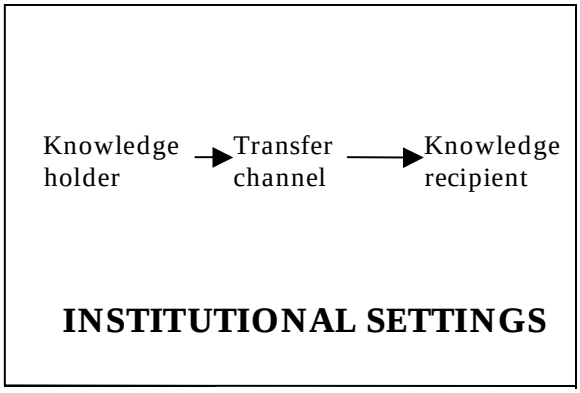

Figure 2. Knowledge transfer landscape

Knowledge Recipients

Knowledge does not become a firm's asset automatically. A set of preconditions is often necessary to absorb it effectively. The ability of a knowledge recipient to employ new knowledge successfully has received different names in literature: "receptive qualities", "receptivity", "translation capabilities", and "absorptive capacities" (reviewed in Gallouj 2000). For instance, "receptive qualities" are defined as "cognitive aptitudes, the "technical conditions" and the attitudes (behavior patterns, strategies) that encourage the acquisition of knowledge" (Gallouj 2000, p.64).

This definition is, in fact stating two aspects of the receptivity phenomenon: firstly, the existence in the firm of the "background" or resources (technological and others) relevant for knowledge absorption, and, secondly, the particular attitudes. As for the first aspect, it has been shown (by Dosi and Marengo 1999 and some others) that the ways corporate organizations "learn" are shaped by what these organizations already "know", and the lack of investments in a certain area of expertise may make it difficult to develop technical capability in this area in the future (Cohen and Levinthal 1990). Thus, in the literature discussing the problems of catch-up by less industrialized countries with respect to more advanced nations it is stressed that increased outward-orientation is not enough to achieve rapid technological catch-up -- what is needed for implementation of the foreign technologies is more skills built by *domestic* workers and managers -- "the absorptive capacity of the economy" (Keller 1996, p.200). Absorptive capacity strengthening is important for developed countries as well: they often need, too, access to better technologies; as Narula (1999) shows, in the mid-1980s there was an increased propensity for the European firms to engage in strategic alliances with US and Japanese firms in the biotechnology and IT sectors, since it is in these sectors that most of the EU firms do not have a significant competitive advantage.

With regard to the second aspect, it is worth noting that reluctance to new knowledge can also arise because of a distrustful attitude towards new outside influences. For instance, the receptive qualities of a firm are known to weaken if the recipient "feels threatened by the new knowledge", which may lead to "refusal to learn" (Gallouj 2000). Interestingly, the studies on barriers to innovation in services sometimes make reference to such internal organizational

[13] The authors define a strategic alliance as "an arrangement that links specific facets of the businesses of two or more firms" (p.7).

problems. For instance, in the study based on the Italian Statistical Survey (Evangelista and Sirilli 1998) 38% of innovating service firms name the factor “resistance to change within the firm” as “hampering innovation” (p.263). Another reason for rejecting something new is cost considerations: for example, in the case of the diffusion of electronic data interchange standards firms may consider costs of switching to a new standard too high and thus prefer to maintain their old practices (David and Foray 1995).

The link between the characteristics of knowledge holders and knowledge recipients in transfer of technological knowledge has been underlined, for instance, by Aharoni (1991), who states that the choice of the appropriate channel of transfer is “a joint function of the goals of the technology donor and the absorption capacity of the recipient” (p.86), and that “making sure that the giver and the receiver are willing and able to work together in an effective manner is a major issue and a precondition of any effective transfer” (p.90).

2.2. Transfer channels

Knowledge transfer channels can be classified according to different criteria. One can distinguish between national and international, intra- and inter-firm, commercial and non-commercial, free and costly channels and so on.[14] Commonly used channels in manufacturing are suppliers, foreign direct investment, licensing, links with academy, training, intra-company strategic knowledge management, producer-consumer two-way knowledge transfer, knowledge intensive business services, human capital mobility, patents and Internet. The main conclusion of this analysis is that firms in both sectors make use of these channels, although some channels (foreign direct investment, training and producer-consumer two-way knowledge transfer) are of greater importance for services.

Suppliers

One of the functions of suppliers in the knowledge transfer is that they provide equipment, which embodies new knowledge. However, their role is wider than that. Apart from providing equipment in terms of its physical delivery, suppliers also provide the information about how to set the machines up, run and maintain them, how compatible their machines are with other equipment, what their operational properties are, what the present and future technological capabilities are and information on their competitors. Knowledge embodied in and associated with the equipment can assist in improving the characteristics of the final product (service).

This channel is important not only for manufacturing, but for services as well -- although the output of the latter is largely intangible, service production often involves extensive use of tangible tools, for instance, machinery of the ICT type. Knowledge embodied in capital plays a large role in innovation in services. For example, in German services in 1997 27% of the total innovation expenditure was accounted for by machinery and equipment (European Commission 2000, p.48). Trade in these goods can be seen as an important channel for knowledge transfer.

It is interesting to note that history of healthcare has examples of innovative manufacturers who contribute to the efficiency of the health services by supplying improved instruments. For instance, M. F. Charrière founded a firm in France in 1820 which manufactured medical instruments until 1930, and is said to have travelled to England to study British techniques of manufacturing hand tools. Among innovations introduced by him were, for instance, “the application of glazing, silver plating, and platinage of steel, lead and tin to surgical instruments” (Davis 1981, p.21).

In some cases (for instance, in sectors such as air, maritime and rail transport, telecommunications and retailing, which co-operate with suppliers of specialised equipment) service companies can increase the effectiveness of their links with suppliers by influencing the focus of R&D used for manufacturing this equipment: United Airlines, for example, is known to have played a significant role in developing Boeing‘s 777 series (Pilat 2000, p.21).

Foreign direct investment (FDI)[15]

FDI can usually take the form of a wholly owned subsidiary or a branch (100 percent foreign ownership), or an equity-based joint venture (the investment jointly owned and managed by two or more partner firms). The possibility of knowledge transfer arises thus from

[14] For a review of possible transfer channels for technological knowledge see, for instance: Aharoni (1991).
[15] Foreign direct investment (FDI) is defined as “sufficient investment in production facilities in a foreign country to give the investor effective control of the operations” (Asheghian and Ebrahimi 1990, p.326-327).

the combination of complementary assets and capabilities of “mother” and “daughter” companies (in the case of a wholly owned subsidiary) or those of the joint venture's partners (in case of a joint venture).

An interesting feature of FDI as a knowledge transfer channel is that both inward and outward investments bring in new knowledge into a country engaging in FDI. In case of an *inward* investment there is a more ‘direct‘ knowledge inflow when foreign companies make tangible and intangible investments in the form of new machinery, new technologies, new human capital skills (if some employees move into the country too or if the firm trains domestic workers) and some others. The *outward* investment can enrich the home country knowledge base by having a ‘feed-back’ property, i.e. by transferring back the knowledge of the host country local business practices, management and marketing techniques, know-how (when feasible) and so on.

Since investment co-operation often involves sharing complementary competencies, one can state with a high degree of certainty that the data on inward and outward FDI in a particular sector and a particular industry can serve as a proxy for the prospects for knowledge transfer to this sector and industry. Table 2 shows provisional data for distribution of Dutch inward and outward investment across sectors in 1995.

Sector	FDI by the Netherlands	FDI in the Netherlands
Agriculture and fisheries	0.06	0.04
Industry	50.60	44.80
Construction	0.70	0.72
Services	48.60	54.50

Table 2: FDI and the Netherlands, inward and outward position by sector (percentage)
Source: Stibora and de Vaal (1999: p.160).

The Dutch inward and outward FDI position is not too different between services and manufacturing, which leads to a conclusion that FDI is an important knowledge transfer channel for both sectors. However, it is important to notice that in contrast to manufacturing, where a product can always be sold by means of exports, service firms do not always have this opportunity and have to establish a “permanent presence abroad” (Stibora and de Vaal 1999, p.143). For instance, retailing, banking, business services and telecommunications as well as hotels and restaurants are industries whose business activity requires commercial presence abroad (OECD 2000). So, from this point of view, this channel can be said to be of greater importance for many services than for manufacturing.

In the Netherlands FDI in the services sector had shown remarkable growth over the recent two decades: it went from fl 5.8 billion at the end of 1973 to fl 138.5 billion in 1995, which is an increase of more than 20 times (Van Hoesel and Narula 1999, p.16). According to 1995 data, finance, insurance and business services (36.2 per cent of total Dutch FDI stock) and wholesale and retail trade (10.5 per cent) accounted for the largest share of total Dutch FDI stock in 1995 (Van Hoesel and Narula 1999, p.16).

According to Jochem Hanse, Commissioner for Foreign Investment (the Netherlands Foreign Investment Agency), knowledge is “the key word” for NFIA in 2000, and attracting high-tech foreign companies is important for raising the country's innovative capacity (NFIA 2000a). This is true both for manufacturing and for services, since foreign high-tech investors create conditions for inflow of advanced technologies and know-how, expertise sharing with their Dutch partners as well as for knowledge spillovers to society as a whole. Among the recent investment decisions cited by NFIA are: the decision of Looksmart, one of the leading service providers in the area of searching and navigating the World Wide Web, to establish its European headquarters in Amsterdam; the decision of DHL to open a European financial

service centre in Maastricht, where centralization of a number of the financial functions for 16 countries will take place.

Licensing

Licensing can be considered a channel for knowledge transfer for both parties to the transaction. A licensor (the technology supplier) may use this as a method of gaining knowledge about a new market (regulatory framework, specificity of demand, etc.), whereas a licensee (the recipient of technology) gains know-how which it cannot develop itself, at least with reasonable financial and time expenses.

Licensing in its "pure" form is more relevant for manufacturing, since it has been observed that it is used more often when a firm's technology "can be codified, patented, or transferred" (Asheghian and Ebrahimi 1990, p.325).

However, there is a form of licensing, franchising, which is a more likely "candidate" for use in services. The essence of a franchise business is that one company (the owner of a trademark) gives permission to others to trade under its name and trademark.[16] Fast-food and hotel chains are among service industries using franchising quite extensively. Again, as in licensing, both partners to a transaction learn from each other: a franchisee (the party receiving the rights) can receive training and knowledge on the service quality criteria from a franchiser (the holder of a famous name and good reputation), whereas the latter gets the knowledge about the local market. The existing body of literature shows that knowledge transfer does take place via such franchise chains: sometimes this transfer is limited to the stores owned by the same franchisee, but sometimes it spreads over to stores owned by different franchisees. An example of this latter, wider transfer is the spread of innovation for placing pepperoni on pizzas, discovered at a franchise store in western Pennsylvania and coming into use in 90% of the stores of that brand nation-wide within a year (Darr, Argote, and Epple 1995).

Links with academy

An interesting type of transfer channel is related to the links between industry and universities or scientific institutions. In microbiology, for instance, the connection between business and academy has often been mediated via small (medium)-sized companies -- dedicated biotechnology firms (DBFs). Having strong links with academic science but lacking finance, these businesses served as a source of knowledge and skills to big multinationals in exchange for money and types of expertise less accessible for novices in the market (Sharp and Senker 1999). The main advantage of this type of the channel lies in industry's access to brand new knowledge, which considerably widens its prospects for innovation. There is also a clear balance of interests between the two parties: each gains the resources it lacks in exchange for resources it is relatively abundant in.

It has been shown in the literature that there is a transition "from sponsorship to partnership" in the relations between academy and industry (Jacob et al. 2000, p.255). The patterns of collaboration are changing from one in which the industry participant supplied funds and outlined the research task to an "interactive model of academic-industry co-operation that promotes joint problem solving" (p.257).

Innovation surveys in the OECD reveal that "service firms rely to a very limited extent on universities and research laboratories for the knowledge they require" (OECD 2000, p.144). One of the reasons is that universities are often engaged in development of industrial production and processes which are not very relevant for service firms. However, there are exceptions: innovation in health, banking and logistical services requires such university knowledge (OECD 2000, p.144). For instance, the Department of Bio-Medical Physics and Bio-Engineering in the University of Aberdeen (U.K.) positions itself as both a university department and as a part of the local hospitals; one of its functions is "to carry out research and development of the applications of physics and technology in medical diagnosis and

[16] The technology transferred under such arrangement usually includes "a well-known name, an established reputation, a management system, some marketing skills, and certain supplies" (Asheghian, P. and Ebrahimi, B. 1990, p.326).

treatment".[17] The research groups of the Department consist of specialists in a particular field who collaborate with the medical staff in the hospital.[18] In the Netherlands the academic community is known to link academic research with industrial innovation in healthcare too. Thus, 11 medical and technological universities belong to VSNU (Association of Dutch Universities) and BMTI (BioMedical Technology Institute) which "seek to improve academic collaboration and research, thereby developing stronger ties between research and industry"; there also exist High-Tech Business Centres to support "emerging and high-growth medical technology businesses"; these centres "offer work space and opportunities for continued collaboration with Academic Medical Centres"[19].

Training

Job-related training is very important for upgrading employees' skills. In the Netherlands, for instance, job-related training for employees can take place during internal and external courses. These are off-the-job courses and they are held in classrooms, training centres, on-site (inside the firm) and off-site (outside the firm) (Baaijens et al. 1998).

It is worth mentioning that more than a decade ago Japanese firms were reported to be encouraging their engineers to attend engineering conferences, read the technical literature and participate actively in the engineering community (Gomory 1989). Such managerial attitudes are especially necessary today: due to the fact that the ability to innovate has become one of the crucial factors behind market success, and firms are actively searching for new ideas and solutions. Getting access to academic and mixed (academy/business) networks of specialists for a manufacturing or a service company often means discovering a new source of pioneering knowledge relevant for tackling its practical problems.

The significant role played by the human capital in services and the fact that in this sector "behavioral knowledge", or "knowledge about how to relate to customers" is an important part of the "product knowledge" (Bertrand and Noyelle 1988, p.75) make intra-company training an important means of knowledge transfer (from managers or from employees with rich expertise and experience relevant for dealing with customers to other employees, who may lack such expertise and experience). Italian survey data indicate that firms' training expenditures (in relation to total wage costs) are higher in such sectors as Insurance, Banking, Telecommunications and Software than in manufacturing industries, such as Chemicals and Pharmaceuticals, Motor-vehicles and Machinery (Evangelista 2000). Data from 1996 on Dutch firms with expenses on innovative activities shows that while expenses on "training" were made by 42% of such firms in manufacturing, in services this share was 53%; in computer services in particular, the figure was as high as 80% (Van Ark, Broersma and de Jong 1999, p.26).

Let us consider training activities in German banks. Quack, O'Reilly and Hilderbrandt (1995) provide interesting data, showing high training intensity in this sector: in 1991, for instance, the proportion of apprentices in relation to employees was one to ten (this is above the national average) and have been stable throughout the last decade (p.770). On average between half a day or one day per week is spent by apprentices on company-based courses (*Interner Unterricht*) (p.771). For more complex sales jobs banks also provide "further training" over a period "of a few months, up to two years after completion of the apprenticeship" (p.771). Also, young people are encouraged to obtain general further education at the Bankakademie - an institution supported by major banks. It gives graduate certificates (Bankfachwirt and Bankbetriebswirt) which are important for promotion (p.771).

[17] http://www.biomed.abdn.ac.uk/Department/
[18] http://www.biomed.abdn.ac.uk/Research/
[19] http://www.nfia.com/html/publish/medical.html#education

Intra-company strategic knowledge management[20]

In order to facilitate intra-company information and knowledge diffusion firms employ many diverse methods, largely supported by electronic means. An important application of ICT for intra-firm knowledge transfer is the Intranet. This is an electronic information system enabling knowledge and information dissemination within particular networks. One public service institution using this system is NFIA (mentioned above): all information relevant for foreign investors is collected in this system which is accessible for all NFIA offices and its regional and local partners who can provide their input into this "knowledge network" (NFIA 2000a). Similarly, AT&T has introduced an intranet-based Knowledge Management System to provide 15.000 customer-service representatives with electronically deliverable information instead of the paper-based one (Tissen, Andriessen and Deprez 1998). Though it is largely an *internal* diffusion tool, an Intranet, as shown in the examples above, can create a kind of interface between the company and its environment such that knowledge circulating *internally*, in fact, provides better *external* service.

Companies can use other knowledge management techniques in order to successfully create, enhance and use knowledge. For instance, at CIGNA Property & Casualty, a Philadelphia-based insurance company, "knowledge editors" process and then distribute information and knowledge contributed by employees. This helps the company to identify information most relevant for its activity and use it profitably (Tissen, Andriessen, Deprez 1998).

An interesting development in the area of knowledge management within the company is the focus on "social capital"[21] – one of the studies on intellectual capital advances the idea that in order to successfully manage employees' ability to share knowledge and create the new one it is important that the "new-economy firms" move "from managing an infrastructure of rules and fixed systems to managing a web-like infrastructure of knowledge and collaboration" (Social Capital 2000: p. 1.). The example cited is Royal Dutch Shell, where executives constantly mix together (including overseas assignments) and people are rotated so that they "are able to call on the advice of a large number of fellow employees" (p.2.). Where the ties and flexible interactions between employees are not encouraged (in other words, if "there is no social capital"), the knowledge flows will be hampered; in fact, the knowledge "will be blocked and rejected" (ibid.). An emphasis on the social capital development seems to be important for both manufacturing and service firms.

Producer-consumer two-way knowledge transfer

Innovation cannot be seen as a process isolated from the outside world by the boundaries of an innovating producer. It is an "interactive process" (Lundvall 1988), and both producers and consumers can learn from each other. Consumers participate in the process at least to varying degrees and serve as a source of knowledge necessary for shaping the process in such a way as to make the innovation welcome in the market. The role of innovative users is especially worth emphasizing. It is interesting to note that major product innovations in some fields, such as scientific instruments, are reported to be almost always developed by product users (von Hippel 1988). Producers, in their turn, instruct customers about the usage of new machinery and equipment.

Table 3 presents some features of producer-consumer learning:

[20] One way to describe knowledge management is offered by Pan and Scarbrough (1999), where it is seen as "the way organizations build, supplement and organize knowledge and routines around their activities and within their cultures, and develop organizational efficiency by improving the use of employee skills" (p.360).

[21] The distinction between human and social capital is as follows: "…while human capital resides in the people, social capital resides in the relationships among them" (Social Capital 2000, p.1.).

What do producers learn from consumers?	What do consumers learn from producers?
Ideas and knowledge important for innovation.	New needs that can be satisfied by consuming new services[22]
Ideas on why services can be rejected by the market?	How to use technologically sophisticated services / new competencies
Which services are in the greatest demand now and which ones are likely to be so in the future	

Table 3: Rationale for producer-consumer two-way learning in services

Consumers can be seen as the source of at least two important types of knowledge -- those related to market situations, and specific types of expertise needed for co-production of services. What facilitates the transfer of knowledge from consumer to producer in services is the fact that in most services a firm‘s production structure “can easily, and most importantly at low cost, change the pre-specified design of the service it provides” (Stibora and de Vaal 1999, p.142). Under such conditions consumers' knowledge can be used effectively for the purpose of improving the service in question.

Producers, in their turn, provide training and advice relevant for consuming technologically sophisticated services.

It is an interesting observation by scholars (Lundvall 1988) that not all user-producer relationships are favourable for innovation: if users are too conservative and have weak technical competence, producers cannot benefit from co-operation with them. The reverse is also true: the service provided by a conservative and low-competence producer is unlikely to satisfy the user.

As compared to manufacturing, service producers have to be more creative as far as the transmission of knowledge about a service to consumers is concerned: as mentioned above, services can not be demonstrated in the way that goods can, so it becomes important to create substitutes for “real experience”. These take the form of oral description, brochures, reference to successful transactions with satisfied clients in the past, conveying positive image through helpful contact personnel and attractive business premises (Normann 1996).

It should be noted that the scope for the knowledge transfer about a service is not limited to basic general information about it. The distinction between the “relieving” and the “enabling” roles of service providers vis-à-vis its customers (Normann 1996) can be useful for demonstrating the point. “Relieving” producers undertake to fulfill a particular task for a consumer without engaging him too much in the problem solution. “Enabling” producers are those, who, by contrast, provide the customer with tools and skills needed to tackle the problem. It seems unlikely that the same distinction would be relevant in manufacturing. It is true that when buying a good one can get information on how it is being produced, but this is usually to address people‘s safety, environmental or dietary considerations and not in order to enable a customer to produce it herself (there can only be instructions for use of an already existing product).

Due to the intangible nature, high information content and the close user-producer interactions in services, the problems with ownership rights may arise. This is especially relevant for knowledge-based services (like technical consultancy) (Evangelista 2000). Both the producer and consumer may view themselves as being co-producers of new expertise and thus

[22] Pasinetti (1981) states that as per capita incomes grow, consumers' demand “becomes dependent less and less on their instincts and more and more on their *knowledge*” (p.75); and this knowledge can be acquired both from external information and from experience. Although this holds true for goods as well, it is possible to underline that given a higher degree of contact between consumers and producers in services than in manufacturing, service producers act as a direct (non-advertising) source of knowledge on possible new preferences more often that goods producers.

having a right for benefits it may yield. Related to this is the issue of liability -- if producer and consumer jointly design a product, who (if anyone) is liable if it does not perform well or as planned? Knowledge transfer can be blocked by anticipation of such problems.

Knowledge intensive business services (KIBS)

KIBS are private companies and organisations which strongly rely on professional knowledge, related to specific (technical) field and which provide intermediate, often knowledge-based products and services (Skogli 1998). They include computer, engineering, advertising, R&D, accounting, management consultancy and some other services. Sometimes a narrower group of "technology-related" related KIBS is identified separately, which includes: computer and related IT services, the private part of "research and development" as well as architectural and engineering activities and related technical consultancy (Skogli 1998).

KIBS help companies in manufacturing and services sectors to solve everyday / routine production problems and also to innovate. In Norway, for example, the 1993 Community Innovation Survey (CIS) for this country has shown that 11% of respondents in manufacturing companies pointed to consultancy firms as the source from which new technology originated (p.6).

Knowledge transfer between service firms themselves is not uncommon. According to den Hertog and Bilderbeek (cited in Skogli 1998), "more than half of the services provided by engineering and other technical consultancy firms… are used by business services" in the Netherlands (p.7).

Technology-related KIBS are more useful for manufacturing and "technical" part of the services (software development, engineering and R&D), whereas KIBS in a broader sense are useful for both sectors to approximately the same degree.

Human capital mobility

The value of "human capital mobility" as a knowledge transfer channel is based on the fact that human beings are "carriers" of tacit knowledge, which is often unique and inseparable from its holder. Literature exists which shows that this tacitness sometimes manifests itself in the difficulties which firms face when they try to find replacement for their former employees, who possess specific expertise. Tacit knowledge does not only have value in itself -- it can also help the diffusion of codified knowledge in innovative activity (European Commission 2000).

Both manufacturing and services firms can benefit from well-organized human capital mobility -- the one which can be achieved by "stimulating co-operation among firms in their knowledge activities, or by facilitating senior knowledge workers visiting, for a medium period, other firms, universities, or research institutes" (European Commission 2000, p.7).

For a small country like the Netherlands this channel of knowledge transfer is very important with respect to both major dimensions of human capital mobility. One is getting access to new expertise by Dutch specialists going abroad, and the other is receiving new knowledge from foreign experts coming to the Netherlands. Small countries (just like small and medium-sized firms) suffer from the fact that they "often lack sufficient critical mass or breadth of high-level technical skills" (Davenport and Bibby). Human capital mobility in the two dimensions identified above can be a solution to the problem of undersupply of technical and non-technical skills by the national economy.

Patents

Patents can be seen as a means of knowledge transfer due to the disclosure requirement.[23] When applying for a patent an inventor has to submit the description of his invention, which thus becomes a source of new knowledge for others. However, not all firms consider patents to be an important source for them. The results of the European surveys of innovative firms about the importance of 11 external information sources for their firm's innovation activities during 1990 to 1992 show that "patent disclosures" are more likely to be used by large, R& D performing firms (34% of them state that they find patent disclosures of value) than by SMEs (firms with 10 to 499 employees) (Arundel 2000).

Patenting is only one of possible knowledge transfer channels, and it is still more relevant for manufacturing firms. It has been shown in section 1.2. that patents in general are not a preferred tool for intellectual property protection in services and that software is a notable exception so far. It became patentable since mid-1980s[24] and firms in this industry can now be using patent information as a channel for knowledge transfer at nearly the same level as the manufacturing firms.

Internet

Popularity of Internet as a channel of knowledge transfer is constantly growing. It serves the needs of different users. Our focus is on how companies in manufacturing and services can receive and transmit knowledge through this medium to their own benefit and that of their customers.

Intel, for instance, has set up non-transactional Web sites which provide its customers with product and technical information and Web-based training (Patel and McCarthy). Thus, it has its Online Learning Centre (OLC), which enables individuals from all over the world to take Intel training courses online or offline through downloading the Intel OLC Desktop Companion software. The available courses are many, and they provide one with materials and exercises to help people to apply knowledge and skills they learn at them.[25] Another interesting aspect of the knowledge transfer by Intel to its customers through Internet is that it offers recommendations for PC configurations for those who contemplate buying an Intel processor-based PC. A person can fill in an online form, stating his or her purposes of making the purchase (e-mail, work-related applications, playing on-line games, etc.) and within seconds they get recommendations as to which configuration would best serve their needs. It is a marketing tool of course, but it conveys important knowledge by freeing a customer from thinking over dozens of possible configurations himself.

Another example is that of Amazon.com: when someone orders a book, Amazon.com provides him or her with a list of related books ordered by other customers, who bought the same book (Patel and McCarthy 2000). In this way customers get additional knowledge about books which may suit their interests apart from the one that they ordered.

The importance of this channel for manufacturing and services seems to be approximately the same. This can be explained by the fact that globalization has affected the functioning of both sectors, and Internet is an excellent means for reaching the world-wide information and knowledge sources (on economic situation at different markets, competitors and customers, etc.) within short time and with relatively low cost.

The analysis carried out above makes it possible to summarize the channels of knowledge transfer (see table 4).

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[23] Disclosure defines "a minimal level of technical knowledge that should become available for the public" (Cowan and Harison 2000: p.16).

[24] For detailed analysis of the evolution of software intellectual property regimes see: Cowan and Harison (2000).

[25] See: http://channel.intel.com/training/olc/index.htm
http://channel.intel.com/training/olc/dc/overview.htm

Channel	Manufacturing	Services
Suppliers	Suppliers are a source of knowledge embodied in machines and/or related to machines usage and maintenance.	Suppliers of ICT-related capital goods are especially important in services, as much innovation in services is mediated by ICT.
Foreign direct investment	Access to new/complementary local knowledge and skills is gained by establishing presence abroad.	In services this channel is even more important than in manufacturing due to specificity of the mode of service delivery.
Licensing	Both the technology supplier and the technology recipient gain access to each other's knowledge (more technological in nature in the case of the latter and more 'local market - related' in the case of the former).	Franchising as a form of licensing is a transfer channel in non-technical services. Licensing as such is more relevant for software industry than for other services.
Links with academy	*Technical* expertise from academy is most relevant for manufacturing.	Health, banking and logistical services often innovate with the help of academic knowledge; other services are less likely to use academic research on a wide scale.
Training	Training is important, but not to the same extent than in services. Manufacturing companies do not accentuate training in interpersonal skills. Technical skills are a priority.	This channel is more important for services due to employees' direct involvement with customers in most services. Training in interpersonal skills is highly important in services.
Intra-company strategic knowledge manage-ment	Intranet and technologies alike enable efficient communication amongst employees, exchange of message and data files, participation in computer conferencing and so on.	Service firms practice intra-firm knowledge and information exchange by electronic means to the same extent as manufacturing firms.
Producer-consumer two-way knowledge transfer	Producers often train customers to use complex equipment. Consumers' knowledge can be involved at the design stage for an individualized order.	This channel has a greater importance in services as compared to manufacturing, since consumers are often both "co-producers" and "co-innovators".
Knowledge intensive business services	Manufacturing firms use KIBS and T-KIBS in general rather extensively.	KIBS in a broad sense can be seen as useful for all types of services, whereas T-KIBS are mostly needed in technical services such as computer, engineering and others.
Human capital mobility	This is a transfer channel for diffusion of tacit knowledge which is valuable in itself and also for spread of innovative codified knowledge.	This channel is of great importance for services as well: tacit knowledge in terms of interpersonal skills and know-how generally are crucial for many services.
Patents	Due to "disclosure" requirement patents become a means of knowledge transfer from inventor to the public (other firms and so on).	This channel is less important for service industries. Software is so far the only service industry where patents are a channel of knowledge transfer
Internet	Manufacturing firms use Internet to receive information and knowledge about suppliers, competitors, potential customers and regulations.	Service firms use Internet for the same purposes and to the same extent. An additional function of *online* service delivery is present in services (this can coincide with knowledge transfer as in online consultancy, for instance).

Table 4: The mechanisms of use of knowledge transfer channels in two sectors

2.3. Institutional settings for knowledge transfer in services

Economists often speak of a firm‘s “macro-environment“ which includes a wide variety of actors, regulations and norms. A stable, predictable and appropriately liberal macro-environment is a powerful impetus for knowledge transfer, because it decreases risks and uncertainty involved in the process for both knowledge holders and knowledge recipients. Attitudes, in their turn are an important factor behind the success of knowledge diffusion.

In particular, participants in the knowledge transfer process want to be guaranteed that:

a) services are traded freely and fairly around the globe. Otherwise (if barriers to trade exist) some transfer channels cannot operate;

b) there is enough transparency as regards national policies in economic and technological spheres relevant for technology and knowledge transfer. Otherwise (if the "rules of the game" are vague) uncertainty may prevent knowledge holders from operating in a particular country;

c) intellectual property rights of knowledge holders are protected;

d) human capital mobility is encouraged as the means of getting access to valuable foreign expertise.

1. International dimension

No country is completely autonomous. International laws and conventions influence its policy-making activities. Knowledge transfer policies are not an exception.

The General Agreement on Trade in Services (GATS)

As was mentioned above, foreign direct investment is one of the knowledge transfer channels used by both manufacturing and services sectors. For this channel to function properly and for knowledge to flow freely it is necessary to create and maintain a favourable regime for service providers as far as their functioning abroad is concerned. There are three main aspects of the GATS’ regulations which are important for ensuring effective knowledge transfer in services through the FDI channel: market access commitments, transparency, and recognition of qualifications.

Market access commitments

The agreement allows “to identify which markets are open to foreign providers and to be sure that same market will remain open in the future” (European Commission, Date unknown: p.1). By making a “market access commitment” for a particular service sector a country allows foreign service providers (for instance, banks) to operate on its domestic market. An important feature of such commitments is that “they can only be modified after negotiations with affected countries”, therefore, they are “virtually guaranteed conditions” for doing business in a particular sector (WTO 1999: p.2). The countries’ commitments can also list market access limitations (for example, if the number of licenses issued for foreign businesses is limited) or exceptions to the national treatment principle (for instance, if foreign banks are allowed only one branch, whereas domestic banks are allowed many branches) (ibid.). Even in these latter cases, having *explicit* “rules of the game” is beneficial for foreign investors.

By providing market access for a foreign service supplier (either in its full or a ‘limited’ form as described above) a country is likely to receive new investment and enjoy many useful “spillovers” from it, including knowledge-related ones.

Transparency

Transparency is an important pre-condition for reducing the uncertainty of potential knowledge holders who are considering doing business in foreign markets, especially as far as such delicate and legally sophisticated phenomenon as knowledge and technology transfer is concerned. The rationale behind this principle is that "traders will be badly handicapped in doing business in a foreign country unless they know what laws and regulations they face" (WTO Secretariat 1999: p.5). One of the GATS' requirements is that "governments must publish all relevant laws and regulations" and that "they have to notify the WTO of any changes in regulations that apply to the services that come under specific commitments" (WTO 1999: p.3).

Recognition of qualifications

This type of regulation is also highly important for the processes of knowledge transfer. It is of essence for both the service providers (doctors, lawyers, etc.) who undertake to deliver services abroad, and for recipient countries who thus gain access to their expertise. GATS specifies that when "two (or more) governments have agreements recognizing each other's qualifications (for example, the licensing or certification of service suppliers)", other members "must also be given a chance to negotiate comparable pacts", and that "the recognition of other countries' qualifications must not be discriminatory, and it must not amount to protectionism in disguise" (WTO 1999: p.3). It is useful to note in connection with this issue that explicit regulations guarding against excessive licensing, qualifications and technical standards requirements have already been developed for the accountancy sector. On 14 December 1998 The WTO's Council for Trade in Services adopted the "Disciplines on Domestic Regulation in the Accountancy Sector", developed by the Working Party on Professional Services (WTO News 1998), which encompasses provisions concerning "the administration of licensing requirements, qualification requirements and procedures, and technical standard for the accountancy profession" (p.1). The key focus here is to ensure that the requirements and the standard are not too trade-restrictive and that there is *transparency* (public availability of the names and addresses of licensing authorities, requirements and procedures for obtaining any licenses or professional qualifications, information on technical standards and some other issues) (p.3).

The World Intellectual Property Organization (WIPO)

The WIPO plays an important role in protecting rights of inventors, thereby facilitating access to and dissemination of new knowledge embodied in intellectual property products. In the new economy the need for intellectual property protection gets a new -- "digital" -- dimension in addition to the traditional one.

Given the growing quantity of services offered on-line one can expect that the amount of knowledge transferred by on-line service encounters will increase as well. This seems especially relevant for 3 types of information-intensive services which are transportable and intangible: data services (for instance, database management), information services (for instance, financial services) and knowledge-intensive services (for instance, consulting), which can be delivered (totally or partly) electronically (RESER 2000: p.4). Intellectual property involved in these services requires protection. In connection with this it seems particularly relevant to mention the Digital Agenda adopted by WIPO in September 1999, which serves the purpose of "adapting intellectual property law to the digital age" (WIPO 1999, p.26). Thus it envisages implementing the WIPO Copyright Treaty (WCT) and the WIPO Performances and Phonograms Treaty (WPPT) before the end of December 2001. It also envisages "progress towards a possible international instrument on the protection of databases" (WIPO, Date unknown, p.1). The Agenda also focuses on dispute resolution and recognizes the need for "effective on-line systems to resolve disputes arising out of electronic commerce and involving intellectual property" (WIPO 1999, p.26).

International conferences

International conferences are an important part of knowledge-generation and knowledge-transfer infrastructures in both manufacturing and services. They can be very diverse in terms of organizers, participants, agendas, but they usually have an immense potential to contribute to a better understanding of what is needed to successfully produce and manage service businesses, especially in the context of the new economy. For instance, in September 1999, WIPO organized the International Conference on Electronic Commerce and Intellectual Property in Geneva, where more than 750 participants were present, including those from the WIPO member States, intergovernmental and non-governmental organizations and industry (WIPO 1999). Another example could be the International Conference on "The Economics and Socio-Economics of Services", Lille-Roubaix, held in June 2000. Amongst many important issues discussed at the Conference there were those related to service jobs and skills, innovation in services, knowledge-intensive business services. Such forums (especially when their results become accessible to practitioners) help to ensure that the knowledge-related aspects of the functioning of the service sector are not only given attention but are a permanent focus of search for improvement.

2. European dimension

eLearning initiative

Knowledge transfer in the new economy is undergoing "digitalization" through the use of information and communication technologies (access to and use of many knowledge sources are increasingly provided by electronic means). Therefore, the initiatives aimed at improving the IT infrastructure (including IT skills) are important to consider.

Thus, the eLearning initiative was adopted by the European Commission in May 2000. According to Commissioner Viviane Reding, eLearning has several objectives, including: "equipment objectives" (focusing on providing all schools in the EU with an Internet connection); "training objectives" (meaning that "…'digital culture' must be an integral part of teacher training, while pupils, apprentices and students must learn to use new technologies critically") and development of "vocational guidance services" in the area of ICT with the development of "educational and cultural multimedia contents industry and services" linked to this third category of objectives (EUR-OP News 2000). The resources allocated through the Structural funds and EU programmes can be used to develop education and research in the e-fields.

Such initiatives provide important guidelines for national governments as to how to improve the "digital culture" in their societies.

Research networks of European experts

Research networks serve to produce knowledge drawing on expertise of prominent researchers. One such group is the European Network for Communication and Information Perspectives (ENCIP), aiming to conduct research on problems related to development, diffusion and use of information and communication technologies. It describes itself as a "European Economic Interest Grouping" and combines members and partners from Belgium, France, Netherlands, Sweden and some other countries.[26]

Research networks organize their activity in different forms, including co-publications. It is worth noting that 60% of all international co-authored papers involving Dutch researchers was with colleagues from other EU member states. The enhancement of collaborative links with Germany and Belgium (the Netherland's neighbouring countries) makes a key contribution into what is called "an on-going process towards further "Europeanization" of Dutch research" (ibid.).

For a small country like the Netherlands participation in the external research networks is especially valuable, since it helps to bring in new knowledge, the creation of which

[26] For information on ENCIP please refer to the web-page: http://www.encip.org

by the country's own efforts and limited resources could be difficult and/or would take much longer.

3. National dimension

The national government is an important element of the institutional settings of knowledge transfer. Its main function is to ensure that new knowledge is accessed (and/or created) and exploited continuously and systematically by both public and private institutions. This can be achieved through a number of innovation (and learning) activities, as well as through liberal and transparent trade and investment policies.

Innovation policies

Effective system of intellectual property rights protection motivates creation and diffusion of new knowledge. Therefore, a government can stimulate innovativeness of local firms and the knowledge transfer from foreign knowledge holders by ensuring such protection on its territory. A country's membership in the World Intellectual Property Organization and its being a signatory of international conventions in the sphere of intellectual property protection is a sign that it is a part of the overall regime and intends to adhere to its principles. For instance, the Netherlands is a member of the WIPO, is a signatory of the Paris Convention for the Protection of Industrial Property and a signatory of the European Patent Convention (US Embassy 1999, p.3). Guarantee of intellectual property protection is especially important for such transfer channel as *licensing*, since it involves extensive technology and knowledge flows.

Informed policy-making requires up-to-date knowledge about the innovation patterns in service industries. An improvement of statistical data collection in this sphere is highly important. Regular *innovation surveys* help to get a clear picture of how innovative different sectors of the country's economy are and what obstacles to innovation exist.

An emphasis on *training in information technology skills* at all levels (school, college, work-place) is also important. Coupled with *increased investment in information and communication technologies*, the high-quality IT training of employees can increase the absorptive capacity of service firms (especially small and medium ones) in relation to new knowledge coming into the sector (European Commission 2000).

Liberal and transparent trade and investment regimes

The OECD study (Pilat 2000) suggests that internationalisation of the services sector "would promote the diffusion of ideas and innovative concepts" (p.30). Indeed, such internationalisation, enabled by liberal and transparent trade and investment regimes, can encourage cross-border co-operation in different spheres, including knowledge. As it was mentioned above, liberal FDI policies encourage knowledge transfer through the FDI channel; liberal trade regimes improve links with foreign suppliers and consumers and can contribute to enhancing knowledge transfer through these channels too. By contrast, highly protectionist, unpredictable environments deter foreign businesses (potential knowledge holders), because of the high risks they see. For instance, it has been noticed that "regulatory risk" described as "never knowing who will make what policies tomorrow", as well as some protectionist tendencies are unattractive features of the otherwise "tempting" telecom market of China (Economist 2000b).

In the Netherlands, for instance, 100 percent foreign ownership is allowed in the sectors open to foreign investment, and the rules on mergers and acquisitions are known to be "nondiscriminatory" (U.S. Embassy 1999: p.2), and in general its trade and investment policy is said to be "among the most open in the world" (p.1).

Creating favourable conditions for labour mobility is also a pre-condition for success in nation-wide knowledge transfer. It has become recognized that since human beings are

"carriers" of tacit knowledge, which plays an important role in innovation and thus economic growth, workers' mobility (in the sense, for instance, of their ability “to sojourn in other locations”, rather than “relatively rapid job turn-over”) can facilitate diffusion of tacit knowledge (European Commission 2000, p.15).

Knowledge can diffuse amongst country nationals (either those who have undergone training in different domestic locations or those having spent some time training abroad), as well as from foreign nationals coming into the country and sharing their expertise. For the Netherlands this latter type of diffusion seems to be especially relevant in ICT: in 2002 there will be “an estimated shortage” of 58.000 ICT-experts, and there is an increasing number of foreign ICT-specialists coming to the country, especially from the United States and the U.K. (Deen 2000). Policy-makers should therefore aim at creating favourable conditions (tax benefits, simplified visa procedures for visa nationals, larger information dissemination about the existing and new opportunities for foreign knowledge holders, etc.) to attract valuable foreign expertise.

Section 3. Impact of information and communication technologies (ICTs) on knowledge transfer in services

Information and communication technologies have a decisive influence on the direction and the pace of service sector development, including the processes of knowledge transfer. Firstly, they trigger the emergence of new types of occupations, and therefore competencies relevant for the e-era. Secondly, they contribute to codification of knowledge, which shapes the latter into a more explicit, well-articulated form. Thirdly, they improve inter- and intra-firm communication.

Highly important for a small country like the Netherlands is the fact that ICT help to attract foreign expertise due to "tacit knowledge at a distance" possibilities.

Information and communication technologies (ICT) affect many aspects of the service delivery process. Since knowledge transfer is involved in practically any service transaction (to a greater or to a lesser extent), it is affected by the impact of ICTs as well. Indeed, improvement of the mode of a service delivery (through electronic channels) can result in more effective transfer of knowledge relevant to a particular transaction. Let us consider the impact of ICT in more detail.

3.1. New content of knowledge

Information and communication technologies trigger the development of new competencies typical of new economy: those of web-site designers, web consultants and Internet access-providers. For instance, one can witness the emergence of "a new breed of consultant", that is "the professional service firm that specializes in creating and implementing Internet strategies" (Fitter 1999, p.2). These consultants help their clients to put their businesses on-line in an appropriate way. This task is known to be more complicated for traditional (sometimes called "bricks-and-mortar"[27]) companies since they are "constrained by existing processes and relationships and encumbered by outdated business assumptions" (Fitter 1999). One can think of, say, a traditional book-store or travel agent who has previously offered "face-to-face" service only, and has tailored both its strategy and its tactics to this way of doing business. Web-consultants assist such companies by transferring to them their knowledge of the on-line domain.[28] Since consultancy is a knowledge-intensive service, the process of the knowledge transfer coincides in this case with the process of the service delivery.

3.2. Growing codification of knowledge

In order to be transferable, knowledge needs to be clearly expressed in some type of code. ICTs assist in knowledge codification. One can distinguish between two main types of

[27] Evans and Wurster, for instance, use this term while discussing the e-retail operations of traditional retailers (1999: p.85).

[28] It must be noted, however, that many on-line consultancies are reported to have experienced serious decline lately: the share prices of many of the top 15 listed Internet consultancies have fallen by 90% or more this year. The reasons for this are said to be as follows: "reckless overexpansion, profligacy, poor management, lack of focus and hype" (Economist 2000a). So, the future of the business seems to be a bit uncertain.

codification: traditional (verbal or paper-based); and ICT-induced. The former category comprises all forms of knowledge turned into explicit (verbal or written) instructions, including, for instance, books and journals, technical specifications and operating manuals, etc. The latter are mostly electronic "codes", like those for instance which help to replace or, at least, to imitate certain human characteristics (memory or others) on computer diskettes, in calculators' functions, or in telephone answering machines. For instance, in order to borrow a book in a library automatically one has to follow certain steps which the machines is "telling" and "showing" him. The knowledge of how to operate this machine (a service producer knowledge) has thus been codified and put as a text on the screen to be transferred to a client.

It is important to emphasize that complete codification in services is unlikely (Petit and Soete 1998), since the improved access to information networks does not eliminate the importance of people's skills and experience. For instance, one can familiarize himself with legal literature on the Internet, but in many cases this cannot replace the advice of an experienced lawyer.

3.3. Improved inter- and intra-firm communication

Early IT advances have made b-2-b possible. The fact that knowledge codified through use of electronic media can be transmitted "over long distances and within complex networks, at very limited cost and high speed" (Cowan and Foray 1997: p.603) improves communication and the resulting information/knowledge transfer patterns between as well as within the firms. Amongst the main service sector applications of IT one finds "electronic mail", "computer conferencing", "advanced telecommunications (message forwarding, cellular radio, DBS, novel local/mobile communications" and some others (Miles 1988 et al.), which are the basis for improved (in times of money, cost and some other parameters) communication.

E-mail, mobile telephones, laptops and other high-tech devices help service firms to communicate with their partners (suppliers, clients and alike), to store and/or deliver messages instantly and to communicate in real time. Due to a large variety of geographical locations global service corporations need technologically advanced means of inter-company communications. The business-to-business electronic commerce (B2B EC) platform enables co-operation between headquarters and subsidiaries by providing e-mail, chat rooms, online corporate data access all over the world.

Intranet and extranet are two key technologies for B2B EC. Multinational service firms use them on a large scale. For instance, Marriott International, which has 1.500 hotels in 50 countries adopted *intranet* for its 20.000 management employees world-wide, which was then extended to an *extranet* to deal with franchisees (Turban et al. 2000).

Information most frequently appearing on the Intranets includes: "corporate policies and procedures, document sharing, corporate phone directories, human resource forms, training programs, customer databases, product catalogues and manuals, data warehouse and decision support access, image archives, purchase orders, enterprise suits, and travel reservation services" (Turban et al. 2000: p.244); extranets, in their turn, provide the following benefits in terms of enhanced communications: "improved internal communications", "improved business partnership channels", "effective marketing, sales, and customer support", "collaborative activities support" (p.253).

In cases where the processes of knowledge and service delivery coincide (operations of knowledge-intensive business services, for instance) diffusion of computer networks and electronic communications media improves both. The remote access to KIBS made possible by ICTs create conditions for global scope of operations of these firms to the extent that the formation of "multinational knowledge-intensive business service firms" is forecast (Antonelli 1999: p.253).

3.4. Implications for the Netherlands

One of the challenges which small countries face is that of a small domestic market, that does not allow them to fully exploit the advantages of economies of scale and scope, which some services (especially professional and educational ones) are subject to. Their strong orientation towards foreign markets is often due to this reason.[29] However, not all services can be supplied on a global scale, because their production and consumption cannot be separated. One way to overcome this barrier is by means of foreign direct investment (by establishing local presence abroad). However, ICTs offer another effective means of increasing tradability of services -- they make it possible to deliver services in various places simultaneously to their production (Petit and Soete 1998). Knowledge codification (including its storage on electronic media) and advanced mode of knowledge transfer (its fast and inexpensive transmission through IT networks) form the basis of this development. It is especially the case where the "substance of the service consists of information and messages - numerical, textual, voice or image" - teleshopping, telebanking, on-line hotel reservation and some other service systems have recently emerged through telecommunications lines (Miozzo and Soete 1999: p.14).

Apart from the enhancement of foreign trade possibilities, ICT help the Netherlands to attract foreign high-skilled expertise, because it takes long for a small country to create indigenous stock of highly qualified human capital. In addition, ICT enable the "tacit knowledge at a distance" phenomenon, when, for instance, video-conferencing sessions help individuals to share their knowledge, correct each other mistakes, indicate the core issues with respect to the matter under consideration without leaving their offices (often separated by thousands of kilometers). This issue remains not well-developed yet. It involves large infrastructure capacity to permit real-time transfer of voice, image and data simultaneously.

[29] On this and other specific problems of small countries see, for instance, Streeten (1993).

Section 4. Conclusions. Recommendations for policy-making in relation to the knowledge transfer in the services sector in the context of the new economy.

The analysis above makes it possible to draw the following conclusions:

The main differences in the mechanisms of knowledge transfer in manufacturing and services lie not in the nature of the transfer channels, but rather in the degree of their appropriateness and intensity of use.

Existing similarities in knowledge transfer in the two sectors are largely due to their embeddedness in the same large economic and knowledge-generating systems as well as due to some "universal" features of knowledge as a social phenomenon.

Borders between the two sectors are blurring due to expansion of information and communication technologies.

The most typical knowledge transfer channels used in both sectors are those related to suppliers, foreign direct investment, licensing, links with academy, training, intra-company strategic knowledge management, producer-consumer two-way knowledge transfer, knowledge intensive business services, human capital mobility, patent and Internet. Training, producer-consumer two-way knowledge transfer and foreign direct investment can be seen as having a special importance and relevance for services.

National policy decisions in relation to knowledge transfer in the services sector in the context of the new economy should include activities related to promoting innovation, scientific co-operation, trade and investment, as well as human capital mobility in this sector.

The analysis of the relevance of the knowledge transfer channels in manufacturing for application in services carried out above makes it possible to make the following concluding remarks.

Firstly, given the fact that knowledge transfer in both sectors is taking place in the era of the new economy characterised by wide and fast spread of new technologies (especially ICT) which lead to an increasing convergence between goods and services, the channels of knowledge transfer in manufacturing and services are very similar. In fact, it is possible to state that the main differences lie *not* in the *nature* of the channels, but in the *degree of their appropriateness* and *intensity of use.*

Similarities present in knowledge transfer processes are to some extent also based on the sectors' embeddedness in the same large economic and knowledge-generating systems as well as on some "universal" features of knowledge itself (it can be theoretical and empirical, modern and traditional, tacit and codified, general and specific in both sectors).

Our analysis has identified eleven most typical knowledge transfer channels used in both sectors and these are presented in table 5 below. They are graded as "less important" ('m' or 's') "average" ('M' or 'S') and "more important" ('M' or 'S') for manufacturing and services respectively. It is necessary, however, to emphasize once again that complete generalizations are not feasible, since both sectors are very heterogeneous.

Channel	The channel's relevance for manufacturing and services
1. Suppliers	m, s
2. Foreign direct investment	m, s
3. Licensing / franchising	m, s
4. Links with academy	m, s
5. Training	m, s
6. Intra-company strategic knowledge management	m, s
7. Producer-consumer two-way knowledge transfer	m, s
8. Knowledge intensive business services	m, s
9. Human capital mobility	m, s
10. Patents	m, s
11. Internet	m, s

Table 5: Channels of knowledge transfer in manufacturing and services

The following five groups of channels emerge from this table:

1) channels of average importance for manufacturing and services (suppliers, licensing / franchising, intra-company strategic knowledge management, knowledge intensive business services, human capital mobility and Internet);

2) channels of average importance for manufacturing, and of more importance for services (foreign direct investment and training);

3) channel of average importance for services, and of more importance for manufacturing (links with academy);

4) channel of less importance for manufacturing and of more importance for services (producer-consumer two-way knowledge transfer);

5) channel of less importance for services and of more importance for manufacturing (patents).

Under such conditions, the policy-makers' task becomes both easier and more difficult. Similarity of transfer channels permits the application of some of the traditional (manufacturing-related) forms of the government intervention to facilitate current and future knowledge flows in the services sector. These are regulations concerning trade and investment regimes, support of the national education system, financial assistance for development (or acquisition) and implementation of new technologies and elaboration of innovation policy in general, creating the transparent and motivating regulatory framework for national and foreign knowledge providers (including a sound system of protecting intellectual property rights). But the critical feature of this similarity it that it is not absolute, since the convergence between goods and services can never be complete. For instance, self-service (or "self-production") is not possible in manufacturing (Sundbo 1994). This "incomplete" similarity

makes it necessary in policy elaboration to take into consideration some nuances (determined by the specificity of services) which is the 'difficult' side of it.

Such peculiar features of the services sector as its heterogeneity in terms of size and service content, client profiles, sources of technical change, and the degree of technical sophistication of producers and users, combine to create several challenges for knowledge transfer and innovation. Many small enterprises have no resources to devote explicitly to innovation; we observe many examples of "non-technical" innovation; vigorous debate over reforms of the intellectual property rights regime; and a shortage of ICT skills.

The rapid emergence of online business technologies has brought both new market opportunities (truly "global reach" for digital service providers) and new problems (in particular concerns about copyright violations and consumer privacy on the Internet). Government policy in response to these challenges should involve a complex of economic, technological and legislative initiatives, aiming at supporting innovation in small and medium-sized service firms, identification of priority areas for intellectual property and personal freedoms protection in the emerging digital dimension, and continuous support for ICT infrastructure including ICT education and training policies. For services with high technical content (software, engineering, telecommunications) strengthening links with academic research can be beneficial. Governments can promote the formation of "techno-economic networks" between public research institutions and knowledge-intensive business firms. A 1992 OECD study gives as policy examples tax incentives for employers to hire researchers linked to the network of university researchers; or providing support for creation of "science parks" within which the links between public research centres and private firms can be fostered. Such measures seem especially relevant today when the emphasis in innovation activities has shifted from so-called "linear research-to-marketing" model to "interactive" models, which presuppose the existence of "feedback effects" between different stages of innovation process. Feedbacks and knowledge flows among agents located in different parts of the innovation web are crucial for good innovation performance. Thus links between science and technology, research and innovation, design and production, not to mention links among science, technology and society, all deserve attention from policy makers. In the Netherlands, where the institutional structure of science policy is characterized by a high density of organizations mediating relations among government, society and science (Van der Meulen 1998), these organizations can be assigned special tasks for strengthening links between technical service providers, academic researchers and governmental bodies. These functions can be given to existing advisory research councils.

The general recommendations for policy-making in relation to the knowledge transfer in the Dutch services sector in the context of the new economy include:

- ensuring (largely through the Bureau voor de Industriele Eigendom) that the country maintains its sound[30] intellectual property protection regime for both

[30] A debate is currently underway as to what kind of IPR regime (if any) is needed for knowledge protection in services: one ensuring more appropriation or less, and what particular types of IPR are most relevant. One group of issues is related to **what** is actually protected (the scope of protection): the implicit knowledge underlying the physical artifacts (as in patents, for instance) or the external "codified" form (as in copyrights and trademarks). It could be argued that trademarks and copyrights are sometimes more appropriate than patents; on the other hand, they can also be more restrictive, granting protection for substantially longer periods. Both have, therefore, negative implications for overall "societal" welfare, which often are not fully taken into account in policy proposals. Therefore, when referring to the "sound" regime for intellectual property rights protection we have in mind a regulatory framework which provides a "sound" **balance** between the economic incentives of knowledge holders to innovate, and the improvement of social welfare as a result of knowledge spillovers . The particular features of such a regime are, however, still under a debate (see, for instance: Cowan and Harison 2000; Dolsma and Soete 2001, forthcoming). Useful insights into the "trade-off" between incentives which patents provide for inventors (by granting them monopoly over their invention) and welfare problems which patents may cause (by restricting competition), as well as into the "optimal" design of patents are provided, for instance, in Verspagen (1999), although he does not tailor his analysis specifically to the services sector.

national and foreign businesses and maintains it in accord with international and European developments in this area;

- carrying out regular innovation surveys in the service sector;
- investing further in the country's ICT infrastructure in the broadest sense, including emphasis on ICT training at school and university levels[31];
- supporting the participation of national scientists in international networks of experts and the activities thereof; ensuring the diffusion of new knowledge gained through such networks to service businesses (by acting as an intermediator to strengthen links between private business and academy);
- training of *future* scientists is also an issue of no small concern for policy-makers - student internships abroad, practised by Dutch universities, should be considered as a welcome and indispensible part of enhancing the nation's general stock of knowledge capital and that of the services' sector in particular; Dutch embassies abroad can help Dutch universities to establish contacts with foreign firms and organizations which would be interested in having Dutch students working for them during their internships.
- knowledge transfer is a two-way process; therefore not only the foreign (academic, research and business) experiences of the *Dutch* nationals, but also participation of *foreign* scientists and innovators in national scientific endeavours and programmes should be encouraged; foreign specialists are often the carriers of specific tacit knowledge and their presence in the country can be conducive for successful introduction of inventions (technical or otherwise), because in many research and business fields "show-how" is needed to supplement "know-how" (Roberts 2000). Government policy can be directed towards providing tax and other financial incentives to foreign specialists, speeding up some of their visa procedures (where applicable), carrying out systematic information campaigns (in mass media and on the Internet) on the investment and research possibilities in the Netherlands.
- public knowledge institutions may consider the possibility of publishing information on legal procedures, probation opportunities (including "Most Needed Skills" page) and other matters of interest for foreign knowledge holders in a special Newsletter "Knowledge Transfer in the New Economy" or the like.
- maintaining liberal and transparent trade and investment regimes.

The governments have a right to restrict the "appetites" of different social actors as far as their political, financial and some other ambitions are concerned. For instance, we all pay taxes and are entitled to have passports. However, there seems to be one social phenomenon where this principle does not apply: the appetite for Knowledge gained by legally and socially acceptable means is to be encouraged. Just as a healthy individual has no problems with appetite, a healthy society is always knowledge-hungry!

[31] The need for governments "to pay sufficient attention to ICT skills in education and training policy" has already featured in policy recommendations on the OECD level (see, for instance: Pilat 2000).

References

Aharoni, Y. (1991). Education and Technology Transfer: Recipient Point of View in T.Agmon and Mary Ann von Glinow (eds.). *Technology Transfer in International Business*. New York and Oxford: Oxford University Press.

Andersen, B. and Howells, J. (1998). *Innovation Dynamics in Services: Intellectual Property Rights as Indicators and Shaping Systems in Innovation* / CRIC Discussion Paper No.8. CRIC, The University of Manchester.

Antonelli, C. (1999). The Evolution of the Industrial Organisation of the Production of Knowledge. *Cambridge Journal of Economics* 23 (2): 243-260.

Arundel, A. (2000). *Patents - the Viagra of Innovation Policy?* Internal Report to the Expert Group in the Project "Innovation Policy in a Knowledge-Based Economy". Maastricht: MERIT.

Asheghian, P. and Ebrahimi, B. (1990). *International Business*. Grand Rapids: HarperCollinsPublishers.

Baaijens, C., Cluitmans, M.M., Gelderblom, A., Huitema, R.J., Waterreus, J.M. (1998). *Alternative Approaches to Financing Lifelong Learning* / Country Report on the Netherlands. Max Goote Expert Center and Netherlands Economic Institute.

Bertrand, O. and Noyelle, T. (1988). *Human Resources and Corporate Strategy: Technological Change in Banks and Insurance Companies: France, Germany, Japan, Sweden, United States.* Paris: OECD.

Bunge, M. (2000). Ten Modes of Individualism - None of Which Works - And Their Alternatives. *Philosophy of the Social Sciences* 30 (3): 384 - 406.

Chase, Richard B. (1978). Where does the customer fit in a service operation? *Harvard Business Review* 56 (6): 137-142.

Cohen, Wesley M. and Levinthal, Daniel A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly* 35 (1): 128-152.

Cowan, R. and Foray, D. (1997). The Economics of Codification and the Diffusion of Knowledge. *Industrial and Corporate Change* 6 (3): 595 – 622.

Cowan, R. and Harison, E. (2000). *Intellectual Property Rights in a Knowledge-Based Economy*, MERIT Study prepared for Adviesraad voor het wetenschaps en technologiebeleid (AWT).

Darr, Eric D., Argote, L. and Epple, D. (1995). The Acquisition, Transfer, and Depreciation of Knowledge in Service Organizations: Productivity in Franchises. *Management Science* 41 (11): 1750-1762.

Davenport, S. and Bibby, D. (1999). Rethinking a National Innovation System: The Small Country as 'SME'. *Technology Analysis and Strategic Management* 11 (3): 431 - 462.

David, Paul A. (2000). The Digital Technology Boomerang: New Intellectual Property Rights Threaten Global "Open Science".

http://www-econ.stanford.edu/faculty/workp/swp00016.pdf

David, Paul A. and Foray, D. (1995). Dynamics of Competitive Technology Diffusion Through Local Network Structures: The Case of EDI Document Standards in Antonelli, C. *The Economics of Localized Technological Change and Industrial Dynamics*. Dordrecht: Kluwer Academic Publishers.

Davis, Audrey B. (1981). *Medicine and Its Technology: An Introduction to the History of Medical Instrumentation* / Contributions in Medical History, Number 7. Westport and London: Greenwood Press.

Deen, F. (2000). *Increasing Number of Americans in Dutch ICT Industry*. http: / / www.nfia.com / html / news / articles / news000823.html

Den Hertog, P. (2000). *Knowledge Intensive Business Services as Co-Producers of Innovation* / Proceedings of the International Conference "The Economics and Socio-Economics of Services: International Perspectives" (Lille-Roubaix, 22 and 23 June 2000), vol.2: 77 – 96.

Desmet, S., Van Looy, B., Van Dierdonck, R. (1998). The Nature of Services in Bart van Looy, R. van Dierdonck, P. Gemmel (eds.). *Services Management: An Integrative Approach. London: Financial Times Management*: 3-23.

Dolfsma, W. and Soete, L. (2001). *"Kennis op markten - Verkenning, en Betekenis voor Overheidsbeleid"*. WRR voorstudie (Kennisintensiveringsproject), forthcoming.

Dosi, G. and Marengo, L. (1999). The Co-evolution of technological knowledge and Corporate Organizations in Gambardella, A. and Malerba, F. (eds.). *The Organization of Economic Innovation in Europe*. Cambridge: Cambridge University Press.

Economist (2000a). *Consultant, Heal Thyself*, 9th December, p.92.

Economist (2000b). *The Minister of Arbitrary Power*, 9th Dec., p.94.

EUR-OP News (2000). *Commissioner Reding, what is eLearning?* No.2. P.1.

European Commission (2000). *Innovation Policy in a Knowledge-based Economy* / A MERIT Study Commissioned by the European Commission. Luxembourg: Office for Official Publications of the European Communities.

European Commission (date unknown). *Opening World Markets for Services* / The European Commission "Info-Point" on World Trade in Services.

http: / / gats-info.eu.int / gats-info / guide.pl?MENU=aaa

Evans, P. and Wurster, Thomas S. (1999). Getting Real About Virtual Commerce. *Harvard Business Review*, Nov.-Dec.: 85 – 94.

Evangelista, R. (2000). Sectoral Patterns of Technological Change in Services. *Economics of Innovation and New Technology* 9 (3): 183-221.

Evangelista, R. and Sirilli, G. (1998). Innovation in the Service Sector: Results from the Italian Statistical Survey. *Technological Forecasting and Social Change* 58: 251- 269.

Fitter, F. (2000). *Arming Goliath.* Knowledge Management, February.

http: / / www.destinationcrm.com / km / dcrm_km_article.asp?id=166&ed=2%2F1%2F00

Gallouj, F. (2000). *Knowledge-intensive business services: processing knowledge and producing innovation* / Proceedings of the International Conference "The Economics and Socio-Economics of Services: International Perspectives" (Lille-Roubaix, 22 and 23 June 2000), vol.2: 57 - 76.

Gomory, Ralph E. (1989). From the 'Ladder of Science' to the Product Development Cycle. *Harvard Business Review* 67 (6): 99-105.

Hill, P. (1999). Tangibles, Intangibles and Services: a New Taxonomy for the Classification of Output. *Canadian Journal of Economics* 32 (2): 426 - 440.

Jacob, M., Hellström, T., Adler, N. and Norrgren, F. (2000). From Sponsorship to Partnership in Academy-Industry Relations. *R&D Management* 30 (3): 255-262.

Keller, W. (1996). Absorptive Capacity: On the Creation and Acquisition of Technology in Development. *Journal of Development Economics* 49 (1): 199 - 227.

Lundvall, Bengt-Åke (1988). Innovation as an Interactive Process: From User-Producer Interactions to the National System of Innovation in Dosi, G., Freeman, C., Nelson, R., Silverberg, G., Soete, L. (eds.). *Technical Change and Economic Theory*. London and New York: Pinter Publishers: 349-369.

Lundvall, Bengt-Åke (1996). *The Social Dimension of The Learning Economy* / DRUID Working Paper No.96-1.

Melvin, James R. (1990). Time and Space in Economic Analysis. *Canadian Journal of Economics* 23 (4): 725-747.

Menon, K. and Dubé, L. (2000a). Ensuring Greater Satisfaction by Engineering Salesperson Response to Customer Emotions. *Journal of Retailing* 76 (3): 285-307.

Menon, K. and Dubé, L. (2000b). Ensuring Greater Satisfaction by Engineering Salesperson Response to Customer Emotions / Executive Summary. *Journal of Retailing* 76 (3): 275-276.

Miles, I. (1993). Services in the New Industrial Economy. *Futures*, July-August: 653 - 672.

Miles, I., Rush, H., Turner, K. and Bessant, J. (1988). *Information Horizons: The Long-Term Social* Implications of New Information Technologies. Aldershot: Edward Elgar.

Miozzo, M. and Soete, L. (1999). *Internationalisation of Services: A Technological Perspective* / Paper presented at the 3rd International Conference on Technology Policy and Innovation, Austin, USA, August 30 - September 2.

Narula, R. (1999). Explaining the Growth of Strategic R&D Alliances by European Firms. *Journal of Common Market Studies* 37 (4): 711 - 723.

Normann, R. (1996). *Service Management: Strategy and Leadership in Service Business*. 2nd ed. Chichester: JOHN WILEY & SONS.

NFIA (2000a). *The Netherlands in the News*. http: / / www.nfia.nl / news_03.htm

OECD (1992). *Technology and the Economy*: The Key Relationships. Paris: OECD.

OECD (1997a). *Labour Force Statistics*. 1976 – 1996. Paris: OECD.

OECD (1997b). *Science, Technology and Industry: Scoreboard of Indicators*. Paris: OECD.

OECD (2000). *OECD Science, Technology and Industry Outlook* 2000. Paris: OECD.

Pan, Shan L. and Scarbrough, H. (1999). Knowledge Management in Practice: An Exploratory Case Study. *Technology Analysis & Strategic Management* 11 (3): 359-374.

Pasinetti, Luigi L. (1981). *Structural Change and Economic Growth: A Theoretical Essay on the Dynamics of the Wealth of Nations*. Cambridge: Cambridge University Press.

Patel, K. and McCarthy, Mary Pat (2000). *Digital Transformation: The Essentials of e-Business Leadership*. New York: McGrew-Hill.

Petit, P. and Soete, L. (1998). *Technical Change and Employment Growth in Services: Analytical and Policy Challenges* / Paper p resented at the conference "Technology, Employment and Labour Markets" held in Athens University of Economics and Business 16-18 May 1996.

Phillips, Owen R. and Schutte, David P. (1988). Identifying Profitable Self-Service Markets: a Test in Gasoline Retailing. *Applied Economics* 20: 263-272.

Pilat, D. (2000). *Innovation and Productivity in Services: State of the Art* (Paper prepared for the OECD / Australia workshop on Innovation and Productivity in Services, Sydney, 31 October - 3 November 2000. OECD.

Pitt, L., Berthon, P. and Watson, Richard T. (1999). Cyberservice: Taming Service Marketing Problems with the World Wide Web. *Business Horizons* 42 (1): 11-18.

Preissl, B. (2000). Service Innovation: What Makes It Different? Empirical Evidence from Germany in J.Stanley Metcalfe and I.Miles (eds.). *Innovation Systems in the Service Economy: Measurements and Case Study Analysis*: 125-148.

Quack, S., O'Reilly, J. and Hildebrandt, S. (1995). Structural Change: Training and Recruitment in Retail Banking in Germany, Britain and France. *The International Journal of Human Resource Management* 6 (4): 759 - 794.

Rangan, U. Srinivasa and Yoshino, Michael Y. (1996). Forging Alliances: A Guide to Top Management. *Columbia Journal of World Business* 31 (3): 6-13.

RESER (2000). *Annual Report on the Progress of Research Into Service Activities in Europe - Services & Internationalisation*.

http://www.reser.net/gb/rapport98.html

Roberts, J. (2000). From Know-how to Show-how? Questioning the Role of Information and Communication Technologies in Knowledge Transfer. *Technology Analysis and Strategic Management* 12 (4): 429 - 443.

Rubalcaba-Bermejo, L. (1999). *Business Services in European Industry: Growth, Employment and Competitiveness.* Luxembourg: Office for Official Publications of the European Communities.

Sharp, M. and Senker, J. (1999). European Biotechnology: Learning and Catching-Up in Gambardella, A. and Malerba, F. (eds.). *The Organization of Economic Innovation in Europe.* Cambridge: Cambridge University Press: 269-302.

Skogli, E. (1998). *Knowledge Intensive Business Services: A Second National Knowledge Infrastructure*? STEP Working Paper A-03. Oslo: STEP.

Social Capital (2000). *Business Europe.* October 4th: pp.1-2.

Stibora, J. and de Vaal, A. (1999). Services FDI and the Dutch Economy in van Hoesel, R. and Narula, R. (eds.). *Multinational Enterprises from the Netherlands*. London and New York: Routledge: 138-171.

Streeten, P. (1993). The Special Problems of Small Countries. *World Development* 21 (2): 197 - 202.

Sundbo, J. (1994). Modulization of Service Production and a Thesis of Convergence Between Service and Manufacturing Organizations. *Scandinavian Journal of Management* 10 (3): 245-266.

Tissen, R., Andriessen, D. and Deprez, F.L. (1998). *Value-Based Knowledge Management*. Amsterdam: Addison Wesley Longman Nederland BV.

Turban, E., King, D. and Chung, H. Michael (2000). *Electronic Commerce: A Managerial Perspective*. Prentice Hall.

U.S. Embassy (1999). *Netherlands Investment Climate Statement*/ U.S. Embassy the Hague, Economic section, August 1999.

http://www.usemb.nl/usduinv.htm

Van Ark, B. , Broersma, L. and de Jong, G. (1999). *Innovation in Services. Overview of Data Sources and Analytical Structures*/Research Memorandum. Groningen Growth and Development Centre.

Van der Meulen, B. (1998). Science Policies as Principal - Agent Games. Institutionalization and Path Dependency in the Relation Between Government and Science. *Research Policy* 27: 397 - 414.

Verspagen, B. (1999). *Intellectual Property Rights in the World Economy*. MERIT Working Paper 2/99 - 017.

Von Hippel, E. (1988). *The Sources of Innovation*. New York and Oxford: Oxford University Press.

Van Hoesel, R. and Narula, R. (1999). Outward Investment From the Netherlands: Introduction and Overview in van Hoesel, R. and Narula, R. (eds.). *Multinational Enterprises from the Netherlands.* London and New York: Routledge: 1-31.

WIPO (1999). *Annual Report.*

http://www.wipo.int/about-wipo/en/index.html

WIPO (Date unknown). *WIPO Digital Agenda.*

http://ecommerce.wipo.int/agenda/

World Bank (1999). *World Development Report 1998/1999.* New York: Oxford University Press.

World Communication and Information Report 1999/2000 (1999). Paris: UNESCO.

WTO News (1998*). WTO Adopts Disciplines on Domestic Regulation for the Accountancy Sector*. Press/1998, 14 December.

http://www.wto.org/english/news_e/pres98_e/pr118_e.htm

WTO (1999). The 3rd WTO Ministerial Conference (30 November - 3 December 1999). *Services: Rules for Growth and Investment.*

http://www.wto.org/english/thewto_e/minist_e/min99_e/english/about_e/09serv_e.htm

WTO Secretariat (1999). *An Introduction to the GATS*

http://www.wto.org/english/tratop_e/serv_e/gsintr_e.doc

Zeithaml, Valarie A. (1981). How Consumer Evaluation Processes Differ Between Goods and Services in Donnelly, James H. and George, William R. *Marketing of Services.* Chicago: American Marketing Association: 186-190.