

Inter- and Intraorganizational Learning Processes in the Interaction between Firms and Patent Offices

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7. Inter- and intraorganizational learning processes in the interaction between firms and patent offices

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Abstract

This chapter focuses upon two types of interaction. One is the interaction between departments within the Danish Trademark and Patent Office (DKPTO). Additionally, the interaction between the DKPTO and firms is analysed. The chapter discusses in what ways an institution like a national patent office is important for product innovation, not just by providing an appropriability system for product innovations in firms, but additionally by improving the long-run capabilities of both firms and the DKPTO itself. The research builds upon interviews in the DKPTO, case stories from firms and of patent granting procedures.

With respect to *internal* competencies, it is found that no efforts were done to create environments for learning between the departments in line with the ‘learning organisations’ described in earlier chapters. However, taking the tasks of the departments into account, the need for such efforts was not obvious. Links to *external*

organizations are not only confined to industrial firms. Many firms, especially the large firms, would not mind if the tasks of the national patent system were moved to the EPO-level. On the other hand, in particular small, new firms may feel more confident with a national patent office.

Keywords: Interactive learning, innovation, organization, IPR-system

JEL classification codes: O34, O32, O33

1. Introduction

From previous chapters, in particular chapter 5, it is clear that innovation studies have increasingly focused on the role of knowledge generation in the economy. Generally, the emphasis has been on the knowledge generated in the interaction between firms and various partners such as suppliers, customers, consultants, knowledge institutions, and universities typically both producing and diffusing knowledge. Other business services like institutes for test, control, certification etc. are mainly seen as producing standardised services without much interaction and learning taking place. Several of the chapters in this volume, in particular those in this section of the book, deal with interaction between firms and knowledge institutions. Likewise, this chapter discusses this type of interaction, but in addition the intra-organizational interaction between departments is in focus.

This chapter highlights an aspect of this interaction, which is often overlooked and scarcely researched. It sets out to investigate whether the presumption of little learning and competence build-up in what appears to be standardised services is actually true. It takes as point of departure the case of granting a patent, or providing services in relation to the patenting. It focuses upon two types of interaction. One is the interaction between departments within the Danish Trademark and Patent Office (DKPTO). Additionally, the interaction between the DKPTO and firms is analysed. The chapter discusses if the role of an institution such as the national patent office is important for product innovation, not just by providing an appropriability system for product innovations in firms, but also by improving the long-run capabilities of both firms and the DKPTO. The research builds upon interviews in the DKPTO, case stories from firms patent

granting procedures. Thus, it is not examining the content of the patent, the knowledge dissemination stemming from disclosure of information from the patent descriptions, or the characteristics of the applicant firm (three issues often treated in studies on innovation and patents). Rather this study investigates the competence building and knowledge diffusion resulting from both the processing of the patent application and the provided services related to patenting¹.

In line with several of the chapters in this volume, the chapter specifies the learning processes involved. The internal competencies resulting from processing applications are likely to affect other activities within the DKPTO such as business services, thus enhancing other departments' abilities to provide services. Thus, it may be assumed that even if the process of handling patent application does not directly influence innovation the competencies built may still benefit the overall innovation level in the economy.

Implications of the results are relevant for two different issues. It is assessed if the internal organisation of the patenting processing is conducive for knowledge exchange and innovation. On a systemic level the results may have implications for the organization of the patent system, specifically whether a *national* patent office is necessary for national competence-building.

Section two discusses the theoretical basis for the research question. The section addresses the issue of the learning effects from the intra- and inter-organizational interaction much in line with the considerations in chapter 2 by Lundvall. Subsequently,

¹ Annex 1 explains in more detail what these services are.

in section 3, it is showed more specifically what may be learned in the interaction. This is done by way of explaining the procedures and interactions in connection with a patent application. The purpose of this section is to show at what stages learning and competence building may take place, while also exploring the intra-organizational learning processes that may produce learning effects from patent examiners to other departments of the DKPTO. Then, section 4 continues on this track, showing not only where learning between the DKPTO and other organizations may take place, but also what is learnt in the interaction. This is done by way of seven illustrative case studies. The concluding section summarises the findings, and points to perspectives based on the research findings².

2. Learning outcomes from the interaction

How is knowledge transmitted?

With the case of the DKPTO in mind, this section highlights elements in the theory of innovation and knowledge diffusion, which may support the research in this chapter. The transmission and transformation of knowledge was already discussed thoroughly in

² The researcher was assisted by Research Assistant Mia B. Rasmussen, Department of Business Studies of Aalborg University. They undertook the field research in collaboration with the Danish Patent and Trademark Office. The author wish to thank colleagues in the Department of Business Studies, Aalborg University for comments. Also thanks to ESST-student Joseph Stewart, Texas for language editing. A special thanks to Ole Kirkelund and Steffen Rebien of the DKPTO for comments on preliminary findings and earlier drafts, as well as written notes on the content. Finally, I am grateful to all the people who helped with information and data during case studies, and internally in the DKPTO.

previous chapters, especially chapter 2. Here the intra-organizational aspects of knowledge are emphasized. As pointed out in Lundvall and Vinding's chapter (5) on user-producer interaction in this volume, exchange of information and knowledge is an important feature of product innovation. Efficient information exchange often requires common channels and codes of information. Once established through interactive learning processes there is an incentive to keep relationships because of the costs involved in getting to know how to communicate. The establishment and maintenance of relationships between users of business services, like the process of producing the final patent application, and producers of these services is facilitated by common social and cultural background.

The media and the way knowledge is transferred may also differ according to the absorptive capacity of the recipient. In the case of patents, there can be two kinds of the recipients. First, the patent examiner may need a broad and in some areas also a deep technological knowledge in order to undertake efficient screening of potential infringements of other patents. In this screening the examiner also needs knowledge on what are the most efficient search methods. Second, the other type can be other firms/entrepreneurs who are interested in the patent description. In order to use the knowledge from such descriptions the entrepreneur needs an absorptive capacity enabling him/her not only to understand the principles of the technology embodied in the patent and to find the relevant patent description in the first place. The entrepreneur also needs an element of creativity, as he must be able to apply this technology to other fields of use not covered by the patent or to see perspectives in the technology in terms of combining the technology with other existing technologies.

Storing and transforming knowledge – organizational learning and cross-departmental knowledge flows

When knowledge from the innovation process is transformed into codified knowledge, e.g. by way of a patent description, it becomes easier for the market to estimate the value of such intangible assets. The transformation of tacit knowledge to codified knowledge is, however, by no means a simple process, and is often not only difficult and costly but also possible only up to a limit.

The process involves for the transmitter to be conscious about the implicit habits, norms, routines rooted in the problem solving practises of the individual or team. In a next step it also involves describing that knowledge in a language, which is understandable to the recipient. The external recipient thus puts a constraint on the way the transmitter is to explain the tacit knowledge in a codified form. This constraint may be common terms of expression and ways of standardising certain explanations.

In recent years it has become common practise to organise work in a manner conducive for learning effects. This has been explicitly referred to in many books, articles and the business press as ‘the learning organization’. By gearing the organization to improve the accumulation of knowledge from daily activities, the learning effects are likely to increase. This is basically what Stiglitz (1987) defines as ‘learning-to-learn’. Pedler et al. (1989) define learning organizations as ‘an organization that facilitates the learning of all its members and continually transforms itself’. Moreover, Pedler proposes that such an entity:

- “Has a climate in which individual members are encouraged to learn and to develop their full potential.
- Extends this learning culture to include customers, suppliers and other significant stakeholders.
- Makes human resource development strategy central to business policy.
- Continually undergoes a process of organizational transformation.”

Indeed, by way of evaluations, the members of the organization in question are also encouraged to reflect on the learning processes themselves. Within learning theories and in earlier chapters in this volume, this has been called 'double-loop learning'. This is a difficult task that requires agents to accurately identify what has been learnt and how. In case the knowledge accumulated could be characterised as tacit knowledge it becomes even more difficult to assess such learning processes effectively. This argument relates strongly to practically all evaluations as well as the issue for this current study: in virtually all evaluations the by-product, unintended learning effects are rarely valued often because there are no good measurements of them. The hypothesis developed in section 1 on the possible knowledge generating/diffusion effects of daily activities of the DKPTO is similarly difficult to test as the effects are likely to be more or less hidden and implicit, even to the recipients. For example, the patent examiners may unintentionally transfer knowledge to other parts of the organization, not on the content of specific patents, but perhaps knowledge on general technological development. Likewise, they may be able to identify accurately what are the problems in the applications received. Where are the deficiencies in the ability of customers to put together an application? This knowledge may be transferred deliberately, but also

informally through daily interaction, with the sales and marketing department, which may then try to educate customers on these points.

Intra-organizational learning may be spurred by procedural skills enabling members of the department/group to apply and use knowledge in different settings than where it was generated. Among several contributors to learning theories, it has been argued strongly that productive learning should basically be seen as situated learning, that is learning should be viewed as contextual and only useful if used in action and in a setting where the learning has been produced. We would argue that it is indeed a challenge for organizations to transform and diffuse knowledge produced within one unit to other units in a productive manner, but also that this is often an important part of organizational learning, and in this case, indirectly important for the product innovations of firms.

The other prerequisite for intra-organizational learning we would emphasize is co-ordination. The co-ordination issue is linked to the distinction between individual and collective learning. Even if organizational learning may go through individuals, the knowledge of an organization is more than the sum of the knowledge of its individuals. The organization may have shared norms and values, which preserve certain behaviours and routines. The routines, involving rules, procedures, conventions, cultures and strategies, make up the memory of the organization.

The build up of routines is largely the outcome of a gradual learning process. This learning is based upon which solutions the organization successfully used for problem

solving in the past. Identification of a problem and a strategy for its solution consequently involves remembering and retrieving solutions that previously were adequate for a problem resembling the one in question. A complementary aspect of this process is to remember solutions, which in the past failed to solve the problem. In other words, it is an important part of learning to forget unproductive routines and be able to rule out solutions likely to fail. In this way routines are important in the economising of information processing. Naturally it varies widely with the situation what should be left out and what deserves focussing. Therefore, routines are indeed context-dependent. Likewise, the relevant sum of capabilities is dependent upon the sum of knowledge of the members of the organization, but it varies what is relevant according to the situation, which points to the necessity of interaction between members of the organization. Only in this way is the individual knowledge of the members activated, as well as the shared meanings and languages developed in the organization.

The above discussion implies that firms may have unique ways of learning, which results in what is called 'firm-specific capabilities' (Teece et al., 1990), 'core competencies' (Prahalad and Hamal, 1990), and 'firm specific competencies' (Pavitt, 1991).

Basically co-ordination and stimulation of intra-organizationel knowledge flows may also be pursued differently according to what kind of knowledge is diffused. It follows from the discussion of routines and organizationel learning being context dependent that the nexus of the learning processes is important, as also emphasized by Lund in this volume.

In many discussions, the creation of routines and learning has to do with the relation between the individual and the organization as such. However, we would argue that to a large extent the routines, capabilities as well as the shared languages and norms are created at an intermediate level of the organization. This may, of course, differ according to the size and structure of the organization. However, we would contend that in many organizations it is possible to identify the different types of groups³.

Difficulties arise when an organization is dependent upon the coordination of activities across different groups, be it e.g. two different functional groups or two different types of groups. In that case the codes of communication and intra-group objectives are not necessarily compatible. In the case of the DKPTO the patent examiners is one group and Sales & Marketing another. The activities of patent examiners are clearly guided by its' own (externally given) objectives. Likewise, the activities of the Sales & Marketing are determined by their main objective of selling various types of services and encouraging firms to apply for IPR. If the efficiency of knowledge diffusion activities of Sales & Marketing is dependent upon diffusion of knowledge from patent examiners (as hypothesized in section 1), it requires that extensive interdepartmental interaction be established with the objective of ensuring knowledge transfer. Two functionally separate departments (as is largely the case in the DKPTO) could, however, also handle respectively the sale and production of services. As mentioned, this is likely to require

³ Typologies of such groups have been discussed in the literature on organizational learning. One of the best known such groups is a *functional group*. Another type of group is a *community of practice*, which is usually associated with Lave and Wenger (1991) and Wenger (1998). A third type of group is an *epistemic community*.

mechanisms of knowledge transfer, and with limited interaction between departments, this transfer is unlikely to take place. Alternatively, the Sales & Marketing department would need competencies from elsewhere.

Implications

In this final section we shall briefly state some of the most important implications, derived from the above theoretical development, for the further steps of the present study.

Even if the patent application process to a large extent is about handling codified knowledge, there is – as emphasised earlier – also tacit knowledge involved in relation to how to organise and undertake this application process. Some of the potential learning between the parties is no doubt possible to mediate by way of simple transfer of codified knowledge. However, we need to investigate whether the tacit element in the knowledge transfer is substantial. The transfer of this element, it was pointed to above, may be stimulated by proximity in various dimensions, geographical, cultural, languages.

Another implication of the theoretical discussion is that preparing the patent application involves transformation of tacit knowledge to codified knowledge in a language, understandable for the recipient. This is a difficult process, and for patent offices playing a role in building up the general innovative competencies of firms it may be essential that they are skilful in guiding firms on how to transform their tacit knowledge into codes that may be managed in a patent.

Moreover, the theory discussed the importance of the intensity and frequency of interaction between the parties in facilitating this mutual learning. The argument is that this interaction stimulates the build up of mutual trust and understanding, which in turn are very important to learning. This points to the need of further investigation of this aspect of the patent granting process. As was pointed out in section 1, this involves several sub-issues. We may point to the interaction between patent examiners and other staff of the patent office, in particular the Sales & Marketing department. As was discussed here, the intra-organizational knowledge flows are important to take into account. In order to be efficient, it is most often required that such knowledge flows are deliberately stimulated by internal organization (tacit knowledge) or management/information systems (codified knowledge).

3. The DKPTO in the innovation process

After having established the theoretical background we proceed in this section with a description of how the DKPTO may have a role in innovation besides its' primary function as an important element in providing protection of intellectual property rights. In many cases, it is important for the innovator to protect an invention and the protection of intangible assets is partly considered a motivating factor for their continuous involvement in innovation activities. It is also important that the society has rules for standardisation in order to protect the consumer and help companies prove that their products have a certain level of quality. So it becomes necessary to have certain regulation on such things as patents and standardisation to promote innovation. The Danish Patent and Trademark Office's primary task is to offer protection for inventions, which includes trademarks, design, and copyrights.

As a secondary function, the office offers consultancy services such as information services, guidance and training within the IPR-area. The patent office also offers courses on how to apply for patents for example at several of the regional Technological Information Centres and at universities. In addition, the office sells different services such as competitor analysis and market analysis. The most important services include novelty searches, infringement inquiries, state of the art inquiries, and analyses of competitors / profile analyses. See Annex 1 for further specification. Educational activities, library and information services, info meetings, and courses are also part of activities. The DKPTO also can help investigate whether a patent has been violated.

A wide array of different actors in the innovation system uses these services. In addition to the direct use by firms a number of intermediaries are using or buying the services from the DKPTO, thus enhancing their capabilities to assist firms in their innovation activities. An important such group of intermediaries are the *patent agents*. The relationship to the patent agents is explained in more detail below as one example of external relations.

The patent agents compete with the patent office when it comes to selling patent-based services. While they do not have the right to issue patents and trademarks they operate within the same business service areas as the patent office. Thus, the patent agents often sell their services such as courses, market analysis, searches on prior art etc. in competition with the patent office. Even if the patent agents are competitors they are

customers and collaborators. The patent agents' main job is to help companies to write applications for a patent and establish a patent strategy.

The patent agents and the DKPTO have a common interest in increasing the knowledge on IPRs in general and of the products offered by the agents. The difference lies particularly with the fact that the DKPTO is not allowed to engage in the same type of close consultancy as the agent, first and foremost because the DKPTO only has a very limited right of guiding applicants on how to formulate the specific claims of the application. However, in the field of patent strategies and novelty searches the DKPTO does to a certain extent act as a competitor to the agents. Because of these built-in overlaps in the activities of both parties, a 'common understanding on competition' has been made between these two parties. This leaves distinct areas of counselling to the patent agents. The common understanding on competition has made it possible to focus more on common interests in developing the IPR system and diffusing knowledge on the economic importance of protecting new products. Besides this, the agents constitute a major group of customers to the DKPTO. Around two-thirds of the applications filed at the DKPTO are filed via a patent agent. This normally means that most communication goes through the agents, who accordingly are the main customers to a range of the services offered by the DKPTO.

Courses and educational activities are also an important part of the external partnerships. The DKPTO often co-operates directly with patent agents when establishing different courses on technical and legal issues concerning patenting.

Initiatives have also been taken to reinforce co-operation with universities in order to

incorporate IPR education into existing curricula of especially technical and natural sciences education (Ministry of Industry and DKPTO, 2001).

The activities of the DKPTO also influence the innovation system more indirectly as the DKPTO acts as a supplier to the industry of trained patent engineers. Because of a high mobility of people from the DKPTO this is an important channel of knowledge diffusion, which enable the industry and patent agents to enhance their capabilities within the field of IPR.

Other channels of knowledge diffusion includes that the DKPTO contributes to the technical / professional literature on IPR, prepare legislation and develop policies within the field of IPR.

In conclusion, patent institutions generally, are most often classified as regulatory institutions. They are of direct importance for firms who need to protect their product innovations through patenting, trademarks etc. However, the additional activities and the interactions with other institutions including the indirect function as educating staff indicates that important inter-organizational learning processes are taking place in addition to the intra-organizational learning described briefly above, and discussed in more detail below. Thus, it is an important question of this study whether some of these external linkages are related to business services, and whether these in turn depends on the competencies attained by the DKPTO staff through search and examination activities. This question is explored in the following section below concerning the internal relations and competencies of the DKPTO.

4. Intra-organizational learning and work processes⁴

Introduction.

Following the discussion of various external relationships we will now provide a general description of the main organizational routines and individual knowledge applied to the DKPTO's activities. The next step will be to link the knowledge and resources obtained by handling patent applications to some of the main business services, which have already been mentioned in the preceding sections. This is a question of what kinds of competencies are obtained through search and examination. In particular, the issue is how these competencies come into play through internal processes of knowledge diffusion. Thus, the competencies of the patent department may be said to benefit other activities of the DKPTO such as business services, if knowledge indeed is diffused across departments.

Knowledge and resources of the DKPTO

In the 'Knowledge Account 2000' (which is a supplement to the conventional account, but focused upon the knowledge base of the DKPTO), the internal resources of the DKPTO have been divided into 'human' and 'structural' capital. Generally speaking, human capital consists of the skills, knowledge, and competencies of individual employees. Structural capital on the other hand consists of the knowledge and experience embedded in the organizational structures, formalised processes, information

⁴ Substantial parts of this section have been written with the help of written inputs from Ph.D Ole Kirkelund of the DKPTO. The author is grateful for these inputs as well as several discussions on the issue.

technology, and formalised communication systems of the DKPTO. In other words, structural capital is the knowledge that stays with the DKPTO when individual employees leave.

The structural capital of the DKPTO consists of two main elements - structurally embedded knowledge and working processes. Working processes may be seen as a catalyst for knowledge diffusion as they may serve to diffuse both tacit and explicit knowledge. Furthermore, working processes themselves may be both codified and non-codified. Structurally embedded knowledge, on the other hand, is quite codified and directly accessible⁵.

The Intranet facilitates knowledge flows. It is the DKPTO's internal network for electronic communication. It is a very important medium for internal communication and it supports the internal knowledge flows between individual caseworkers and between different sections of the DKPTO.

Knowledge sharing by developing working culture and daily routines is a key to preserve and develop competencies, which support the diffusion of especially tacit (non-codified) knowledge. Regular section meetings and workshops support this type of

⁵ The most important resources include the following: Collections of handbooks containing technical and juridical literature as well as other relevant subjects. A collection of more than 30 mill patent documents. Internal handbooks on patents (and utility models, trademarks, design, and personnel). Internal checklists, guidelines, reports, and databases. Library resources including electronic journals and works of reference Intranet.

knowledge sharing besides ordinary educational programmes. Statistics on the personnel may provide a general impression of the DKPTO's human capital.

Table one about here

As mentioned, there is a high turnover of staff, rendering very high expenses for education and development of central competencies necessary for maintaining the core competencies of the organization. The educational activities of the DKPTO are also very important for the internal diffusion of knowledge, as teaching of new employees by experienced colleagues is an important part of the educational programme of patent examiners and -engineers. Table 2 shows the resources (measured by working days) allocated to different types of educational activities.

Table 2 about here

The activities that are relevant to the primary functions of the DKPTO (patent casework) take up a large part of total educational and competence building activities. The activities basic training, training by colleagues, and advanced training of specialists, totalled a number of 1593 working days. These activities occur almost exclusively internally within the DKPTO. Generally, the education of individual staff members and the internal training processes by which human capital is developed and maintained are important prerequisites for maintaining and enhancing the ability of employees to carry out their tasks.

When the DKPTO takes on new employees (engineers and natural sciences candidates) a comprehensive educational programme is implemented in order to train new employees to become competent patent engineers. The training consists of a 'two-step-training' programme. The first step is the basic training course, by which the employee obtains the so-called 'announcement right'. The second step by which the employee is appointed 'patent engineer' requires additional training and experience (in particular training by experienced colleagues). The basic training programme consists of both theoretical and practical modules, which are necessary in order to obtain the basic competencies for handling patent applications. The duration of the course varies depending on the specific needs of the employees and developments in the field of patent technique. The training by experienced colleagues goes on for about 1 – 1 ½ years. It has character of apprentice learning, and is combined with specialised competence building and training on specific technical issues. This additional training could, e.g. include international courses in patent technique under the Centre d'Etudes Internationales de la Propriété Industrielle (CEIPI). In addition to the specific technical skills, the apprentice learning also involves substantial transfer of tacit knowledge. In total it takes about 3 years of training before new employees can be appointed 'patent engineers'.

With this in mind, we proceed to discuss how the technical competencies might come into play in the production of business services.

Knowledge transfer involved in business services

Most of the business services require technical as well as knowledge on law on the part of the DKPTO's employees (and on the part of the customers in order to be able to utilise the information). The question is how, exactly, do the competencies within the DKPTO come into play in the 'production processes' of the business services? What are the links to the competencies associated with (and acquired through) the handling of patent applications?

Organization and production processes

The production of technical business services is dependent on expertise on searching and assessing the international patent literature. In the DKPTO the business services are sold through the sales and marketing section, but they are produced in the patent section. Interviews with employees of the S&M and the Patent sections indicate a relatively clear division of labour between the two sections concerning the production of business services. Thus, the internal diffusion of knowledge that is required for the production of business services does not differ much from the codified processes as described in the internal handbooks and production guides. It should though be mentioned that there has been some people who shifted job from the patent sections to the S&M department, which implies a certain diffusion of knowledge across divisions

The S&M section is the customer's gateway to business services and the S&M section is responsible for the initial communication to the Patent section of the customer's request. Thus the S&M prepares the case, which is thereafter taken over by the relevant employees in the Patent section. This is initially an employee who is assigned as responsible for the specific case. The case is then handed over to a technical expert /

patent engineer. The responsible caseworker and the problem solver / patent engineer is often one and the same person. Alternatively, the job is handed over to the head of section who then hands over the job to a patent engineer of his / her choice.

Whether the service in question is a novelty search, infringement inquiry, or state-of-the-art-inquiry it requires more or less the same competencies and knowledge as required for search and examination of patent applications. The patent engineer also takes care of further communication with the customer, which is often of a technical nature.

Conclusions

The general conclusion concerning internal processes is that the interdependence between the competencies acquired through patent casework and those required for technical business services is not based on the formal (codified) or informal (non-codified) organization of production processes. It follows from the above that the S&M-section could service industry with enhancing general awareness of IPR and sales of business services without having the technical expertise, as represented by the patent section, in-house. In principle, the technical search and examination processes could be bought from outside the organization (or even outside the nation) and re-sold through the S&M-organization/department. However, a number of practical difficulties are associated with this idea. In particular, the possibility of communicating directly (in Danish) with the responsible patent examiner would most likely be limited or non-existent. This would reduce the potential value of the services in question. Moreover, the S&M-section would need some security for supply of the search and examination

that they sell. It is likely that flexibility in the production is greater if the production is done in-house.

Interviews in the S&M and Patent sections have indicated that the functionally separated working processes are characterised by codified, internal structures of knowledge diffusion while potential non-codified (informal) ones seem rather limited. Actual case-by-case co-operation between the sections is rather limited. Although most business services (in particular technical services) are produced with a quite clear division of labour, there is probably more room for non-codified co-operation internally within each section than between sections. One could therefore argue that the specific internal relations and the diffusion of knowledge between the S&M section and the Patent section is in fact not very developed, but perhaps that is not necessary. It may be argued that this streamlined organization of the work processes with limited cross-departmental knowledge flows is a rational way of organising activities. The community of practise-like organization discussed in the theoretical section only have its' merits in certain situations, it is not an universal best practise. In fact, the interviews within the DKPTO revealed that such an organization has been tried out in the DKPTO, but with poor results.

5. Mutual competence building – cases from Danish enterprises⁶

Introduction

Section 2 pointed to some of the possible ways of competence building and knowledge transmission of relevance for innovation. Section four highlighted more precisely where in the patent granting process such learning processes are likely to take place. This section sets out to illustrate, via descriptions of real world cases, if some of the theoretical considerations are indeed also to be found in practise. Thus, the cases illustrate how patent offices may contribute to product innovation in firms by virtue of other activities than just filing a patent. As the primary purpose with the section is to explore in more detail the nature of the learning processes and learning effects of the interaction between the DKPTO and the firms, the cases are not chosen randomly. On the contrary they are picked under the presumption that they illustrate learning processes related to product innovation.

The section starts out with a short discussion on research strategy and methodology. The description of the cases are structured as a first presentation of the applicant firm, its industry and its technological competencies and patents. Secondly, we analyse the interaction between the firm and the DKPTO. Thirdly, learning effects are identified and possible implications for product innovation in the firm are discussed. Related, it is

⁶ The work on the cases have been conducted jointly by the present author and research assistant Mia B. Rasmussen, who did the major part of the interviews.

discussed if the cases give any evidence to the discussion on whether the firms benefit from the national location of the patent office⁷.

Case studies as research strategy

The study includes case studies based first and foremost on interviews with an employee or manager engaged in the company's patent policy. The cases includes Rockwool, Østjysk Innovation, the Technological Institute, Pure Snack, Plougman & Vingtoft, Patentgruppen, and Kristoffer Larsen Innovation A/S. Østjysk Innovation, the Technological Institute and Pure Snack is reported one group and Plougman & Vingtoft and Patentgruppen as another group. The companies were selected in such a way that we can show different ways of using and interacting with the DKPTO.

To get a better understanding of the procedures of patent applications, the business services offered, and the patent examiners relations to customers, we used earlier reports (consumer analyses, descriptions of procedures for patent application and others), the DKPTO homepage and the DKPTO Intranet. Besides the material found we also held several informal meetings with employees of the marketing department of the DKPTO and patent examiners in order to get an understanding of the patent system and how it

⁷ This is a discussion that have been going on all through the 1990s, and is closely linked to what functions should be kept nationally and what could be centralised. This is discussed thoroughly in Christensen (2005) and is only a sub-issue here.

works. The informal talks with employees of the DKPTO were crucial for formulating the right questions for the case study⁸.

The interviews lasted between 1½-2 hours and each interview was introduced with the respondent talking about his or hers company. The questions were open-ended and a large part of questions requested the respondent to come up with example⁹.

Case: Kristoffer Larsen Innovation A/S

Kristoffer Larsen Innovation A/S is a one-man business. The company sells imported spare parts for trucks and has been the owners' main source of income the past 15 years. During the past ten years the owner has also been busy inventing equipment for the production of pork. Today Kristoffer Larsen Innovation A/S has invented a house for free-range pigs and an advanced feeding robot that ensures that each pig automatically receives precise individual feeding. The robot thus identifies the pig, its weight and individual feeding need. By doing so it becomes possible to trace back in time what fodder each individual consumed. This allows you to investigate what are possible inexpedient effects of different types of fodder, medicines, environmental factors etc. Kristoffer Larsen Innovation A/S applied for patent on the ability of the robot to link

⁸ One of the researchers involved in the present casework had the daily work place physically at the DKPTO in about half of the research time (for ½ year). This greatly benefited the researchers assessments of the internal organization of the DKPTO and of the way the DKPTO operates in relation to external parties.

⁹ To avoid misunderstanding of the transcription of the interviews, the respondents afterwards passed remarks on the case stories. The stories are supported by quoted statements. Each case story is presented individually and subsequently the stories are linked together and the common denominators are emphasized.

each individual pig to the record of consumed fodder. Kristoffer Larsen Innovation A/S is constantly involved in new invention activities. Currently, the owner is for instance working on an outdoor pig toilet.

Generally most of the work with new inventions in equipment for outdoor pigs is informal and rarely patents are applied for. Today, Kristoffer Larsen Innovation A/S actually seems to be the only firm in Denmark who is applying for patents for equipment for outdoor pigs. Moreover, at the moment it makes no big difference if you take out patents on your equipment for outdoor pigs or not. The chances of your idea being imitated seem to be small and the possibilities of exploiting the patents are limited as well. However, it is likely that the situation will change. First of all because outdoor pigs is a fairly new phenomenon but also due to changes in regulation and consumer preferences. Therefore, the respondent thought that taking out a patent would be the safe strategy.

Kristoffer Larsen Innovation A/S 's contact to PVS

Kristoffer Larsen Innovation A/S has been busy inventing equipment for pigs since the mid 1990s and as the first inventions began to take form, he decided to apply for patents. Kristoffer Larsen Innovation A/S contacted the DKPTO in 1998 and set up a meeting. Among the participants at the meeting was the patent examiner Michael¹⁰, who at that time dealt with patents within the agriculture area. Later Michael became Kristoffer Larsen Innovation A/S's permanent case officer. Kristoffer Larsen Innovation A/S presented the feeding robot at the meeting and the participants from the DKPTO

¹⁰ The name of the patent examiner is fictitious but the author is aware of the real name.

first impression was that the idea was promising. After the presentation, the meeting participants went to the library where a novelty search (a patent technical search) was conducted. No existing patents were found on the automatic feeding robot and the DKPTO requested Kristoffer Larsen Innovation A/S to go on with the patent, and to find a patent agent to help to formulate a patent application. Kristoffer Larsen Innovation A/S chose one of the larger patent agents in Denmark, who helped to select patent strategy, including the formulation of the patent claims. To ensure that the patent application was optimised Kristoffer Larsen Innovation A/S requested the DKPTO to make a patent family search. No infringements were found under the search and Kristoffer Larsen Innovation A/S became aware that the patent was too narrow. It was then decided to broaden the patent and so maximise the possibilities to exclude others. The patent application was reformulated, a new test was conducted and the application was finally accepted.

Kristoffer Larsen Innovation A/S has as part of the patent application bought the services novelty search and patent family search in order to set up the right claims. The patent on automatically linking individual pigs to its past consumption of fodder is technically advanced, and according to the respondent, it is highly uncertain if the patenting process could have been carried through without the assistance of the DKPTO. Kristoffer Larsen Innovation A/S has during the last years learned much about the patent system and how it works. The interaction with the DKPTO has especially increased knowledge on how to apply for patents and Kristoffer Larsen Innovation A/S is today much better at making descriptions of the patent. Also, Kristoffer Larsen Innovation A/S has learned how to judge a patent and the patent claims.

... I have increased my knowledge of the patent application and gained a better insight in the patent system. Consequently, it has become easier for me to participate actively in the patent application process. My increased knowledge of patents in general has also increased my interest in applying for new patents.

Kristoffer Larsen Innovation A/S believes that the interaction he has had with the DKPTO and the knowledge he has gained from his experience from dealing with the patent system, has had an impact on his innovation activities and will continue to have so. In conclusion, Kristoffer Larsen Innovation A/S's interaction with the DKPTO has first and foremost been vital in connection with his specific applications, but has also increased his knowledge of the patent system as such and increased his skills in applying for patents and judging relevant claims for the patent. In turn, this is likely to positively influence innovation activities also in the future.

DKPTO's benefits from the interaction with Kristoffer Larsen Innovation A/S

Kristoffer Larsen Innovation A/S describes the relations to the case officer Michael as informal and personal. The level of interaction between the two parties has been fairly extensive. It is also Kristoffer Larsen Innovation A/S's belief that the DKPTO and especially Michael have benefited from the collaboration. Michael became aware of which types of problems one faces, when applying for patents for the first time. The intense involvement enables case officers as Michael to answer questions in the future, which goes beyond questions on how the patent system works and formalities in the formulation of the patent application. The case officer gains insight in the types of

questions you might ask as a first time applicant and the surprises customers get when the cost of an international patent is first revealed, the procedures and complications of sale of the inventions, license deals etc. The case officer also becomes aware of which supporting possibilities there might be such as network possibilities, where to get technical advices, or which funds you can apply for if needed. This type of information can then be passed on to new applicants and thus help them get through the system in the most efficient way.

The benefits from having a national patent office

Kristoffer Larsen Innovation A/S believes that the contact with the Danish patent office has been fruitful due to the way the communication has proceeded. The respondent doesn't think he could have communicated in the same manner if the patent system was centralised and all patent examination were e.g. placed with the EPO in Munich. He mentioned the foreign language as a major communication barrier. Also he mentioned that the personal relations to the DKPTO has meant much to him in his work with patents, and he doubts that this type of relationship could be maintained if the patent system was fully centralised and his case officer was in Munich.

Østjysk Innovation (pre seed capital provider), Pure Snack (a company financed partly by Østjysk Innovation) and the Technological Institute (an government Approved Technological Institute)

In this case the two innovation supporting institutes Østjysk Innovation (a pre-seed capital provider) and the Technological Institute (an Approved Technology Institute - GTS) are used to illustrate how these types of organizations work with patents and interact with the DKPTO. In order to illustrate the interaction between the institutions and their portfolio companies, a one-man company Pure Snack is included. Pure Snack

is supported financially by Østjysk Innovation and seeks to commercialise low fat snacks. The case study is based on interviews with Gyda Bay from Østjysk Innovation, Peter Lauridsen (the Technological Institute, Invention department) and Ole Knudsen (Pure Snack).

The most important function of Østjysk Innovation and the Technological Institute is to support entrepreneurs and researchers commercialising inventions. The institutes help inventors with guidance in such questions as licensing, marketing and sales related questions. Both institutes also support the companies financially and in creating networks, the two types of support that they provide in the area of technical guidance. The GTS institutes have in-house engineers and consultants with expertise within several technical areas.

These institutes see patents as very important elements in the innovation process. They spend many of their resources supporting companies in their work with patents. Even though it is costly, both institutes encourage the inventors to apply for patents. Both Institutes use in-house expertise to screen for novelty and then buy novelty searches (patent technical searches) from the DKPTO or from the patent bureaus. The in-house novelty screenings are carried out in free databases available on the Internet and in databases that the institutes have paid access to. In addition to using the DKPTO to carry out novelty searches, Technological Institute also uses the DKPTO to acquire new information in the patent area, and send participants to many of the seminars provided by the DKPTO.

Like the Technological Institute, Østjysk Innovation only buys novelty searches. Gyda Bay mentions that they buy a limited number of novelty searches from the DKPTO since patent bureaus can provide more information in the novelty search in certain subjects. Østjysk Innovation uses the novelty searches as one of many factors to make final decisions on whether to support a project or not. Ole Knudsen of Pure Snack recognises this situation. Luckily, the novelty search for his invention had a positive outcome leading Østjysk Innovation to support his business financially and to help him get a licensing deal. The novelty search was also useful in the process of attracting investors, Ole Knudsen suggests.

Østjysk Innovation lets the patent agents carry out their search because they have experienced that some of the patent agents are doing a better job within some technical areas. Also Gyda Bay finds it convenient that the patent agents can pass remarks on the searches and make comments on the chances of getting the patents and chances of infringement of other patents. Due to legal concerns, DKPTO services are limited in this respect.

Even though the three respondents leave much of the patent work to patent agents, they still believe they have learned much from dealing with patent questions. In general it is difficult for the respondents to point out the origin of their knowledge. Some knowledge might have come directly from interaction with the DKPTO, seminars in Denmark, abroad, and some from the patent agents, according to the respondents.

Peter Lauridsen mentions that there are a large number of employees from the Technological Institute, who have learned much from joining DKPTO's introductory courses and seminars in intellectual property right issues. The courses have increased the qualifications among employees in the work with patents and contributed to a better awareness of intellectual property rights in the Technological Institute in general. This, in turn, benefits the innovation activities in the customer firms buying consultancy services from the Technological institutes because of more qualified guidance of these firms.

The benefits of a national patent office

None of the questioned institutes believe their portfolio companies would have applied for fewer patents, if the DKPTO had not existed. However, all three respondents find it convenient to have a national patent office due to shared language and culture, and the close localisation. Peter Lauridsen says,

... It is always nice to have the help on one's doorstep and not externally placed in Stockholm or Munich. Unfortunately, I think there is a tendency towards further centralisation of the patent system and it might very well lead to the EPO running the whole thing (Peter Lauridsen).

Besides the advantages of close geographic localisation, the shared language and the shared culture, the respondents also mention good personal relationships with the staff in the DKPTO as an essential reason to preserve a structure with a national patent office.

The patent agents: Plougman & Vingtoft and Patentgruppen

Patent agents complete around 80 per cent of the patent applications the DKPTO receives. This makes the patent agents a very important customer group and makes it necessary to evaluate the patent agents' relationships with the DKPTO, their attitudes and their view of the DKPTO, as well as their expectations in future collaborations with the DKPTO. In order to answer these and other questions we have interviewed Peter Jensen¹¹ from Plougman & Vingtoft and Jørgen Møller from the Patentgruppen. The two bureaus differ in size and also to some extent in the provided services. Plougman & Vingtoft is the largest patent agent bureau in Denmark and they support their customers technically in further development of inventions if necessary. Patentgruppen consists of five patent agents and a number of other staff. The bureau is the fifth in size in Denmark measured by international patent applications in 2000. The Patentgruppen also differs from Plougman & Vingtoft in its service offerings. In comparison to most bureaus the Patentgruppen is highly involved in their customers' innovation process. While most bureaus evaluate the final innovation output, the Patentgruppen evaluate the patent possibilities of inventions early in the innovation process and continuously throughout the whole innovation process.

Both Plougman & Vingtoft and the Patentgruppen consider the DKPTO to be more of an authority and a sub-supplier than an actual collaborator. The bureaus consider also their role in the system to be rather different from that of the DKPTO. The patent agents can be considered as an intermediary between the companies and the DKPTO and it is the patent agents who help the companies with the patent applications. The patent

¹¹ The real name of the respondent has been changed.

agents' most important job is to work out the patent strategy, which involves drawing up the patent claims. Due to regulations, the DKPTO is not allowed to handle this function. The DKPTO is also limited in the guidance that they can provide when selling business services. When the patent agents sell a business service to their customers, they are allowed to comment on the company's chances of getting the patent. Peter Jensen sees this division of labour as a necessity because it gives room for both actors. Peter Jensen also mentions that their customers never address the DKPTO directly.

According to the two bureaus, the division of labour is clear, the DKPTO is a sub-supplier of business services and the issuer of intellectual property rights.

The bureaus' use of the DKPTO

Plougman & Vingtoft often buy business services from the DKPTO. They buy various services like novelty search, patent family searches, and various surveillance searches (patent family surveillance, competitor surveillance, or technical surveillance). Before they buy the searches, they usually make their own introductory searches. Unlike Plougman & Vingtoft, the Patentgruppen sometimes make their own final novelty searches before they determine whether to apply for the patent or not. Jørgen Møller says, that it is possible to make good online searches within some technical areas if the technical area is new, such as for the mobile phone industry. For such a case, all the relevant material is available on line, which makes it unnecessary to scan the DKPTO's patent literature.

The Patentgruppen submits around 15 per cent of all patent applications for trial in the DKPTO. This is because some of the Patentgruppen's customers want to apply for patent in Denmark first in order to save time. Some companies are not sure of the

market possibilities of the patent and some companies' want to reduce the costs involved with gaining the patent. Unlike the Patentgruppen, Plougman & Vingtoft has never filed a patent application at the DKPTO, but they hand in patent applications in Denmark for registration. According to Peter Jensen, their customers are not interested in a patent that is only effective in Denmark. *'... Our customers are thinking internationally and there is a good reason to think that this tendency will continue in line with the increase in internationalisation.'*

In the Patentgruppen they also believe that fewer of their customers will want a patent, which only is valid in Denmark, and thus fewer are likely to have their patent application tried at the DKPTO. Jørgen Møller also mentions that the DKPTO probably will receive even fewer applications when the cheaper Community patent is introduced. According to Peter Jensen there is no knowledge diffusion from the DKPTO to Plougman & Vingtoft when they interact. Actually the work with patent application does not give rise to much interaction with the DKPTO or any other patent offices. The only thing that is likely to give rise to exchange of knowledge is their employees' attendance at DKPTO's held courses in intellectual property rights. Plougman & Vingtoft's new employees often attend the introductory courses.

Both Plougman & Vingtoft and the Patentgruppen are aware that many of the employees that the DKPTO train end up in private patent bureaus and four out of five of the consultants in the Patentgruppen are from the DKPTO. Jørgen Møller mentions that it is an advantage to hire someone who has worked for the DKPTO because they know how the system works. The patent agents job is of course very different from the work

in the DKPTO. The patent agents' job is to formulate a description of an invention in a legal-technical way and to make the patent application as broad as possible by formulating the right claims. The staffs in the DKPTO dealing with the applications on the other hand read and make a judgement of the application. Plougman & Vingtoft have only recruited few employees from the DKPTO. Instead they often recruit PhDs from the universities. They believe these are able to help customers with inventions, as well as to recognise the opportunities in inventions¹², Peter Jensen says.

DKPTO's new role

The DKPTO can, because of its status as an authority, stimulate and contribute to networking among the actors in the industry. This fact both respondents agree upon. The DKPTO's status as an authority allows the organization to fulfil a number of coordinating functions and to implement initiatives useful to society. Some of the initiatives that the DKPTO has implemented are listed below.

- **Education/courses:** the DKPTO is together with Patentagentforeningen and DIP (Dansk Industris Patentagentur) coordinator of the Intellectual Property Right education in Denmark. Courses are held in intellectual property rights, consequences of changes in the international patent system, etc.
- **Conference organiser:** the DKPTO continuously arranges conferences. The purpose of a conference could e.g. be to increase managers' awareness and knowledge of intellectual property rights at a strategic level.

¹² Plougman & Vingtoft do not cover all technical areas. They have specialised within the areas bio technology, chemistry and software technology.

- **The spring meeting:** the DKPTO hosts a spring meeting once a year. The participants at the meeting are usually 200 employees from the DKPTO, patent agents and industry associations. The purpose of the meeting is to have the players in the industry inform each another of their activities and to network.
- **Innovation Forum:** Once a year the DKPTO and the patent agents hosts an event, where the invention of the year is elected.
- **Sparring Partner:** the DKPTO to a large extent uses people from the industry as sparring partners in product development. The DKPTO has for example invented the program Ipscore and several publications at the request of the industry.
- **Information campaigns:** the DKPTO works with private patent bureaus on joint information campaigns, which seek to increase awareness of intellectual property rights.
- **Joint mouthpiece of the industry:** In many ways the DKPTO works as a mouthpiece of the industry and especially in international questions. The DKPTO discusses political and international questions with the industry at meetings.

Peter Jensen says, that the DKPTO has done a good job gathering the industry during the last 4-5 years and it has been fruitful in terms of networking. Plougman & Vingtoft also participates in several of DKPTO's activities listed above.

... We always participate in the popular spring meetings. It is an event, which offers possibilities of creating networks. I think it is of high value that a public institute is able to gather the industry and create events where networks are established. In Denmark, the DKPTO is the catalyst for organising industry events and meetings because they are neutral.

Both Plougman & Vingtoft and the Patentgruppen are aware that the DKPTO's role has changed, and they expect further changes during the next couple of years. The DKPTO thus is more than just an authority, granting intellectual property rights and a sub-supplier of business services. The DKPTO is also an organization, which brings the industry together, while stimulating the networking within the industry.

Case: Rockwool International A/S

The Rockwool Group is the world's leading manufacturer of stone wool. With more than 20 factories in Europe, North America, and East Asia, and a global network of sales companies and trade offices, the Rockwool Group covers all parts of the globe. The Group has more than 7,000 employees. The sale of traditional thermal insulation makes up 5/6 of Rockwool's revenue.

In Rockwool we interviewed Arne Kraglund, who is responsible for the patent department, Technology Search. The department is responsible for patenting and

technology, as well as competition surveillance based on review of patent literature. The patent department consists of five employees.

The large players in the industry are all very conscious about using patenting.

Rockwool's products have a long lifetime and the products can be easily imitated, so gaining a patent is an important way of protecting their inventions and market share.

Rockwool would never run the risk of not applying for patents on new important inventions, because they realize that their competitors are just behind them with their own inventive activities. Additionally, there have been incidents where the large mineral wool producers have handed in almost identical patent applications, according to the company. Arne Kraglund believes that if Rockwool in such environment had chosen a secrecy strategy, waiting until the market for the products has been investigated and sale prognoses had been made, it would have failed.

Rockwool's way of using the DKPTO

Each year Rockwool hands in a large number of patent applications to both the DKPTO and to PCT authorities and today Rockwool's portfolio consists of more than 1000 patents or patent applications. Rockwool's patents are first and foremost product patents, but they also have patents on processes. Almost one-fourth of all Rockwool's patents are examined in the DKPTO and three-fourths are examined at a PCT authority. Arne Kraglund says that if they are convinced an invention will become a success in a number of countries the patent application will normally be handed in directly to the EPO.

Rockwool buys two types of business service from the DKPTO, novelty searches and state of art searches. Rockwool does not buy novelty searches from patent agents. This is due in part to their confidence in the patent authorities and also because they know the authorities have substantial and current holdings of patent literature, Arne Kraglund claims. The state of art searches are not used directly in the patenting process, but more as information material used for R&D. The state of art searches has for example been used to give a better insight in a certain technical area and as a tool for generating ideas. The state of art-searches are mostly useful if they address R&D outside Rockwool's key competencies. There is not much knowledge to gain from the patent literature of Rockwool's key product, stone wool.

Rockwool's relationship to the DKPTO

Rockwool has a contact person in the DKPTO and it works out well. It is nice to always know which person to contact, Arne Kraglund says. The person who ends up getting the task will often call Rockwool and make sure that the description is properly understood. Arne Kraglund finds it convenient to have such good relations to the DKPTO:

... I don't just call the EPO and they do not call me to ensure they have understood a description correctly. I can definitely feel that the geographic distance to the EPO is long. Besides I like the idea of knowing the person I am calling and that is the case when I am calling the DKPTO. It gives one some sort of security that you know the people who are dealing with your patent applications and searches and also much can be unsaid if it is always the same person who is dealing with your company (Arne Kraglund).

According to Arne Kraglund, it is important that there is a good understanding between the DKPTO and Rockwool and he likes that the two parties are close geographically. Because the geographic distance is short, we can easily meet if it is necessary, noting that they actually meet once a year to discuss their collaborations, Arne Kraglund says. At these meetings, Arne Kraglund is asked to come up with ideas to improve the effectiveness of the DKPTO and assess their customer-client relationship. This implies that it is likely that the DKPTO has learned from its collaboration with Rockwool.

The advantages of having a national patent office

Rockwool supports the national patent office. However, Arne Kraglund thinks that Rockwool would do just as well without a national patent office amongst other because Rockwool has many years of experience with the patent work. But for the sake of small companies and newly established companies that might be low on cash, Rockwool supports the national patent office. From a society point of view Arne Kraglund believes that there is a necessity for a national patent office, adding that it is also convenient.

Conclusions from case stories

The contribution of patent literature and -information to technology spillover in the innovation system

None of the respondents believe that they have increased their specific technological knowledge through their interaction with the DKPTO. The patent literature and information (on which business services are based) likewise have only to a limited extent contributed as inspiration to new inventions. Two of the respondents (Arne Kraglund, Rockwool and Peter Lauridsen, Technological Institute) mention that they have used the state of art-searches as inspiration for new inventions, but, not very often.

At the Technological Institute, these types of searches have also been used for adjustment of the direction of future inventions.

In general, it is believed that the technological knowledge that might be gained from patent literature is indirect. This result is no surprise and it is widely supported by research concerning the general importance of patent literature to the innovation process.

The DKPTO's contribution to increasing knowledge and awareness of IPR and to facilitating access to IPR protection

The case stories show that the patent applicants learn a lot from working with patent questions on their own. Also, all the respondents clearly have gained a higher ability to see the IPR-angle of their innovations from dealing with patent questions; they are all able to read and understand the patent literature and the inventors are today better at giving full descriptions of their inventions or to codify the knowledge behind an invention.

With respect to learning effects of interacting with the DKPTO, the size of the firms may have a bearing on learning effects, as one should expect learning to be most intense during the first occasions of interaction. Thus, a large firm with its own patent engineers, or even patent department, like Rockwool, may have learned much in connection with their first patent application. However, after having developed internal competences at a high level, it is likely that learning effects diminish. Vice versa, small firms may experience disproportionally higher learning effects.

The importance of a national patent office

None of the respondents believe it would affect their patent activities negatively if the patent system were fully centralised in Munich and several of the respondents mention that they are indifferent to from where they buy their business services. The business services can be bought from the DKPTO, other patent authorities or patent agents.

Several of the respondents also claim that it is just as easy to hand in a patent application to the EPO as to the DKPTO.

Even though the respondents do not think that they would apply for fewer patents if the DKPTO had not existed, they all mention advantages with having a national patent office. The respondents all agree that it is convenient to have a patent office in Denmark because of the shared language and culture, it is easy to meet and communicate, also because the respondents have good personal contacts in the DKPTO. Some of the respondents also mention that the DKPTO organise courses in IPR thus stimulating general awareness of IPR. Furthermore, the patent agents interviewed believe it is useful to have a national patent office to bring together the patent industry and to promote networking in the industry. So all the respondents could point out advantages of the national patent office. Some of the respondents point to additional benefits of a national patent office for small firms.

6. Conclusions – the role of the DKPTO in knowledge transfer and competence building relevant to product innovations

Two types of learning processes have been investigated in this chapter. First, it was contended in section 1 that the interaction between on the one hand firms,

intermediaries or individuals applying for patents and on the other hand the patent office would add to the competencies with both parties. In the end, this may have positive effects on the innovative abilities of the firms and their awareness on and actual use of the IPR-system. Moreover, the competencies in the patent office may increase as a result of this interplay. Second, internal competencies resulting from processing applications may then be transmitted to other parts of the organization thus enhancing these other parts' ability to provide services, not only to firms directly, but also indirectly through various types of intermediaries.

In the theoretical framework, and in other chapters, notably chapter 2 by Lundvall, we pointed to different ways of transmitting different kinds of knowledge such as codified and tacit knowledge. We thus pointed to the need to study the nature of knowledge to be exchanged between Sales & Marketing -department and patent examiners as well as to which extent such knowledge transfer is actually taking place. If the efficiency of activities of Sales & Marketing is dependent upon diffusion of knowledge from patent examiners it requires that mechanisms of knowledge transfer be established with the objective of ensuring knowledge transfer. With limited interaction between departments, this transfer is unlikely to take place. In a dynamic setting, the establishment of such an appropriate level of learning processes may be part of an overall strategy for organizational development¹³.

¹³ Note that learning is usually considered a positive thing. However, as learning processes may be costly there is a limit to how far it is rational to go in investing in the build-up of organizational structures conducive for learning processes. In fact, it may in some cases be rational to have less close interaction, as was discussed in section 2, and as has been referred to in the literature as “the strength of weak ties” (Granovetter, 1973).

With respect to the *internal* competencies, we found that it is crucial for the production (and supply) of technical business services that the technical expertise is readily available. In the DKPTO these services are supplied without any intensive cross-departmental knowledge flows or close cooperation between patent examiners and the Sales & Marketing section. The knowledge involved furthermore primarily is of a codified nature. The division of labour and procedures are strictly defined and the need for increasing knowledge flows was felt greater within departments than between departments. Consequently, there were no efforts to create environments for learning between the departments. However, taking the tasks of the departments into account, the need for such efforts was not obvious¹⁴. The accessibility of patent expertise was important, but we did not find arguments for having access to this expertise in-house. The separation of the two functional groups, and the codified nature of the knowledge needed, means that, in principle, it would be possible to buy the examination expertise elsewhere, if it were readily available. In practical terms, there are a number of objections to a separation of functions. For example, it is the responsibility of the government authorities to manage the application processing according to strict rules. This is due to considerations on equal process, secrecy, and the risk of disqualified processing.

¹⁴ In fact, the studies within the DKPTO revealed that the DKPTO earlier worked a lot with organizational change and developed the organization into a community of practice-like set up. However, this showed to be inefficient and consequently it was changed to the functionally oriented structure.

We have shown in a discussion of the functions of the DKPTO what are its relationships to other organizations in the innovation system, including demonstrating that its associations with *external* organizations are not only confined to industrial firms. A wide array of other relations is important in the overall picture of the position of the DKPTO in the innovation system. This reveals that although the DKPTO has direct contact with many firms, its indirect role as a provider of information and knowledge to other organizations should not be underestimated.

The general impact of the DKPTO on transfer of knowledge conducive for product innovation in firms is, according to the case studies primarily in increasing the awareness of IPR. In addition, there is a flow of qualified patent caseworkers from the DKPTO to the patent agents (and to large industrial firms), which in itself means a transfer of knowledge relevant for the innovation process.

One may question if these functions could effectively be taken care of by EPO, patent agents, or some other institution. Certainly many firms, especially the large firms, would not mind if the functions mentioned in section 3 and annex 1 were fulfilled by the EPO. On the other hand, we saw in the case studies, that in particular, small, new firms may feel more confident with a national patent office in the proximity, with its familiar and national language.

Appendix 1: Business services

The descriptions provided here do not cover all kinds of business services. Only those that are seen as the most important to innovation activities of companies and inventors are included in the analysis. The review is based on the descriptions of individual services in the DKPTO's 'Handbook of Products'. The production processes connected to the services are also briefly described in the handbook and further information has been gathered through interviews with employees in S&M and in the patent section.

Central business services

Novelty searches

This service is intended to establish whether an invention is 'new', which is important in terms of patentability. Novelty searches are, therefore, an important element of the casework involved in handling patent applications. However, novelty searches can also be delivered as a 'stand-alone service' on different scales.

This service may quickly offer customers a preliminary indication concerning the possible patentability of an invention.

Infringement inquiries

This service investigates whether a customer's product violates the IPRs of another company or person if marketed. The inquiry may be limited to material provided by the customer, but apart from this, infringement inquiries involves more or less the same search operations in patent literature and databases as is the case with novelty searches.

Besides offering a more thorough assessment of the technical properties of the customers' product, which is relevant for deciding to apply for a patent, infringement inquiries offer more or less the same advantages as novelty searches. Thus, it may guide decisions on further investments and development. In particular, it may guide decisions on whether or not to market a product.

State of the art technology inquiries

Inquiries into state of the art within a specific technology area are equally based on searches in international patent literature both manually and in electronic databases. Searches into other relevant material are provided on the customer's request.

The purpose of this type of inquiry is to give inspiration to customers for further development of a product. It is somewhat broader in scope than a novelty search as the focus is on technology assessment of a technical area in general rather than on the customer's own product as in novelty searches and infringement inquiries.

Profile analyses

The services mentioned above are quite technical in nature as they aimed at assessing technology, e.g. according to novelty or potential infringement of IPRs. Profile analyses can be both technical and non-technical depending on the type of profile in question. The DKPTO offers basically four different types of profiles, industry profiles, company profiles, product profiles, and technique profiles.

Monitoring

Monitoring consist of searches that are repeated periodically. This type of searches can be aimed at different types of information depending on the needs of the customer. The main types of monitoring include:

- Monitoring of a specific technical subject through patent literature or relevant technical literature.
- Monitoring of the activities of certain companies or inventors concerning patenting (or utility models, design, and trademarks).
- Monitoring of activities concerning a certain IPR identification number ('rettighedsnummer').
- Monitoring of changes in intellectual property law within a certain (e.g., technical) area specified by the customer.

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Table 1. Number of man-years by staff category in 2000.

Executives and heads of section	Consultants	Engineers	Other academic staff	Office workers and other staff
22,5	23,8	56,4	35,5	139,3
8,1 %	8,5 %	20,2 %	12,7 %	50,5 %

Source: DKPTO Knowledge Account 2000.

Table 2. Competence development and educational activities in 2000.

<i>Activity</i>	Number of days	External / Internal
Basic training / patent course.	445	Internal
Training by experienced colleagues.	864	Internal
Advanced training of specialist incl. on-line search.	284	Internal / external
Basic juridical training and competencies.	210	Internal
Sales and marketing competencies.	35	Internal
Management training.	193	Internal / external
Networking competencies.	30	External
Professional and personal development.	495	Internal / external
Behavioural and attitudinal development.	396	Internal
Language proficiency.	230	Internal / external
Presentation and supervision techniques.	77	Internal
Presentation in writing.	28	Internal
Introductory meeting	57	Internal
Total	3345	-

Source: DKPTO Knowledge Account 2000.