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# Intellectual Property Rights and Competitiveness: Challenges for ICT-Producing SMEs

Study report  
**No. 08/2008**



European Commission, DG Enterprise and Industry

Email: [entr-innov-ict-ebiz@ec.europa.eu](mailto:entr-innov-ict-ebiz@ec.europa.eu),  
[info@ebusiness-watch.org](mailto:info@ebusiness-watch.org)

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# Intellectual Property Rights for ICT-Producing SMEs

A Sectoral e-Business Watch Study by  
IDC EMEA Government Insights

## Final Report

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September 2008



This report was prepared by IDC EMEA on behalf of the European Commission, Enterprise & Industry Directorate General, in the context of the "Sectoral e-Business Watch" programme. The Sectoral e-Business Watch is implemented by empirica GmbH in cooperation with Altran Group, Databank Consulting, DIW Berlin, IDC EMEA, Ipsos, GOPA-Cartermill and Rambøll Management based on a service contract with the European Commission.

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## About the Sectoral e-Business Watch and this report

The European Commission, Enterprise & Industry Directorate General, launched the Sectoral e-Business Watch (SeBW) to study and assess the impact of ICT on enterprises, industries and the economy in general across different sectors of the economy in the enlarged European Union, EEA and Accession countries. SeBW continues the successful work of the *e-Business W@tch* which, since January 2002, has analysed e-business developments and impacts in manufacturing, construction, financial and service sectors. All results are available on the Internet and can be accessed or ordered via the Europa server or directly at the SeBW Web site ([www.europa.eu.int/comm/enterprise/ict/policy/watch/index.htm](http://www.europa.eu.int/comm/enterprise/ict/policy/watch/index.htm), [www.ebusiness-watch.org](http://www.ebusiness-watch.org)).

This document is the final report of a Topic Study, focusing on Intellectual Property (IP) protection in small and medium-sized enterprises (SMEs) producing information and communications technology (ICT).

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## Contact

For further information about this sector study or the Sectoral e-Business Watch, please contact:

 <i>Analyze the Future</i>		
<p><b>IDC EMEA Government Insights</b>            Viale Monza, 14, 20127            Milano, Italy            Fax: (39) 02 28457 333  <a href="mailto:gcattaneo@idc.com">gcattaneo@idc.com</a></p>	<p><b>Sectoral e-Business Watch</b>            c/o empirica GmbH            Oxfordstr. 2, 53111 Bonn,            Germany            Fax: (49-228) 98530-12  <a href="mailto:info@ebusiness-watch.org">info@ebusiness-watch.org</a></p>	<p><b>European Commission</b>            Enterprise &amp; Industry Directorate-            General ICT for Competitiveness            and Innovation            Fax: (32-2) 2967019  <a href="mailto:entr-innov-ict-ebiz@ec.europa.eu">entr-innov-ict-ebiz@ec.europa.eu</a></p>

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## Executive summary

### The critical role of IPR for ICT SMEs' competitiveness

This study aimed at producing original evidence, based on a survey and case studies, about the awareness and use of IPR (Intellectual Property Rights) by European SMEs (Small and Medium Enterprises) active in the ICT (Information and Communication Technologies) Industry. Intellectual property rights (including copyrights, patents, trademarks and other informal tools) are widely recognized as a key driver of innovation in the ICT arena.

ICT SMEs are approximately 731,000 in the EU 25, but are very important for the dynamism and competitiveness of the European economy. ICT SMEs must deal with increasing international competition, keep up with the pace of technological innovation and adapt to the reorganization of world supply chains. To do so, ICT SMEs need to develop original knowledge, to protect it and to bring it to the market as fast as possible. Therefore they have an increasing need to exploit the full range of formal and informal IP tools, to help to build and defend their competitiveness. However, IPR regulation is at the heart of some of the most heated competitive battles in the ICT industry. They concern the existence and role of software patents, piracy and counterfeiting of software and digital content (affecting Digital Rights Management), the management of IPR in ICT standardization and interoperability processes, particularly for open standards development.

ICT SMEs face greater barriers than large enterprises in IPR adoption, because of their minor resources and lack of specific expertise. This means that IP protection is an extremely sensitive issue, where policy makers have a considerable power to influence the development of the market.

### The adoption of IPR is increasing but advanced users are a minority

ICT SMEs are following the general market trend, increasingly adopting IPR, both formal and informal. Their IPR portfolios are more articulated than normally expected from SMEs. But the most common tools remain informal IPR (confidentiality agreements, used by 69% of the study sample), followed by copyright (41%), trademarks (31%) and patents (25%). The study identified three main typologies of users, remarking that the size of the IPR portfolio tends to grow with company size. They are **Low Profile Users (29%)** with only one type of IPR, usually informal; **Mainstream IPR Users (36%)**, the relative majority of ICT SMEs, who use 2 or 3 different IPR tools and are more present in the Software and ICT services industries (copyright is the cornerstone of their IPR strategy); **Advanced IPR Users (23%)** with a portfolio of 4 to 7 different IPR tools covering the full range of IPR, both formal and informal. These firms most frequently use copyright, patents, Confidentiality Agreements and DRM. Nevertheless, there is a gap between the actual use of IPR and the potential benefits, which ICT SMEs might gain, if they exploited the full range of IPR tools.

Only the minority of advanced IPR users are fully exploiting the potential of their portfolios. For example, the majority of ICT SMEs do not have a dedicated IPR department or manager, and only a third of firms use specialised external support. The problem is not a lack of generic awareness about the role of IPR, rather a lack of knowledge about the potential benefits of specific IPR tools for the firm business strategy, and the best way to exploit them.

## Using IPR for competitive advantage and innovation

Advanced ICT SMEs are learning to use IPR to protect their research investments and defend their competitiveness in global supply chains. Overall, it appears that many ICT SMEs have progressed in the learning curve of IPR, described by literature, beyond the first stage, which is the purely defensive strategy, towards a use of IPR to implement innovation and achieve competitive advantages.

According to our survey, the majority of ICT SMEs use copyrights, trademarks, registered designs and utility models mainly to **exploit innovation**, in order to launch new products and services. **Gaining access to funding** (using IPR as a financial asset, which is a fairly sophisticated strategy) is the second-ranking goal for copyrights and registered designs, followed by **Exchanging IPR** (one of the most common ways to use IPR in business alliances). The least important goal appears to be **blocking competitors**, which used to be one of the main reasons to adopt IPR according to most sources.

The case studies of advanced IPR users confirm this view, providing evidence of use of IPR to attract investment capital and to access finance, to protect original knowledge and research investments when entering new and international markets, to build a portfolio of patents for exchange in cross-licensing agreements. Many advanced ICT SMEs use IPR to protect original knowledge within supply chains, business alliances and other networks and to improve the company image and competitive positioning.

## The use of IPR is correlated with better business performance

According to the survey data, there is a link between IPR use and business performance. First of all, ICT SMEs with IPR are more likely to declare turnover, market share and employment growth, than firms without IPR. The likeliness to show turnover and profit growth increases with the size of the IPR portfolio, since a higher percentage of ICT

SMEs in the group of advanced IPR users are growing (77%), compared to the group of Low profile IPR users (where 56% are growing). From the point of view of the composition of the IPR portfolio, firms with patents are more likely to grow, while firms with informal IPR are even less likely to grow than firms without IPR.

## Impact of IPR on competitiveness

The evolution of the value chain in the ICT industry is leading to increasing specialization of the different actors, with knowledge-intensive tasks such as R&D and design increasingly outsourced to dedicated firms, within complex global networks. This creates the opportunity for newly emerging business models based on the creation and exploitation of IPR, essentially new market niches. They can be divided between “pure” IP-based business models, where IP are the most important, if not the only, source of revenues, and IPR are a *sine-qua-non* condition, and other innovation models, where ICT SMEs use IPR to participate in supply chain networks. They are illustrated through the case studies.

**IP-based New Technology Firms** gather all their revenues from licenses and royalties of IP and use IPR broadly. Three of our case studies (Array Technology-Denmark, Comsys-Israel and DxO Labs-France) fall in this typology, focusing on design and development activities, and outsourcing production. These firms are inherently exposed to high risks, because of the need to keep investing in R&D and remain one step ahead of the competition in technological innovation.

**Firms with Cooperative innovation Business Models** depend on IPR as a competitive advantage and gain part of their revenues from IP-protected products and services. IPR allow these ICT SMEs to increase sales and market share in competitive global markets. Three of our case studies fall in this typology: Eurotech, Net Insights and Vierling, who are ICT manufacturing firms.

**Open Source Software Business Model:** OSS firms gain their revenues from a



combination of licensing and services, so also their revenues depend on IP-protected products. The case studies show that IPR management is an issue also for these firms, because the licensing and copyright regime requires specific knowledge and skills.

## Policy implications

The development of the knowledge economy is changing the scenario for the use of IPR, which is becoming more challenging and complex. ICT SMEs face two order of problems concerning the use of IPR: those specific of the ICT sector, which affect ICT SMEs more than large competitors, and those descending from the inherent weaknesses of small enterprises, such as undercapitalization and lack of specialized human resources and knowledge. There is a need for a revision of the basic assumptions of IPR policies for ICT SMEs, to move beyond general support without industry specificity, taking instead into account the new range of emerging needs, in order to remove barriers and enable small, innovative ICT players to implement the right IPR strategy to compete effectively. The study conclusions suggest the following policy recommendations.

**Improve the quality of IPR adoption and management by ICT SMEs:** There is a need for streamlining and reinforcing the broad range of IPR support services for SMEs, already existing in Europe. They should be encouraged to progress beyond an excessive focus on patents to promote wider IP protection strategies, taking into account the full range of formal and informal IPR, and to provide industry-specific services, particularly to ICT SMEs. To address the needs of Innovative ICT SMEs, policy makers should consider carefully the business case for launching, and/or contributing to, specialized, value-added IPR consulting, enforcement and implementation services, possibly web-based, dedicated to specific vertical market segments. These services should allow ICT SMEs to find help to compete and cooperate in business chains with larger enterprises with greater means. To address the needs of less

innovative ICT SMEs, policy initiatives and support services should still promote the diffusion of practical knowledge of the IPR system and of existing alternatives to achieve competitive advantages. Advanced awareness initiatives should include periodical monitoring and comparative assessments of the suitability of the different IPR tools (or alternative protection methods), from the point of view of ICT SMEs business strategies.

**Promote greater coordination between Innovation policies, ICT industry policies, IPR policies for SMEs:** In order to respond to specific ICT SMEs needs in this area, IPR policy should not be considered only as a horizontal, general SME policy tool, but should be better integrated with innovation and ICT industry policy goals, at the EU, national and regional levels. To achieve this goal, there is a problem of coordinating the institutions and actors responsible for the different policy strands. For example, institutions operating in the national innovation system should ensure that IP is adequately incorporated into the broader framework of support for entrepreneurs and SMEs and for the ICT industry. In doing so, institutions should take into consideration the main obstacles faced by entrepreneurs and SMEs not just in seeking grant/registration of IP rights but throughout the IP management cycle.

**Analyse the implications of the IP-based business models in the ICT industry for IPR policies:** This study confirmed that emerging IP-based business models have increasing relevance in the new global supply chains of the ICT industry, particularly for start-ups and new-technology based firms. These ICT SMEs deserve to be supported, because they are showing high growth and competitiveness. It is advisable to understand better whether there is a specific need for IPR policies integrating innovation policies in this area.

**Respond to ICT SMEs Needs of Improvement of the IPR System in Europe:** ICT SMEs ask first of all for a greater harmonization of the IPR regulatory framework between the European and national level, particularly for patents. They ask for

streamlining and harmonization of bureaucratic processes, rather than a deep overhaul of the IPR regulatory framework; only the patent system raises strong criticisms.

The adoption of a Community Patent granted by one central authority and subject to the same rules throughout the EC is ideally the best solution to reduce the present inefficiencies of the European Patent system. But it presents several problems and should be encouraged only if the costs of such Community patents could be affordable to all patent holders including SMEs. In order to respond to ICT SMEs needs, the overall efficiency and timeliness of the European patent system should be improved, and the burden of excessive translation costs should be reduced. Additional funding could be considered to fill the gap in time when ICT SMEs must anticipate costs for patents, before new revenues start to come in.

**Enhance technology transfer and knowledge sharing, also solving the problem of software patents:** From the point of view of the policy maker, the improvement of the IPR system should lead to better technology transfer and knowledge sharing, rewarding inventors but also helping to leverage inventions at the system level. This is particularly important for the ICT industry and for ICT SMEs, who need to develop their own innovations within the digital ecosystem building on other enterprises inventions and technology advances. Real progress on this issue would need a resolution of the conflict on software patents, which is not only an ICT SMEs problem but involves also large players. As shown by the analysis of this report, the differing opinions on the software patents issue are entrenched. Any resolution favourable to both sides is likely to be complex, requiring a delicate balancing act among the interests of all competitors. Given the difficulty to achieve a suitable compromise, there is a risk that the present situation (with the EPO releasing CII patents, recognized by some and contested by others, including courts and judges in different countries) may continue indefinitely. It is important that the EC steps up its efforts to

solve this problem with a generally acceptable compromise. Competition law may play a role in this effort.

**Defend the role of ICT SMEs in the open standards development:** This study documented the increasing conflict about the best way to deal with IPR in the ICT standards development arena, particularly about open standards, which are a key EU policy goal. Many ICT SMEs advocate ensuring positive complementarities between IPR protection, particularly patenting, and standardization and interoperability, particularly open standards. Many other ICT SMEs (and some large players) argue that IPR stand in the way of open standards development and should not be used at all in that context. It is important that the EC continues its activities to defend the interests of ICT SMEs in the standards development process.

It is also recommended that the High Level Policy Group on ICT standardization, announced by European Commission Vice-President Günter Verheugen, engage widely and take into account in particular the issues of standardization and IPR from the ICT SMEs perspective based on a practical review of the ICT SME competitive issues in the software and standardization-interoperability areas.

### About this study

This is the final report of the Sectoral e-Business Watch study on IPR (Intellectual Property Rights) for European SMEs (under 250 employees) active in the main Information and Communication Technologies (ICT) industries. The authors are Gabriella Cattaneo, Elena Vaciago and Ruediger Spies of IDC EMEA.

The study is based on a review of the extensive literature, 9 case studies, expert interviews with main stakeholders, and an international survey conducted by SeBW in 8 EU countries (AT, DE, ES, FR, IE, IT, PL, UK) in August/September 2007. The study sample was selected on the basis of adoption of IPR, therefore 89% of the interviewed ICT SMEs hold at least one type of IPR.

# 1 Introduction

## 1.1 About this report

### Objectives, sources and addressees

This is the final report of the Sectoral e-Business Watch study on IP (Intellectual Property) protection for ICT-producing small and medium-sized enterprises (SMEs), i.e. enterprises with less than 250 employees. The study focuses on the universe of ICT-producing SMEs, including ICT manufacturing, software and services, excluding purely commercial-oriented enterprises.

The study provides evidence on the way European ICT SMEs use IPR (Intellectual Property Rights) to enhance their competitiveness and their business strategies, as well as on their awareness of and their views about the present IPR regulatory framework. The study analyses also the economic and policy implications of the use of IPR by ICT SMEs.

The results of the study are based on a review of the extensive literature, nine case studies, expert interviews with main stakeholders, and an international survey conducted by SeBW in eight EU countries (AT, DE, ES, FR, IE, IT, PL, UK) in August/September 2007. The study addresses, in particular, policy makers (in the fields of innovation, ICT-related and SME policies), representatives of the ICT industry (notably firm general or strategy managers, decision makers for research and technical know-how protection, and human resources managers).

### Study structure

The study is structured into **six main chapters**. Chapter 1 explains the background and context *why* this study has been conducted: it introduces the Sectoral e-Business Watch (SeBW) programme of the European Commission, a conceptual framework for the analysis of e-business, and the specific methodology used for this study. Chapter 2 provides some general information and key figures about intellectual property protection by ICT-producing SMEs in Europe. Chapter 3 describes the current state-of-play of intellectual property protection in SMEs in related industries. Chapter 4 assesses the impact of the developments described in chapter 3 on business strategies and competitiveness. Chapter 5 presents company case studies. These have been selected as practical examples and evidence for the issues discussed in chapters 3 and 4. Chapter 6, finally, provides an outlook and draws conclusions on policy implications that could arise from the observed developments.

## 1.2 About Sectoral e-Business Watch

### Mission and objectives

The "Sectoral e-Business Watch" (SeBW) explores the adoption, implication and impact of electronic business practices in different sectors across the European economy. It represents the continued effort of the European Commission, Directorate-General (DG) Enterprise and Industry to support policy in the fields of ICT and e-business, which started with "*e-Business W@tch*" in late 2001.

In ICT-related fields, DG Enterprise and Industry has a twofold mission: "*to enhance the competitiveness of the ICT sector, and to facilitate the efficient uptake of ICT for European enterprises in general.*" The services of the SeBW are expected to contribute to these goals. This mission can be broken down into the following main objectives:

- to assess the **impact of ICT** on enterprises, industries and the economy in general;
- to highlight **barriers for ICT uptake**, i.e. issues that are hindering a faster and/or more effective use of ICT by enterprises in Europe;
- to identify and discuss **policy challenges** stemming from the observed developments, notably at the European level;
- to engage in **dialogue with stakeholders** from industry and policy institutions, providing a forum for debating relevant issues.

By delivering evidence on ICT uptake and impact, SeBW is supporting informed policy decision-making, in particular in the fields of innovation, competition and structural policy.

### Policy context

The original *e-Business W@tch* programme was rooted in the **eEurope Action Plans** of 2002 and 2005. The goal of eEurope 2005 was "*to promote take-up of e-business with the aim of increasing the competitiveness of European enterprises and raising productivity and growth through investment in information and communication technologies, human resources (notably e-skills) and new business models*".<sup>1</sup>

The **i2010 policy**<sup>2</sup>, a follow-up to eEurope, also stresses the critical role of ICT for productivity and innovation, stating that "*the adoption and skilful application of ICT is one of the largest contributors to productivity and growth throughout the economy, leading to business innovations in key sectors*" (p. 6). This Communication anticipates "*a new era of e-business solutions*", based on integrated ICT systems and tools, which will lead to an increase business use of ICT. However, it also warns that businesses "*still face a lack of interoperability, reliability and security*", which could hamper the realisation of productivity gains (p. 7).

In February 2005, the European Commission proposed a **new start for the Lisbon**

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<sup>1</sup> "eEurope 2005: An information society for all". Communication from the Commission, COM(2002) 263 final, 28 May 2002, section 3.1.2.

<sup>2</sup> "i2010 – A European Information Society for growth and employment." Communication from the Commission, COM(2005) 229 final.

**Strategy.** While it recommended changes in the governance structures, i.e. the way objectives are to be addressed, the overall focus on growth and jobs remained the same. Some of the policy areas of the renewed Lisbon objectives address ICT-related issues. Central Policy Area No. 6 deals with facilitating ICT uptake across the European economy. Policy-makers in this area will require thorough analysis of ICT uptake based on accurate and detailed information on the most recent developments. Such evidence-based analysis is also needed when targeting individual sectors to fully exploit the technological advantages, in alignment with Central Policy Area No. 7 "Contributing to a strong European industrial base". Furthermore, Guideline No. 9, addressed to Member States, encouraging the widespread use of ICT,<sup>3</sup> can be effectively addressed only if actions are based on understanding of the potential for and probable effectiveness of interventions.

***"ICT are an important tool ..."***

*"More efforts are needed to improve business processes in European enterprises if the Lisbon targets of competitiveness are to be realised. European companies, under the pressure of their main international competitors, need to find new opportunities to reduce costs and improve performance, internally and in relation to trading partners. ICT are an important tool to increase companies' competitiveness, but their adoption is not enough; they have to be fully integrated into business processes."*

*Source: European Commission (2005): Information Society Benchmarking Report*

In 2005, taking globalisation and intense international competition into consideration, the European Commission launched a **new industrial policy**<sup>4</sup> with the aim to create better framework conditions for manufacturing industries in the coming years. Some of the policy strands described have direct links to ICT usage, recognising the importance of ICT for innovation, competitiveness and growth.

The SeBW is one of the policy instruments used by DG Enterprise and Industry to support the implementation of the industrial policy and related programmes. Its activities are complementary to other related policy programmes in the field of ICT, such as:

- the e-Business Support Network (**eBSN**), a European network of e-business policy makers and business support organisations,
- the **eSkills Forum**, a task force established in 2003 to assess the demand and supply of ICT and e-business skills and to develop policy recommendations,
- the **ICT Task Force**, a group whose work is to draw together and integrate various activities aiming to strengthen Europe's ICT sector, and

<sup>3</sup> "Working Together for Growth and Jobs: a New Start for the Lisbon Strategy", Communication, COM (2005) 24, Brussels, 02.02.2005  
[http://europa.eu.int/growthandjobs/pdf/COM2005\\_024\\_en.pdf](http://europa.eu.int/growthandjobs/pdf/COM2005_024_en.pdf).

<sup>4</sup> "Implementing the Community Lisbon Programme: A Policy Framework to Strengthen EU Manufacturing - towards a more integrated approach for Industrial Policy." Communication from the Commission, COM(2005) 474 final, 5.10.2005.



- activities in the areas of **ICT standardisation**, as part of the general standardisation activities of the Commission.<sup>5</sup>

In parallel to the work of the SeBW, the "**Sectoral Innovation Watch**" (see [www.europe-innova.org](http://www.europe-innova.org)) analyses innovation performance and challenges across different EU sectors from an economic perspective. Studies cover, inter alia, the following sectors: chemical, automotive, aerospace, food, ICT, textiles, machinery and equipment.

## Scope of the programme

Since 2001, the SeBW and its predecessor "e-Business W@tch" have published e-business studies on about 25 sectors<sup>6</sup> of the European economy, annual comprehensive synthesis reports about the state-of-play in e-business in the European Union, statistical pocketbooks and studies on specific ICT issues. All publications can be downloaded from the programme's website at [www.ebusiness-watch.org](http://www.ebusiness-watch.org). In 2007/08, the focus is on the following sectors and specific topics:

No.	Sector / topic in focus	NACE Rev. 1.1	Reference to earlier studies by SeBW
1	Chemical, rubber and plastics	24, 25	2004, 2003
2	Steel	27.1-3, 27.51+52	--
3	Furniture	36.12-14	--
4	Retail	52	2004, 2003
5	Transport and logistics services	60, 63 (parts thereof)	--
6	Banking	65.1	2003
7	RFID adoption and implications	(several sectors)	--
8	Intellectual property rights for ICT-producing SMEs	30.01+02, 32.1-3, 33.2+3; 64.2; 72 (parts thereof)	--
9	Impact of ICT and e-business on energy use	--	--
10	Economic impact and drivers of ICT adoption	--	--

The SeBW presents a **'wide-angle' perspective** on the adoption and use of ICT in the sectors studied. Studies assess how ICT is having an influence on business processes, notably by enabling electronic data exchanges between a company and its customers, suppliers, service providers and business partners. The underlying conceptual framework is explained in more detail in the following section. In addition, the studies also provide **background information** on the respective sectors, including a briefing on current trends.

<sup>5</sup> The 2006 ICT Standardisation Work Programme complements the Commission's "Action Plan for European Standardisation" of 2005 by dealing more in detail with ICT matters.

<sup>6</sup> See overview at [www.ebusiness-watch.org/studies/on\\_sectors.htm](http://www.ebusiness-watch.org/studies/on_sectors.htm).

## 1.3 ICT and e-Business – key terms and concepts

### A definition of ICT

This study examines the use of information and communication technology (ICT) in European businesses. ICT is an umbrella term that encompasses a wide array of systems, devices and services used for data processing (the information side of ICT) as well as telecommunications equipment and services for data transmission and communication (the communication side). The European Information Technology Observatory (2007) structures the ICT market into four segments with an estimated total market value of about €670 billion in 2007 ([Exhibit 1.2-1](#)).

*Exhibit 1.3-1: The EU ICT market according to EITO (2007)*

Market segment	Products / services included (examples)	Market value for EU (2007) (EITO estimate)
<b>ICT equipment</b>	Computer hardware, end-user communications equipment (such as mobile phones), office equipment (such as copiers) and data communications and network equipment (such as switching and routing equipment, cellular mobile infrastructure)	€159 billion
<b>Software products</b>	System and application software	€76 billion
<b>IT services</b>	Consulting, implementation and operations management	€140 billion
<b>Carrier services</b>	Fixed voice telephone and data services, mobile telephone services, cable TV	€293 billion

Source: EITO 2007

In its widest sense, 'e-business' refers to the application of these technologies in business processes, including primary functions (such as production, inbound and outbound logistics or sales), and support functions (such as administration, controlling, procurement and human resources management). Companies in all sectors use ICT, but they do so in different ways. This calls for a **sectoral approach** in studies of ICT usage and impact. The following section introduces a wider framework for the discussion of e-business developments that will be used in the following analysis of the chemical, rubber and plastics industry.

### Gaining momentum after a phase of disappointment

When the bust phase of the previous economic cycle – commonly referred to as the 'new economy' – started in 2001, the former internet hype was suddenly replaced by a widespread disappointment with e-business strategies. Companies adopted a more reserved and sceptical attitude towards investing in ICT. Nevertheless, ICT has proved to be the key technology of the past decade (OECD 2004, p. 8), and the **evolutionary development** of e-business has certainly not come to an end. The maturity of ICT-based data exchanges between businesses and their suppliers and customers, fostered by progress in the definition and acceptance of standards, has substantially increased across sectors and regions over the past five years. In parallel, **recent trends** such as "Web 2.0" and social networking are widely discussed in terms of their business implications and it is widely recognised that 'e'-elements have become an essential

component of modern business exchanges. In short, e-business has regained momentum as a topic for enterprise strategy both for large multinationals and SMEs.

*"Measurement of e-business is of particular interest to policy makers because of the potential productivity impacts of ICT use on business functions. However, the ongoing challenges in this measurement field are significant and include problems associated with measuring a subject which is both complex and changing rapidly."*

*OECD (2005): ICT use by businesses. Revised OECD model survey, p. 17*

Companies use ICT in their business processes mainly for **three purposes**: to reduce costs, to better serve the customer, and to support growth (e.g. by increasing their market reach). In essence, all e-business projects in companies explicitly or implicitly address one or several of these objectives. In almost every case, introducing e-business can be regarded as an ICT-enabled process innovation. Understanding one's business processes and having a clear vision of how they could be improved (be it to save costs or to improve service quality) are therefore critical requirements for firms to effectively use ICT.

The increasing **competitive pressure** on companies, many of which operate in a global economy, has been a strong driver for ICT adoption. Firms are constantly searching for opportunities to cut costs and ICT holds great promise in this respect as it increases the **efficiency of a firm's business processes**, both internally and between trading partners in the value chain. While cutting costs continues to motivate e-business activity, innovative firms have discovered and begun to exploit the potential of ICT for delivering against key business objectives. They have integrated ICT into their production processes and **quality management** and, most recently, in **marketing** and **customer services**. These last sectors are widely considered key to improve competitiveness in the current phase of development of European economies. Competing in mature markets requires not only optimised cost structures, maximal efficiency, and products or services of excellent quality but also the ability to communicate effectively and cooperate with business partners and potential customers.

## A definition of e-business

As part of this maturing process, electronic business has progressed from a specific to a very broad topic. A central element is certainly the use of ICT to accomplish **business transactions**, i.e. exchanges between a company and its suppliers or customers. These can be other companies ('B2B' – business-to-business), consumers ('B2C' – business-to-consumers), or governments ('B2G' – business-to-government). In the broad sense, transactions include commercial as well as other exchanges such as sending tax return forms to the tax authorities.

If transactions are conducted electronically ('**e-transactions**'), they constitute e-commerce. Transactions can be broken down into **different phases** and related **business processes**, each of which can be relevant for e-commerce (see [Exhibit A.V-2](#)). The pre-sale (or pre-purchase) phase includes the presentation of (or request for) information on the offer, and negotiations over the price. The sale / purchase phase covers the ordering, invoicing, payment and delivery processes. Finally, the after sale / purchase phase covers all processes after the product or service has been delivered to the buyer, such as after sales customer services (e.g. repair, updates).

Glossary

**Definitions by standardisation groups (ISO, ebXML)**

The term 'business transaction' is a key concept underlying the development of e-standards for B2B exchanges. Therefore, definitions have been developed by standards communities to underpin their practical work. Examples include:

- ◆ **Business:** "a series of processes, each having a clearly understood purpose, involving more than one party, realised through the exchange of information and directed towards some mutually agreed upon goal, extending over a period of time" [ISO/IEC 14662:2004]
- ◆ **Business transaction:** "a predefined set of activities and/or processes of parties which is initiated by a party to accomplish an explicitly shared business goal and terminated upon recognition of one of the agreed conclusions by all the involved parties even though some of the recognition may be implicit" [ISO/IEC 14662:2004]
- ◆ **e-Business transaction:** "a logical unit of business conducted by two or more parties that generates a computable success or failure state" [ebXML Glossary]

**Exhibit 1.3-2: Process components of transactions**

Pre-sale / pre-purchase phase	Sale / purchase phase	After sale / after-purchase phase
<ul style="list-style-type: none"> <li>■ Request for offer/proposal</li> <li>■ Offer delivery</li> <li>■ Information about offer</li> <li>■ Negotiations</li> </ul>	<ul style="list-style-type: none"> <li>■ Placing an order</li> <li>■ Invoicing</li> <li>■ Payment</li> <li>■ Delivery</li> </ul>	<ul style="list-style-type: none"> <li>■ Customer service</li> <li>■ Guarantee management</li> <li>■ Credit administration</li> <li>■ Handling returns</li> </ul>

Practically each step in a transaction can either be pursued electronically (online) or non-electronically (offline), and all combinations of electronic and non-electronic implementation are possible. It is therefore difficult to decide which components actually have to be conducted online in order to call a transaction (as a whole) 'electronic'.

In 2000, the OECD proposed broad and narrow definitions of electronic commerce, both of which remain valid and useful today<sup>7</sup>. While the narrow definition focuses on 'internet transactions' alone, the broad definition defines e-commerce as "*the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over **computer-mediated networks**. The goods and services are ordered over those networks, but the payment and the ultimate delivery of the goods or service may be conducted on- or offline*" (OECD, 2001). The addendum regarding payment and delivery illustrates the difficulty mentioned above to specify which of the processes along the transaction phases constitute e-commerce (see Exhibit 1.2-2). The OECD definition excludes the pre-sale / pre-purchase phase and focuses instead on the ordering process. The SeBW follows the OECD position on this issue,<sup>8</sup> while fully recognising the importance of the internet during the

<sup>7</sup> In 1999, the OECD Working Party on Indicators for the Information Society (WPIIS) established an Expert Group on Defining and Measuring Electronic Commerce, in order to compile definitions of electronic commerce which are policy-relevant and statistically feasible. By 2000, work of the Group had resulted in definitions for electronic commerce transactions.

<sup>8</sup> The respective survey questions ask companies whether they "place / accept online orders".

pre-purchase phase for the initiation of business.

### Glossary

#### **Definition of key terms for this study**

- ◆ **e-Transactions:** *commercial exchanges between a company and its suppliers or customers which are conducted electronically. Participants can be other companies ('B2B' – business-to-business), consumers ('B2C'), or governments ('B2G'). This includes processes during the pre-sale or pre-purchase phase, the sale or purchase phase, and the after-sale / purchase phase.*
- ◆ **e-Commerce:** *the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over computer-mediated networks. (OECD)*
- ◆ **e-Business:** *automated business processes (both intra- and inter-firm) over computer mediated networks. (OECD)*
- ◆ **e-Interactions:** *covers the full range of e-transactions as well as collaborative business processes, such as collaborative online design processes which are not directly transaction focused.*

Using the OECD definition, e-commerce is a key component of **e-business** but not the only one. A wider focus oriented on business processes has been widely recognised. This vision of e-commerce also covers the digitisation of **internal business processes** (the internal processing of documents related to transactions) as well as **cooperative** or **collaborative processes** between companies that are not necessarily transaction-focused (for example industrial engineers collaborating on a design in an online environment). The OECD WPIIS<sup>9</sup> proposes a definition of e-business as "*automated business processes (both intra-and inter-firm) over computer mediated networks*" (OECD, 2004, p. 6). In addition, the OECD proposed that e-business processes should integrate tasks and extend beyond a stand-alone or individual application. 'Automation' refers here to the substitution of formerly manual processes. This can be achieved by replacing the paper-based processing of documents by electronic exchanges (machine-to-machine) but it requires the agreement between the participants on electronic **standards** and processes for data exchange.

## e-Business and a company's value chains

In some contexts, the term c-commerce (collaborative commerce) is used. Although this concept was mostly abandoned when the 'new economy' bubble burst in 2001, it had the merit of pointing towards the role of ICT in cooperations between enterprises and the increasing digital integration of supply chains. These developments go beyond simple point-to-point exchanges between two companies.

Despite dating back 20 years to the pre-e-business era, Michael Porter's framework of the company value chain and value system between companies<sup>10</sup> remains useful to

<sup>9</sup> Working Party on Indicators for the Information Society.

<sup>10</sup> Porter, Michael E. (1985). *Competitive Advantage*. New York: Free Press. Page references in



understand the relevance of e-business in this context. A **value chain** logically presents the main functional areas ('value activities') of a company and differentiates between primary and support activities. However, these are "*not a collection of independent activities but a system of interdependent activities*", which are "*related by linkages within the value chain*".<sup>11</sup> These linkages can lead to competitive advantage through optimisation and coordination. This is where ICT can have a major impact, in the key role of **optimising linkages** and increasing the efficiency of processes.

The **value system** expands this concept by extending its scale beyond the single company. The firm's value chain is linked to the value chains of (upstream) suppliers and (downstream) buyers; the resulting larger set of processes is referred to as the value system. All e-commerce and therefore electronic transactions occur within this value system. Key dimensions of Porter's framework (notably inbound and outbound logistics, operations, and the value system) are reflected in the **Supply Chain Management** (SCM) concept. Here, the focus is on optimising the procurement-production-delivery processes, not only between a company and its direct suppliers and customers, but also aiming at a full vertical integration of the entire supply chain (Tier 1, Tier 2, Tier n suppliers). In this concept, each basic supply chain is a chain of sourcing, production, and delivery processes with the respective process interfaces within and between companies.<sup>12</sup> Analysing the digital integration of supply chains in various industries has been an important theme in most sector studies by the SeBW.

## 1.4 Study methodology

The methodological framework of SeBW builds on the methodology established for the previous implementation of the e-Business Watch. However, the methodology has been adapted to the new focus of activity, supporting the progress from monitoring "e-readiness" and "e-activity" to the evidence-based analysis of "e-impact". Concerning the topic reports such as this one, the methodology is adapted to the specific topic under analysis.

### Data and information sources

The Sectoral e-Business Watch approach is based on a mix of data collection instruments, including the use of existing sources (e.g. the Eurostat Community Survey on ICT usage in enterprises) as well as primary research (notably the SeBW Survey and case studies). The main sources of information used for this study are:

- **A CATI survey** of European ICT SMEs of 683 interviews in 8 countries (AT, DE, ES, FR, IE, IT, PL, UK). The sample drawn was a random sample of companies from the respective ICT sector population in each of the countries, with the objective of fulfilling minimum strata with respect to company size-bands per country-sector cell (see Exhibit). Samples were drawn locally by fieldwork organisations based on official statistical records and widely recognised business directories such as Dun & Bradstreet (used in several countries) or Heins und Partner Business Pool.

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quotations refer to the Free Press Export Edition 2004.

<sup>11</sup> Ibid., p. 48.

<sup>12</sup> Cf. SCOR Supply-Chain Council: Supply-Chain Operations Reference-model. SCOR Version 7.0. Available at [www.supply-chain.org](http://www.supply-chain.org) (accessed in March 2006).

**Exhibit 1-3: Strata by company-size**

Size-band	Target quota specified
Micro-firms (3-9 employees)	34%
Small firms (10-49 employees)	33%
Medium-sized firms (50-249 employees)	33%

- **Case studies:** Nine case studies on the use of IPR by ICT SMEs were conducted for this study. The case studies were selected in order to achieve a balanced mix in terms of countries, business activities (sub-sectors, that is IT Manufacturing, TLC Manufacturing and Software), and company size-bands. Cases include best practices and innovative approaches of IPR strategies in the ICT industry.
- **In-depth interviews:** In addition to the interviews conducted with firm representatives as part of the case study work, in-depth interviews with company representatives, industry and IP experts were conducted.
- **Information from industry federations:** Annual reports and position papers of industry federations were a further source, for example from EICTA (European Information and Communication Technology Association) or the Foundation for Free Information Infrastructure (FFII).
- **Desk research** of the vast existing **literature** provided important insight for the analysis of the specific issues concerning the use of IPR in the ICT industry, IPR by SMEs, ICT SMEs specific problems, emerging IPR business models, IPR support services, relations between IPR policies and standardisation, interoperability issues, the software patents debate and the role of IPR in respect to the open source software movement.

## Validation of results

The study was conducted in consultation with an Advisory Board dedicated to this topic, established to critically accompany the study from the start. Members of the Advisory Board for this study were:

- Leo Baumann, Director Public Affairs, EICTA, Belgium.
- Pieter Hintjens, Foundation for a Free Information Infrastructure (FFII), Belgium.
- Carlo Piana, Lawyer, Tamos Piana & Partners, Italy.
- Henry J.F. Ryan, Lios Geal Consultants, Ireland.
- Eleni Sinodinou, Attorney at law, Bar Office of Thessaloniki, Greece.

For each Advisory Board, in addition to informal exchanges with the respective study teams during the research phase (e.g. via telephone, e-mail and in bilateral meetings), three meetings were foreseen. The **first meeting** took place on May 30, 2007, in Brussels, during the inception phase. At this meeting, the study exposé and research plan was discussed. The **second meeting** was held in Milan, on Wednesday February 6, 2008 discussing the findings of the Interim Report. An **open workshop** to present the final results was held in June 4, 2008 in Paris, with the participation of the Advisory Board experts and several experts and representatives of ICT SMEs.

The authors of the study wish to thank the AB components and the Commission for the constructive feedback and the valuable support given to the study. Any mistake remains of course full responsibility of the authors.

## 2 Context and background

### 2.1 Topic definition — main goals and scope of the study

This chapter defines the scope of this study, clarifying its objectives and the scope from the point of view of the industry sector (ICT) and the topic (definition of IPR).

#### Main goals

This study analyses the use of IPR (Intellectual Property Rights) by SMEs (Small and Medium Enterprises under 250 employees) active in the main ICT (Information and Communication Technologies) industries (see Exhibit 2-1). The study aimed at producing original, unbiased and coherent evidence about the awareness and use of IPR by European ICT SMEs and their influence on business strategies and competitiveness. In addition, the study analyses ICT SMEs' opinions about the current IPR system, its benefits and its shortcomings, in order to provide a contribution to the policy debate on this topic.

The topic is both urgent and sensitive, since Intellectual Property Rights (including copyrights, patents, trademarks and other tools) are widely recognized as a key driver of innovation in the ICT arena. Adequately protecting and promoting IPR is thus fundamental to Europe's future ICT competitiveness. But there is a fierce debate on the present IPR legal system and its proposed evolution, particularly concerning software patents, digital rights management for media content and other issues. The main problem is achieving the difficult balance between intellectual property protection and knowledge circulation. This is particularly relevant for ICT SMEs, since small innovative firms may have greater benefits from an effective IPR regime, but face greater barriers because of their minor resources and lack of specific expertise. There is also a conflict between defenders of IP protection and stakeholders who believe that excessive regulation in this field may even result in obstructing innovation, rather than encouraging it. The report is structured as follows. This chapter describes the context and background of the study, including the main issues concerning IPR in the ICT industry, their main trends and challenges, focusing specifically on ICT SMEs. The third chapter analyses the awareness and use of IPR by ICT SMEs, based mainly on field research results. Chapter 4 looks at the main impacts of IPR management on ICT SMEs strategies and business results. Chapter 5 presents in detail the 9 case studies carried out for the study. Chapter 6 presents the final conclusions and policy implications.

#### Scope: ICT SMEs

The ICT industry as defined for the study (see the following exhibit) includes the following main subsectors: ICT manufacturing, Software, and IT services. The total number of enterprises under 250 employees in the sectors targeted by this study in the EU 25 is relatively small: approximately 731,000 SMEs, corresponding to 4% of the total universe of European enterprises (based on Eurostat SBS data, excluding banking and the public sector). (see Ex.2.2). The largest subsector by far is Computer Services, counting almost half a million enterprises. Micro enterprises with 1 to 9 employees represent 93% of SMEs in ICT services, but "only" 82% in ICT Manufacturing, which is more concentrated.

**Exhibit 2-1: Industries included in this report (NACE Rev. 2 and 1.1)**

NACE Rev. 1.1	NACE Rev. 2	Business activity:
		<b>Manufacturing activities</b>
32.1	26.11	Manufacture of electronic components
30.02	26.2	Manufacture of computers and peripheral equipment
32.2	26.3	Manufacture of communication equipment
32.3	26.4	Manufacture of consumer electronics
33.2	26.51	Manufacturing of instruments and appliances for measuring, checking, testing
33.2	26.7	Manufacture of optical instruments and equipment
		<b>Information technology services</b>
64.2	61	Telecommunications
72.1, 72.3	63	Information technology service activities
		<b>Software</b>
72.2	58.2	Software publishing

Source: e-Business Watch (2007)

ICT SMEs are very important for the dynamism and competitiveness of the European economy. In terms of value added, the share of SMEs in ICT manufacturing in the EU25 is about 36%, while the comparable share in ICT software and service production is 33%<sup>13</sup>. The share of value added is higher than in most other industry sectors.

**Exhibit 2-2: Number of ICT SMEs (1 to 250 employees) in the EU 25 by sector**

		1-9 empl.	10-49 empl.	50-249 empl.	TOTAL
dl	<b>Manufacture of electrical and optical equipment, of which:</b>	<b>159.289</b>	<b>27.158</b>	<b>7.117</b>	<b>193.564</b>
dl33	<i>Manufacture of medical, precision and optical instruments, watches and clocks</i>	76.800	11.821	2.316	90.937
dl32	<i>Manufacture of radio, television and communication equipment and apparatus</i>	23.568	3.438	1.278	28.284
dl31	<i>Manufacture of electrical machinery and apparatus n.e.c.</i>	50.557	10.847	3.220	64.624
dl30	<i>Manufacture of office machinery and computers</i>	8.364	1.052	303	9.719
k72	<b>Computer and related activities</b>	<b>450.000</b>	<b>24.665</b>	<b>4.536</b>	<b>479.201</b>
i64	<b>Post and telecommunications</b>	<b>52.415</b>	<b>4.932</b>	<b>1.159</b>	<b>58.506</b>
	<b>TOTAL</b>	<b>661.704</b>	<b>56.755</b>	<b>12.812</b>	<b>731.271</b>

Source: Extraction from Eurostat Structural Business Statistics, 2004

<sup>13</sup> Elaboration by UNU-MERIT based on EUROSTAT, data 2002, from the Final report of the "Study on Innovative ICT SMEs in Europe (EU 25)", IDC EMEA, October 2007.

## 2.2 Classification of IPR

### 2.2.1 Overview

The system of intellectual property rights serves as a way to resolve the "appropriability" problem of knowledge, by creating property rights over knowledge. A precise definition is provided by the World Intellectual Property Organization:

*"IP rights may be defined as exclusive rights granted by the State giving the owner the right to exclude all others from the commercial exploitation of a given invention, new/original design, trademark, literary and artistic work and/or new variety of plant."* (WIPO, 2003a)

IPR are classified in two main groups, formal (rights granted by the legal system) and informal (where protection exists in practice but does not depend on a legal procedure), which may be used in alternative or complementary ways. In this study the term IPR includes both formal and informal rights. This study analyses both methods, with greater focus on formal IPR and specifically on patents and copyrights.

The main categories of formal and informal protection methods are listed in the table and described in the following paragraphs.

**Exhibit 2-3: Classification of Formal IPR and Informal Protection Methods**

Formal IPR	Informal Protection Methods
Patent	Trade secret
Copyright	Lead time advantage
Trademark	Complexity of design
Industrial design (registered and non registered)	Digital Rights Management
Other (special cases):	
Database sui generis rights	
Topography of semiconductor	
Domain names.	

Source: e-Business Watch (2007)

### 2.2.2 Formal IP rights

The most important and better-known IPR are patents and copyrights, while trademarks are the most diffused. They differ on the basis of the conditions at which the right is granted, the starting date of validity, the duration of the protection, and the country of validity, as shown by the following table.



**Exhibit 2-4: Characteristics of different formal intellectual property rights**

Type of IPR	Conditions	Initial date of validity	Length of protection period	Country of validity
Patent for an invention	Novelty- Inventive step	Date of application	20 years, no renewal	Where the right is granted
Patent for a utility model	Inventive step	Date of application	7 or 10 years No renewal	Where the right is granted
Copyright	Original and novelty (form of expression)	In force at creation	In the EU, life of author plus either 50 or 70 years	Where protection is claimed
Trademark	Novelty- Originality- Distinctive character	Date of application	10 years. Possibility of renewal	Where the right is granted
Registered industrial design and models	Originality- Individual character	Date of application	35 years from filing date	Where the right is granted
Non registered industrial design	Originality- Individual character	Date of disclosure	3 years after disclosure	Where the right is granted
Data base <i>sui generis</i> rights	Substantial investment	Date of first public sale	15 years Possibility of renewal in case of update	EU
Topography of semiconductor	Originality- Result of intellectual effort	Different possibilities	10 years	Where the right is commercialised

Source: e-Business Watch (2007)

## Patents

According to WIPO<sup>14</sup>, “patents, also referred to as patents for invention, are the most widespread means of protecting the rights of inventors. Simply put, a patent is the right granted to an inventor by a State, or by a regional office acting for several States, which allows the inventor to exclude anyone else from commercially exploiting his invention for a limited period, generally 20 years”. An invention is an object or process that must meet the following conditions to be protected by a patent (Art. 52 of European Patent Convention):

- have an element of novelty compared with the prior art;
- be based on an inventive step which could not be deduced by a person with average knowledge of the technical field;
- be susceptible of industrial application.
- The invention must fall within the scope of patentable subject matter as defined by national law. This varies from one country to another.

<sup>14</sup> Understanding Industrial Property”, WIPO 2004, [www.wipo.int/freepublications/en/intproperty/895/wipo\\_pub\\_895.pdf](http://www.wipo.int/freepublications/en/intproperty/895/wipo_pub_895.pdf)

In most cases a patent is granted after an examination of the technical merit. The application:

- must sufficiently describe the invention, so that an expert in the field is able to reproduce the invention, and
- provide a list the claims that make explicitly what is the field of protection sought by the patent application (and lately conferred by the patent), this list being generally enumerated from the most far reaching to the more specific.

Patents expire in 20 years from the filing date. Extensions or renewals are not allowed and upon expiration, the invention enters into the public domain.

Exploitation of a patent can be performed by using the invention for internal purposes, licensing that use to others, by selling all rights to a third party or a combination of the same. Frequently, because of mutual interferences between different inventions, large patent holders establish a common framework to share some or all of their patents (cross licensing agreements).

Patents for inventions offer the highest degree of protection for innovation, as they cover a larger area than just the actual implementation of the idea, and – unlike the copyright – there is no such a thing as an “independent development” defence. In other words, of two inventors who achieve the same innovation, the first to file for a patent obtains all the rights on the idea, and the second has no right whatsoever on the same.

In Europe, software as such cannot be patented. However, the EPO grants patents on what are called ‘computer-implemented inventions’ or CII. These are not patents on software as such; they do not cover the code or other expression of a computer program in its own right. It is the inventions that reside in or otherwise are implemented by computers and software that are patentable. When used in the software field, they prevent imitation by a larger degree than copyright. (See *sec.2.4.4 for an analysis of the software patents debate in the EU*).

Patents are considered by economic literature as a key tool to reward research investments, and therefore promote innovation. The Commission PatVal<sup>15</sup> study, which was based upon a survey of 10,000 inventors in eight Member States, developed an estimate of the economic value of patents, both for the inventor and the economic system. The study identified the “patent premium”, defined as the value of a patented invention, net of the value of the invention itself, in case the inventor had no patent on it. The total patent premium was estimated at 3 million euros as an average for the EU-8 MS examined, representing roughly 1% of the GDP in 1994-1996, increasing to 1.16% of GDP in 2000-2002.

Few patents account for the bulk of the overall economic value of patents. The estimated median is 300 thousand euros, but a 7.2% of the patents are worth more than 10 million Euros, and 16.8% have a value higher than 3 million Euros. About 68% of the patents produce less than 1 million Euros, while 8% have a value lower than 30 thousand Euros.

It is suggested, moreover, that there is a correlation between the use of intellectual property rights and good innovation performance. Under this assumption countries with a high innovation performance are in general characterised by high levels of patenting and the use of other rights, such as design and trademark rights. This correlation is confirmed

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<sup>15</sup> "The Value of patents for today's economy and society", Gambardella et.al. 2005, Study for DG Market of the EC, Tender n° MARKT/2004/09/E, Lot 2.

at the sectoral level, with the sectors where more patents are issued tending to be more innovative.

## Utility models

According to WIPO,<sup>16</sup> “the expression “utility model” is simply a name given to a title of protection for certain inventions, such as inventions in the mechanical field. Utility models are usually sought for technically less complex inventions or for inventions that have a short commercial life”. The procedure for obtaining protection for a utility model is usually shorter and simpler than for obtaining a patent. Substantive and procedural requirements under the applicable laws differ to a large extent among the countries and regions that have a utility model system. However, utility models usually differ from patents for invention because the requirements of novelty are less stringent (for example they may apply to incremental innovations), the maximum time of protection is generally shorter, and fees required for obtaining and maintaining the right are generally lower. Utility models are considered particularly suited for SMEs that make "minor" improvements to, and adaptations of, existing products.

Utility models exist in more than 30 countries (within the EU in Austria, Germany, France, Finland, Italy, Spain, Portugal, Poland, in Asia in Japan, Taiwan and China). Utility models are registered by a national patent office. The term of protection for the utility model varies from country to country (usually between 7 and 10 years, without the possibility of extension or renewal). It is not a widely used form of patenting, because of the limited time and protection offered. Quite often utility models are registered as a backup, when patents for inventions are refused or impossible.

## Copyright

Copyright consists of a set of exclusive rights regulating the use of a particular form of expression of an idea or information, but not the idea or concept itself. The form of expression must be original (new).

Copyright in general comprises the exclusivity:

- To produce copies of the work;
- To reproduce and broadcast the work;
- To create derivative works;
- To sell or transfer these rights to others.

There are no formalities required to be entitled of the copyright on the works, although in various country a mechanism for registering copyrighted works exists. The effect of this registration is to provide an evidence as to the date of creation of the copyrighted work and the identity of the author. In most of the European countries the default length of copyright is generally the life of the author plus either 50 or 70 years.

Copyright is one of the most used way to protect intellectual creations, because it is simple and straightforward, as no formalities are requested, not even a claim of copyright (such as a © or a more elaborate statement). On the other hand, protection provided by copyright is relatively narrow, as it covers almost only literary copying.

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<sup>16</sup> “Understanding Industrial Property”, WIPO 2004,  
[www.wipo.int/freepublications/en/intproperty/895/wipo\\_pub\\_895.pdf](http://www.wipo.int/freepublications/en/intproperty/895/wipo_pub_895.pdf).

In ICT it is the basic protection for software, although increasingly companies use also patents. Unlike patents, however, copyright allows the reproduction of the same idea under a different form. Therefore, it has limited effect to protect from follow-up innovation, or even from parasite imitation. In the software sector the copyright protection is enhanced by keeping the source code secret, but also this can be overcome by clean-room reverse engineering, with a certain degree of confidence of avoiding copyright infringement. Despite those shortcomings, copyright protection has allowed a steady growth of the software market, a good pace of innovation and a relatively ubiquitous strong competition.

In the last thirty years a creative evolution of copyright protection has been introduced by so-called “copyleft”, a set of copyright licenses that use copyright protection to ensure that derivatives from Free/open source Software works remain under the same or compatible licenses.

All European countries' copyright systems basically derive from two different mainstream concepts: copyright and droit d'auteur. Copyright tends to protect the industrial investment in producing and distributing creative content of the publisher, while the droit d'auteur system tends to protect the original, creative activity of the human mind and the rights of the author. Nowadays the difference between the two systems is unnoticeable. This trend is driven by the dominance of major providers of audiovisual and software products from the USA. However, this unification is not complete. One of the main discrepancies still existing between the different systems is the existence of “moral rights” in the droit d'auteur, which are irrelevant in the copyright, and which could lead to inconsistencies in the use of copyrighted material protected by different laws.

## Trademarks

A trademark is a distinctive sign which identifies certain goods or services as those produced or provided by a specific person or enterprise. A trademark can be a word, a picture or a symbol, a colour, a sound or a tri-dimensional shape.

A trademark must have the following conditions to be registered:

- novelty: it must not be identical or similar to other trademarks already used in the same market
- distinctive character: it must not consist of a generic denomination or description of the kind of a product or service.

Registration must be asked for a specific category, or for several categories, within a standard international classification of products and services. However some trademarks, because of their recognition, can be protected even beyond the categories for which they are registered.

A trademark can be registered in a single country with a national trademark office or in the entire European Union with the Office for Harmonization in the Internal Market for Trademarks and Design (OHIM), the EU agency based in Alicante, Spain. It is also possible to extend the protection granted in one country to each of the countries, which are part of the International Trademark system.

Trademark is possibly the most ancient form of protection for intangible goods, and is widely used. There is a clear trend towards increasing protection to registered trademarks, which have gained force in comparison with unregistered trademarks (whose value nowadays is almost negligible). This stronger protection covers colours, sounds

and shapes. Widely known trademarks have an absolute protection, beyond the categories in which they are registered and used. In addition, the conditions to license or to sell a trademark have been lowered, so that exploitation of trademarks by licensing to other companies in even not adjacent markets is commonplace. Trademark, finally, have a very solid and effective protection against counterfeiting.

The importance of a well-chosen trademark is nonetheless often underestimated by start-ups. A very famous case of a multi-decade litigation about an original, but not new, trademark was Apple vs. Apple, the label producing the Beatles against the computer company from the Silicon Valley with the same name.

## Registered industrial designs and models

An industrial design or model is defined as the appearance of the whole or a part of a product resulting from the features of, in particular, the lines, contours, colours, shape, texture and/or materials of the product itself and/or its ornamentation. Industrial design does not cover the technical aspects of the product.

An industrial design must have the following conditions to be registered:

- It must be original
- It must have an individual character, in other words, the "informed user" would find it different from other known designs.

Upon the registration of the industrial design, the owner is granted an exclusive right against unauthorized copying or imitation of the same by third parties for commercial purposes. In Europe the protection is for 5 years, or multiples, from the filing date and can be extended by subsequent renewal up to 25 years. Registrations can be made either at national level or as a Community Design.

Industrial design is also used in the technology field as a way to differentiate otherwise commoditized products, to increase the appeal of the items and to raise their price above competing products offering similar technical characteristics, on esthetical or functional grounds. Examples of large success in the consumer technology are companies like Apple or Bang & Olufsen, but also smaller players use similar strategies to carve a niche market.

Most often, industrial design is used in connection with trademarks, and sometimes the two protections merge, as the distinctive shape of a product could be registered as a tri-dimensional trademark. In addition, the design, when it shows a sufficient degree of creativity, can also be protected as a matter of copyright.

Unregistered industrial design has been conceived to offer a limited and easy to achieve protection, so that it can be used by either companies with small or no IP budget or in markets characterized by fashion-like fast obsolescence of aesthetic components. Industrial unregistered designs are protected for three years after disclosure, without any kind of registration.

## Data bases "sui generis" rights

Databases are organized collections of works, information or data information. Databases which, by reason of the selection or arrangement of their contents, constitute the author's own intellectual creation are protected by copyright. The Directive 96/9/CE provides an additional right, the so-called "database right" generally referred to as "sui generis right"

(which is Latin for “right of its own kind”, to indicate that it is an extraordinary right, different from all others). This “sui generis right” protects the database as such (and not as an original work of the mind) if there is substantial investment in collecting, organizing and verifying its content. The holder of this sui generis right may prohibit the extraction and/or re-utilization of the whole or of a substantial part of the database.

Database “sui generis” right last for 15 years, but this term can be extended for a further 15 years period if the database is considerably updated with further investment.

Database “sui generis” right protection is used to protect the “sweat of the brow” investment of enterprises, thus not the creative production of human minds. Some very valuable databases are not protected because they have been collected as a by-product of otherwise remunerated activities, such as a telephone directory or a TV listing.

The database “sui generis” right system was supposed to be reassessed after a certain period since its introduction, even though this assessment has never been undertaken. It is therefore uncertain whether the said right will be available on the long run, as the European example does not appear to have been followed by other jurisdictions, and its effectiveness is still questionable. By definition it exists only at the European level, since a European directive created it.

## Topographies of semiconductors

A "topography of semiconductor" is essentially a design of a semiconductor product, such as a chip. The topography of a semiconductor product shall be protected in so far as it satisfies the conditions that it is the result of its creator's own intellectual effort and is not commonplace in the semiconductor industry.

The exclusive rights shall not apply to reproduction for the purpose of analysing, evaluating or teaching the concepts, processes, systems or techniques embodied in the topography or the topography itself. The exclusive right comes to existence, depending on the national regime, upon registration with an official registry or by its mere use. This protection is by its own nature very limited in scope and technical in nature.

## Domain names

A domain name identifies a computer or computers on the Internet. Technically a Registration Authority governs Top Level Domain Names, based on geographical location (country code Top Level Domain Names, ccTLD) or type of category (generic Top Level Domain Names, gTLD). Different rules apply to different TLD.

Although the domain name could be any combination of letters and numbers in the allowed namespace that is not yet assigned, a domain name is generally considered similar to a trademark, and under most TLD rules a trademark is a title of preference to obtain and to be reassigned a corresponding domain name. Domain names are in fact used in a wider branding strategy, to reinforce the use of a trademark.

Abuse of domain names is very frequent, and it is a fast growing source of revenues for questionable businesses or even for cybercriminals. The loss for many companies, and especially those offering services via Internet, can be relevant. Protection against this abuse is comparatively difficult, as there is almost no way to make sure who is responsible for registering an infringing domain name when an online scam is discovered. In addition, the reassignment of the domain name, although fast administrative



procedures are available, suffers from relatively long delays.

The counterstrategy is to register the trademark as a domain name in all possible TLD, but this can be very expensive, as the TLD are a high and increasing number. This strategy is ineffective against a peculiar kind of cybersquatting known as typosquatting, which uses the most common typo errors to hijack traffic from high traffic websites. Registering all possible typo errors (such as the missing dot between “www” and the name, or inversion of two letters, or zero for “o”) would easily run into the thousand applications, with registration and administration cost out of reach of even very large corporations.

## Harmonization of the EU regulatory framework for IPR

Harmonization of the national legal frameworks at the EU level is particularly important for SMEs, to insure protection at the EU level, avoid duplication of efforts and discourage multiple litigation. Harmonization at the EU level is quite advanced for copyright, trademark and industrial design protection, quite far from it for patents (see par 2.6.2.)

Concerning **copyright** regulation, there are international treaties and several European Directives (IPRED (Directive 2004/48/EC on the enforcement of intellectual property rights), Software Directive, EUCD (Directive 2004/48/EC on the harmonisation of certain aspects of copyright and related rights in the information society), IPRED 2 (a proposed directive amending IPRED)). As anticipated, there are also “copyleft” licences used to protect derivatives from the Free/Open source software works. The **trademark** system is the most harmonized of the major IP rights, thanks to various international treaties, to the existence of a Community trademark and a single centralized European registration authority (the Office for Harmonization in the Internal Market for Trademarks and Design, OHIM). National jurisprudence and practices of the registering bodies tend to conform to those of the European body.

Harmonization of **industrial design** protection is also rather advanced. The same European Agency protecting trademarks provides registration services for industrial design and models, although there are some differences at the national level. There can also be some confusion between industrial design rights and patents on models, which are not granted in all the EU Member States.

### 2.2.3 Informal IPR

Enterprises may utilize, in alternative or in addition to formal IP rights, other methods of defining the propriety of innovation, such as secrecy or trade secret, lead time advantage, complexity of design, technical measures as DRM (Digital Rights Management).

Empirical evidence shows that such strategies are extremely important for all types of enterprises, not the least for SMEs. This may be due in part to shortcomings of the system of formal IPR, but may also be determined by other factors. For example, the study by Kitching & Blackburn<sup>17</sup> suggests that firms believe their IP (or, to be more

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<sup>17</sup> Kitching, J. & Blackburn, R. (2003): Innovation, intellectual property and informality: evidence from a study of small enterprises and some implications for policy, in: Blackburn, R. A. (2003): "Intellectual Property and Innovation Management in Small Firms", London, New York: Routledge; p. 16-34

precise, their confidential know how) to be threatened much more by inside sources (i.e., their own employees) than by outside competitors. While many of the informal practices seem to address the inside problem alone, informal IP protection practices prove also useful for outside protection.

## Trade secrets and confidentiality agreements

A **trade secret** is any kind of information used by a business and preserved from outsider access. Protection of trade secrets is largely ensured by the very condition of being kept secret. From a legal point of view the secrecy of the information is generally protected on contractual grounds (such as in Non Disclosure and Confidentiality Agreements). Trade secrets can be commercially exploited alone or as a part of a technology transfer agreement. Although not protected by law in the same way as patents or trademarks, trade secrets may still enjoy some level of legal protection.

## Lead time advantage

The so-called **lead time advantage** is a consequence of a business strategy aimed at continuous innovation, with the effect to anticipate competition and indirectly protect the intellectual property developed.

## Design complexity

The **complexity of the design** is another aspect of a firm's product development strategy. Firms rely on their products complexity as a barrier against competitors, who would incur disproportional costs to copy them.

## Digital rights management

**Digital rights management (DRM)** refers specifically to digital content. "DRM" identifies all technological measures that can be used by a copyright holder to restrict use and reproduction of its digital works, ranging from a simple copy protection to more sophisticated control over the use of a work, such as the type of permitted player or how many times the content can be played. They are partially protected by Directive 2001/29/EC.

DRM are also used to protect software from installation of malicious code (such as viruses). While DRM have technical and interoperability problems, they also can have legal problems, insofar as they may be too strong and deprive users of their statutory rights, such as the right to make backup copies. On the other hand, DRM offer a immediate protection preventing usages against the will of the copyright owner.

## 2.3 Industry and topic background

This paragraph summarizes the key background issues affecting the use of IPR by SMEs, more specifically the role of IPR for competitiveness of ICT SMEs, IPR issues for ICT SMEs, IPR issues and the Open Source Software movement, ICT piracy and counterfeiting, patents and high tech SMEs.

### 2.3.1 ICT SMEs, Competitiveness and the Role of IPR

Today more than ever, ICT SMEs must keep pace with the relentless pace of innovation and globalization. IPR management is an essential element of SMEs innovation strategies. In order to analyze it, we must understand better the main challenges faced by ICT SMEs.

The ICT sector grows faster than Europe's overall economy, particularly the software and IT services industry, according to the i2010 third annual report<sup>18</sup>. However, the overall trade performance of the EU in ICT goods is unsatisfactory. In 2006, it reported a €77.5 billion trade deficit, including €48.3 billion in computers, €20.9 billion in audio and video equipment and €14 billion in electronic components. The main threats for the EU ICT industry originate in the increasing competition by emerging economies in Asia (China, India), in the possible expansion of US dominance in computing, and in a lack of user acceptance and uptake of new technology within the EU economy.

In this scenario, ICT SMEs must deal with increasing international competition, keep up with the pace of technological innovation, which is heating up again, and adapt to the reorganization of world supply chains. Moreover, ICT SMEs cannot afford any more to focus only on local markets, as the push of globalization is increasing trade openness, forcing greater specialization and the elimination of less efficient firms<sup>19</sup>.

The new technological cycle of the ICT industry is driven by digital convergence and the complete diffusion of the Internet as the main architectural network, launching a new wave of applications under the label of the so-called Web 2.0 or social computing. The software industry is undergoing a deep transformation process. In order to respond to customers needs to deal with IT complexity and infrastructure optimization, new business models are emerging, characterized by greater service content ("software as a service") and ever closer interaction with customers. This requires investments in R&D and innovation, as well as continuous skills upgrading. European markets fragmentation and still insufficient investments in ICT research and new skills are weaknesses affecting especially ICT SMEs. Both the EU Competitiveness Report and the ICT Task Force Report underline that raising research investments of the EU ICT sector is essential, particularly by ICT SMEs.

According to the 2007 EU Competitiveness Report, the general trend across Europe is the emergence of global value networks led by the most successful enterprises, who will integrate planning, marketing and R&D services, subcomponents and customer services by many different actors. This will lead to more complex organizational approaches, with a high degree of collaboration and networking between suppliers, customers, competitors and external sources of knowledge such as research institutions and universities. The best performers among innovative ICT SMEs are adapting to this model to survive, finding valuable roles within the emerging value chains, especially if they become specialized niche leaders.

ICT SMEs are highly innovative. According to a study carried out by IDC EMEA for DG INFSO, based on an original survey, innovative ICT SMEs in the EU-25 are approximately 300,000, that is about 41% of the universe. The results of the study

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<sup>18</sup> i2010 - Annual Information Society Report 2008, Commission Communication, Brussels, 17.04.2008, COM(2007) 146 final

<sup>19</sup> European Competitiveness Report 2007, Communication from the Commission, 31.10.2007, COM (2007) 666.

confirm the link between R&D, innovation and economic performance of enterprises and underline the relevance of innovation clusters for high-tech enterprises. “Best performers” (including a group of very small, very innovative micro enterprises with less than 10 employees) invest more than 10% of their turnover in R&D, declare more than 10% sales and profitability growth, are focused on international rather than local markets, and are engaged in networking for knowledge with the main actors of the ICT value chain. According to an estimate based on a comparison with the Community Innovation Survey 4 data and the study results, these Best Performers ICT SMEs should be from 45,000 to 75,000 firms, between 6 and 10% of the overall population of ICT SMEs in the EU-25.

This scenario shows why ICT SMEs need to develop original knowledge, to protect it and to bring it to the market as fast as possible. Therefore they have an increasing need to exploit the full range of formal and informal IP tools to help to build and defend their competitiveness. Firms increasingly diffuse intellectual property beyond company and even country boundaries, as firms innovate more openly. ICT SMEs are becoming more vulnerable to counterfeiting and fraud by foreign competitors: they must become more alert and able to defend themselves by enforcing their IPR.

### 2.3.2 IPR issues for ICT SMEs

ICT SMEs suffer from IPR problems resulting both from the specific characteristics of the ICT industry (discussed below) and the general weaknesses of SMEs.

*Exhibit 2-5: Role of IPR in ICT producing industries versus other high tech Industries*

	Pharma	Biotech	Computer Hardware and Semiconductors	Software and Internet
<b>Innovation type</b>	mainly discrete	discrete and cumulative	cumulative	cumulative
<b>Product complexity*</b>	few	medium, high for research tools	high	high
<b>Importance of interoperability</b>	negligible	negligible	high	high
<b>Blockage potential of patents</b>	negligible	negligible, except for research tools	high	high
<b>Innovation costs</b>	very high	very high	medium	low
<b>Product cycle</b>	long	short – long	short	short
<b>Patent use</b>	protective (return on investment)	protective (return on investment) + attract capital	defensive (freedom to operate)	defensive (freedom to operate)
<b>Major alternative IP approaches</b>	none	none	trade secrets	copyright and open source
<b>Relevance to systemic failure</b>	Low	medium	high	high

Source: EPO (2007). \* Product complexity defined as number of patents per product

According to literature, the formal IPR system and particularly the patent system is better

suited to sectors such as pharmaceuticals and biotechnology, characterised by long product cycles and highly concentrated research investments (*see following table*). The ICT sector features cumulative innovations with short product cycles, and therefore needs a wider range of more flexible IP tools, such as trade secrets or copyright. This means also that ICT enterprises, particularly ICT SMEs, tend to complain more than those of other sectors about the costs and the length of time needed for IPR registration, particularly patents.

Technological innovation is influencing strongly the evolution of IP management in the ICT industry, particularly in two sectors: one is software and digital content; the other is the microelectronics sector.

More specifically, in the software, entertainment (video-games) and multi-media market:

- The products of these industries can be easily copied in the digital era, and the copyright system is a fundamental tool for protecting the creative efforts of companies. A new legal framework for copyright enables the exchange of copyright/protected products and information on the Internet.
- In the software sector, the evolution towards software-based rather than hardware-based innovation and the growing practice by the EPO to assign CII patents to software innovation is fiercely opposed by the Open Source Software movement (see par.2.6.2)
- Easy copying and distribution possibilities led to the development of new business models, some of which are heavily IPR-related (e.g., double licensing with open source software).
- Consumer electronic suppliers and digital content providers have opposite interests in the introduction of so-called digital rights management technologies, which avoid digital content copying, but may reduce consumers choices about the use of devices and platforms.

Concerning microelectronics and ICT manufacturing:

- These industries are characterized by rather short product life cycles and also low sales prices, coupled with small profit margins per unit sold. R&D expenses for these products are nonetheless high, and many devices have to use several technologies, each of which may be protected by a range of patents.
- Specialization along the supply chain and strong partnership with other players is leading some companies to outsourcing production and focusing more on R&D phases and IP protection.
- A significant share of the income of the ICT and electronics companies nowadays stem from out-licensing to other manufacturers and to a lesser extent from direct sales revenues (SME-IIP Benchmarking Report, 2007).
- In the semiconductor industry, patenting is not used to deter entry but to create a market for know how exchange and to obviate the threat of established competitors.
- Cross-licensing is more common in electronics (20%) than other industries (10%): this arrangement is observed more for transfers of technology not yet developed than ex-post transfers (Anand, Khanna, 2000). In Japan the ratio of cross-license to out-license observed is about 90% in the electronics industry, while this same ratio accounts for less than 20% in the chemical industry (JPO, 2004).

All these issues about IPR in the ICT industry affect SMEs more than large firms, because of their inherent weaknesses of lower capital and smaller specialized staff able to deal with these issues.

ICT SMEs are also affected by the general problems mentioned in literature about SMEs use of IPR. They have been explored in a number of studies (WIPO, 2003; Thumm, 2006; Blackburn, 2003), all of them yielding a more or less similar picture. The primary perceived constraints are the costs of IP protection, difficulties in enforcing already obtained rights, the time to make IP protection work, followed by little awareness on the side of the SMEs about IPR issues, and a (perceived and/or real) bias of patent examiners towards patent applications of large firms. (see also *par.2.3.6 about the exploitation of patents*).

General awareness of IPR issues is, on average, low by most SMEs (De Marinis, 2002; Blackburn, 2003). A Roland Berger study of the 1990s, for example, came to the conclusion that there is a major information deficit among SMEs on the patent system, which is not sufficiently addressed by government policies (EPO, 1994 cited in WIPO, 2003a).

### 2.3.3 Policy support for IPR use by ICT SMEs

During the last five years, the EU has built a full portfolio of policies and instruments addressing the needs of innovative SMEs in general and of ICT SMEs in particular. IPR policies are receiving increasing attention in order to stimulate greater use by SMEs. According to a recent EC Pro-Inno Policy Benchmarking report<sup>20</sup>, SMEs in Europe benefit from a broad range of IPR support services, including pro-active awareness raising activities, Information provision services, Training, Customized in-depth consulting and advisory points/services, Financial assistance & legal framework services. They are not generally specialised by industry, even if many of the technological parks and innovation agencies offering these services have a high percentage of ICT SMEs start ups and innovative firms among their customers.

Those IPR services are to a significant extent operated by **national patent offices** and to a much lesser extent by **technology/development agencies**. National Governmental bodies (or regional ones) have often contractual arrangements with other entities, as **associations, research institutes** or **private companies** (with external consultants and patent attorneys), whereby the service is either offered jointly with or on behalf of the governmental bodies. The remainder is comprised of **technology parks, chambers of commerce** or **incubators**, which usually offer smaller IPR services.

The study noticed that there is a need for streamlining and harmonizing these support services, and especially to progress beyond an excessive focus on patents to promote wider IP protection strategies taking into account the full range of formal and informal IPR, depending on the SME needs and their industry characteristics. This study was part of a project under the PRO INNO Europe initiative with the aim of spreading knowledge among SMEs of the IPR system and particularly of patenting. Moreover, the Competitiveness and Innovation Framework Programme is implementing a 3-year IPR Awareness and Enforcement project to raise significantly awareness and knowledge of

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<sup>20</sup> Benchmarking National and Regional Support Services for SMEs in the Field of Intellectual and Industrial Property, Austrian Institute for SME Research, Pro Inno Appraisal, Vienna 2007



IPR among SMEs, improving registration and enforcement of rights and combating counterfeiting.

### 2.3.4 Open source software and IPR

This paragraph provides a summary of essential information about the open source software phenomenon, as a necessary background to the analysis of the role of patents in the software industry. Because of its characteristics, the OSS model is well suited to and embraced by many SMEs in the sector. Large enterprises rarely adopt OSS as their only business model.

Open source software (OSS) represents a fundamental shift in the way to produce software, emerged in the last 20 years as an alternative to proprietary software development. It is also known as FLOSS (acronym from Free/Libre/Open Source Software). According to IDC, the open software movement has changed the competitive rules in the software market, so that companies now compete on business models (where their revenues come from) as well as on their products and services. According to the Open Source Software Initiative, its main characteristics are:

- Free redistribution of the software
- Reasonable and well-publicized access to the source code
- Modifications to the source code and derived works are permitted and are allowed to be distributed under the same terms as the original license
- No discrimination against the usage of the software by any individual or group or for a particular purpose
- No restrictions on other software distributed alongside the open source software

According to IDC<sup>21</sup> analysis, OSS is not a market segment, but a software development and distribution model cutting across all of the software industry. Software developers use most often copyright licenses for their OSS projects.

A study promoted by the EC on the economic impact of FLOSS on the European ICT sector<sup>22</sup>, conducted by a consortium of research institutions led by UNU-MERIT's Rishab Aiyer Ghosh, arrived to the following conclusions:

- FLOSS applications are top rung products in terms of market share in several markets.
- The existing base of quality FLOSS applications with reasonable quality control and distribution would cost firms almost Euro 12 billion to reproduce internally. This code base has been doubling every 18-24 months over the past eight years.
- The notional value of Europe's investment in FLOSS software today is Euro 22 billion (36 billion in the US) representing 20.5% of total software investment (20% in the US)

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<sup>21</sup> IDC reports used for this paragraph: "Worldwide Open Source Software Business Models Taxonomy", Dec 2006; "Open Source Software Businesses: What is and what is not working", 2007; "Open Source in Global Software: Market Impact, Disruption, and Business Models", 2007

<sup>22</sup> Study on the Economic impact of open source software on innovation and the competitiveness of the Information and Communication Technologies (ICT) sector in the EU, Final report, November 20, 2006, <http://ec.europa.eu/enterprise/ict/policy/doc/2006-11-20-flossimpact.pdf>

- While the US has an edge in large FLOSS-related businesses, Europe is the leading region in terms of globally active FLOSS software developers, and leads in terms of global project leaders, followed closely by North America. Asia and Latin America face disadvantages at least partly due to language barriers, but may have an increasing share of developers active in local communities.
- By providing a skills development environment valued by employers and retaining a greater share of value addition locally, FLOSS can encourage the creation of SMEs and jobs.

### 2.3.5 Piracy and counterfeiting issues

Despite the fact that most of the WTO members have adopted legislation implementing the minimum standards for enforcement set out in the WTO TRIPS Agreement, piracy and counterfeiting remain significant obstacles to the success of Europe's ICT industry, as well as to other IP-reliant industries. Piracy and Counterfeiting refer to the manufacture, distribution or sale of goods that have been made without the authority of the owner of the intellectual property. In the ICT industry, usually "piracy" refers to copyright infringement (excluding private copying) while "counterfeiting" refers to trademark infringement. While especially concern over piracy and counterfeiting is not new, it has magnified due to the availability of efficient compression algorithms, broadband Internet access technology and powerful peer-to-peer networks. These technologies make it possible to not only distribute legitimate content but also illegal content.

According to the ICT Taskforce Working Group on IPR, *"Piracy and counterfeiting in the EC are at unacceptably high levels and, for many industries, are dramatically increasing. In 2000, piracy and counterfeiting rates were believed to have reached 16 % in audio-visual industries and 10 % in the music industry. In 2005, the software industry reports a piracy rate of 35 % For example the software industry estimates that a 10 point drop in piracy in the EC could add 155,000 new jobs, over € 70 billion to its economies and contribute € 20 billion in tax revenues"*<sup>23</sup>.

There are different positions in the IT industry about software piracy. IT industries in favour of software patents and strong IPR protection believe software piracy creates economic damages, limits the growth of the industry and must be fought with all possible means. The OSS movement supporters do not share this view: they believe that the free circulation and licensing approach weakens the reasons to carry out software piracy, that software diffusion is good in itself, even if they do not agree with copyrights violations in principle. A different matter concerns copyright violations of digital content (illegally downloading music or films for example) either by individuals or for business reasons, an extremely complex issue.

This study scope does not cover the analysis of the piracy and counterfeiting issue in the ICT industry, even if some implications for ICT SMEs IPR strategies will be taken into account.

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<sup>23</sup> IDC study: "Expanding the Frontiers of Our Digital Future: Reducing Software Piracy to Accelerate Global IT Benefits", December 2005. Economic Study commissioned by the Business Software Alliance.

### 2.3.6 Exploitation of patents by ICT SMEs

Since SMEs have a lower number of patents, the general view used to be that they were also less likely and able to exploit them than large enterprises. Recent research has changed this perception, showing that small innovative enterprises may have a smaller number of patents than large firms, but they are actually taking good advantage of them. The evidence is not specific to ICT SMEs, but there is no reason to think it does not apply to them as well.

Many empirical studies have demonstrated that SMEs have, in absolute terms, an inferior number of patents if compared to large enterprises (see Norman (2001), Iversen (2002), CHI Research (2003), Hanel (2004)). This used to be explained as a less efficient way to use IPR by SMEs. The analysis carried out by Jensen, P.H., Webster, E. (2004) has re-opened the terms of the question, affirming that SMEs, in many industries, have an intensity of IP usage (that is, usage of IP taking in account their effective potential to create and protect innovations) similar to that of large enterprises. This was confirmed by the PatVal-EU survey conducted in 2003-2004 interviewing 10,000 European patents holders in 8 countries<sup>24</sup>, which found that small firms (less than 100 employees) use 80% of their patents, whereas large firms (more than 250 employees) use slightly less than 60% of their patents (medium firms, 100-250 employees, use about 75% of their patents).

The study estimated that about one third of the European patents are not used for any industrial or commercial purpose. About half of the unused patents are “blocking” patents, i.e. they are meant to block rivals from using a given technology even if the patent holder does not use the technology. However, half of the unused patents are “sleeping” patents, i.e. they are simply left unexploited by the patent holder. The “sleeping patents” are natural targets for enhancing the rate of utilization of patents. Large firms are more likely to hold blocking patents, which explains in part their lower utilization rate. However, they also have a good share of sleeping patents, which typically arise as by-product inventions in non-core technologies from their large R&D budgets. A case of intensive use of patents is that of the “patent troll” companies. The term “patent troll” basically describes a patent owner, often a SME, that enforces patent rights against accused infringers, but does not actually produce or supply services based on the patents in question. (See also *par.4.3.3*)

## 2.4 Trends and challenges

This chapter looks at the main trends of evolution of IPR use and of the European Patent System, including an analysis of its main problems for ICT SMEs. Main challenges concern the debate on software patents and the use of IPR in ICT standards development.

### 2.4.1 Increase of IPR use

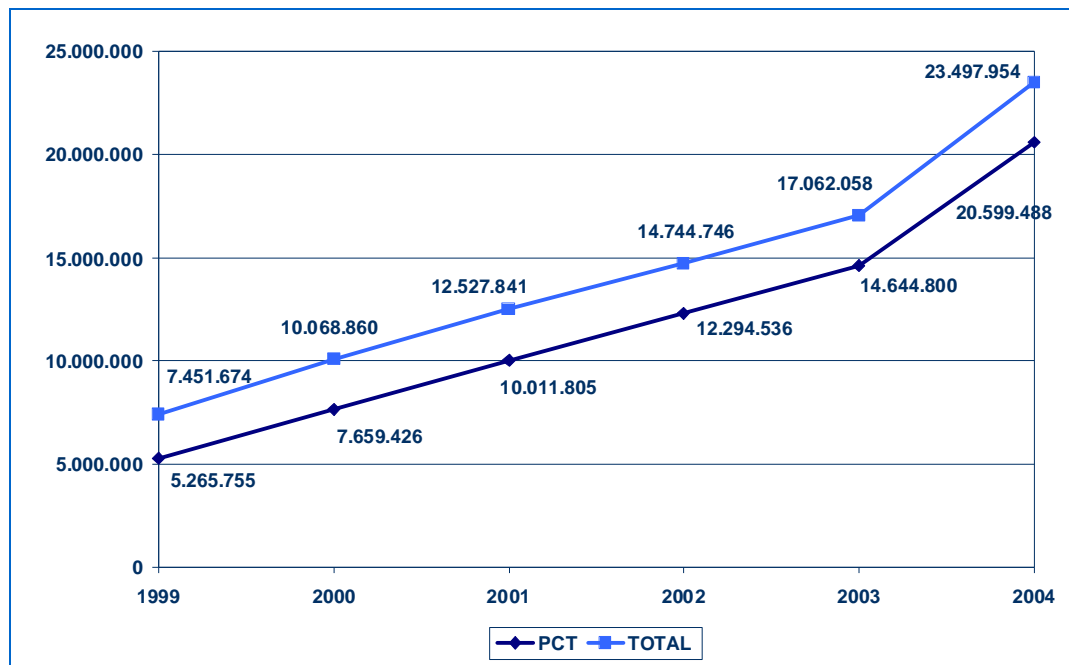
The development of the knowledge economy increases the value of immaterial goods and creates greater demand for intellectual protection tools. The past two decades have seen a surge in patent applications and IPR use, particularly significant in knowledge-based industries such as ICT, biotechnology, nanotechnology or advanced chemicals.

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<sup>24</sup> “The Value of patents for today’s economy and society”, Gambardella et.al. 2005, Study for DG Market of the EC, Tender n° MARKT/2004/09/E, Lot 2.

The demand for patents in 2004 was three times higher than in 1999 (Exhibit 2-6, Trilateral Statistical Report). Demands to the European Patents Office are also increasing fast (Exhibit 2-7).

**Exhibit 2-6: Demand for patents rights worldwide**



Source: Trilateral Statistical Report, 2004 and 2005, cited in Gowers, 2006. PCT are international applications, according to the Patent Cooperation Treaty

According to the WIPO 2008 report<sup>25</sup> the total number of applications filed across the world in 2006 is estimated to be 1.76 million, representing a 4.9% increase from the previous year. In 2005, a large number of patent filings were filed across the world in computer technology (144,594), telecommunications (116,770), and electrical machinery (121,350) technologies. Between 2001 and 2005, patent filings in computer technology, optics, and semiconductors grew by 5.3%, 5.0% and 4.9%, a year, respectively. The total number of PCT filings (international patent applications filed through the Patent Cooperation Treaty) in 2007 was approximately 158,400, representing a 5.9% increase from the previous year. PCT filings grew rapidly until 2001 (yearly growth rate in excess of 10%) and since then, there has been a slowdown in the yearly growth rate.

Unfortunately there is no data about SMEs patent filings, even less by ICT SMEs. But since the share of innovative ICT SMEs is growing and there is evidence that innovative firms tend to use IPR, it can be deduced that ICT SMEs are participating in the increase of requests for ICT patents.

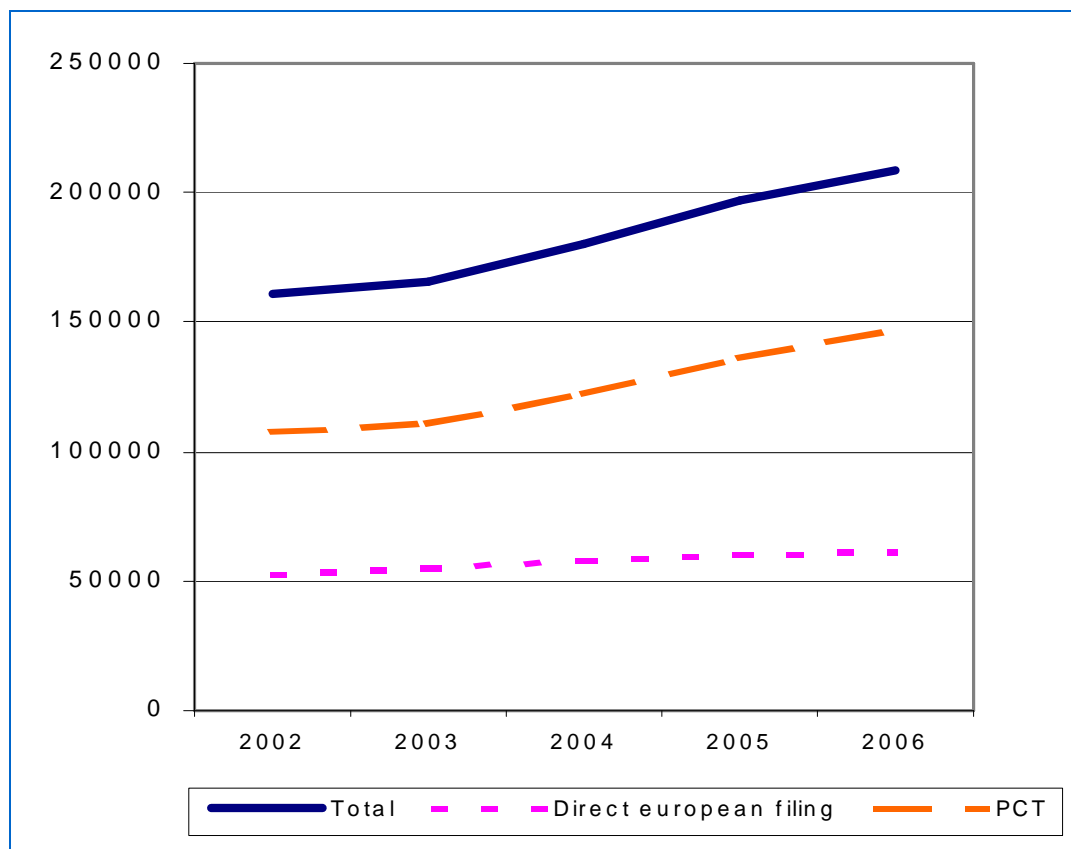
As regards trademarks and designs, the EU Agency OHIM<sup>26</sup> reports an increase from 43,144 applications for community trademarks in 1996 to 87,500 applications in 2007. This means that applications have doubled during this period, with acceleration in the last years. As community designs have only been available since 2003, corresponding time series data is limited to the years afterwards, but the data from OHIM suggests that

<sup>25</sup> World Patent Report 2008, A statistical Review, by WIPO, <http://www.wipo.int/ipstats/en/statistics/patents/>.

<sup>26</sup> OHIM Annual Report 2007.

demand for this type of IPR is also increasing, with 76,000 designs received in 2007 (+10% on the year before).

**Exhibit 2-7: Patent applications filed at the European Patent Office**



Source: European Patent Office Annual Report 2006

Reasons that explain the trend to increase the use of IPR are:

- Higher value attributed to IPR in the knowledge and global economy, particularly by high technology sectors where firms competing on global markets need to protect their inventions at international level.
- The trend of outsourcing manufacturing activities intensifies the need for inventors to protect the ownership of some aspects of their products.
- Legislative changes (as international harmonization) are facilitating the access to IPR. In some countries, the expansion of patentable subjects has also favoured a growing number of applications (as in the biotech sector, or in United States for business method patents and software patents).
- Also, the number of actors playing in the IP field has grown recently: in some countries (as the US, with the 1980 Bayh-Dole Act) this fact depended from the creation of a favourable environment for universities and other non-profit organizations, encouraged to collaborate with commercial enterprises in the commercialisation of inventions and new technologies.

On the other hand, EU countries are still characterized by a lower propensity to apply for patents than the US or Japan. Even in Europe, the US and Japan patent more than the EU. According to EPO data, 137 patents per million inhabitants are from the EU, versus 143 patents from the US and 174 from Japan (source: Commission Communication 165

2007).

The difference in patenting rates between the United States and Europe is partly due to a difference in industrial structures. Compared to the US, a higher percentage of European value added and employment is from manufacturing sectors that show a low and moderate background patenting rates, such as transportation equipment. The US, conversely, has a higher concentration of firms active in high-technology sectors with high background patent rates such as pharmaceuticals, biotechnology and IT equipment (European Commission, 2006). In addition, according to the EURAB study<sup>27</sup>, there are more “micro” enterprises in Europe than in the US (89% vs 78%) and small enterprises of comparable size invest less in RTD in Europe than in the US, therefore tending to patent less. Another hypotheses advanced by researchers is that European firms are less likely to patent an equivalent invention than American firms, having different attitudes to IPR, and facing higher cost for IPR, or lack of knowledge about how to apply for IPR.

There is some concern that the shortcomings of the European Patent System affect the lower EU patenting rates (see par.2.4.3) but it is very difficult to weigh the effect of all these different factors.

#### 2.4.2 New organizations offering IPR-related services

The evolution underlying the use of IP rights led to the creation of other emerging business models, based on the provision of services related to the use and exploitation of IPR, particularly patents. These business models are not exclusive of the ICT sector, but they frequently target the ICT industry as a key market, and may be very important to support ICT SMEs more advanced use of IPR.

#### Technology transfer offices (TTO)

The use of patent rights emanating from publicly funded research has led to the formation of **Technology (or Knowledge) Transfer Offices** (TTOs), initially part of public research institutions as Universities, then, in some cases, becoming independent companies. They organize the licensing or commercialization of research emanating from public research bodies like universities. While large research universities, such as the Cambridge University, have been able to develop in-house technology transfer operations of considerable scale and sophistication, many small and medium sized research universities are signing deals with external **Intellectual Property commercialization companies**. The principle is that the IP commercialization company obtains the exclusive right to invest in the spin-out companies of a given university. In return the commercialization company provides expertise in the identification of intellectual property with commercial value and delivers seed capital finance (Library House, 2007). IP commercialization companies seek to focus their energies on fewer, higher quality propositions rather than support a broad range of companies, many of which will fail. Companies are selected and supported on the basis that they provide a clear path from formation to exit.

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<sup>27</sup> EURAB report “SMEs and the ERA”; table based on Eurostat “SMEs in Europe, Competitiveness, Innovation and the Knowledge-driven economy (2002)”.



## Patent exchanges

New technology markets exchanges have been set up in order to link potential licensees and licensors (see EPO, 2007). One example is Tynax Inc., a Silicon Valley based corporation that operates an online trading exchange for patents, technologies and other intellectual property assets. The company was founded in 2003 by experienced entrepreneurs, technologists and lawyers, and today the marketplace comprises almost 50,000 technologies available for licensing from universities, research laboratories, R&D groups and independent developers. The most active markets for the Company are currently: U.S.A., Japan, Korea, Taiwan, China, India, U.K. & European Union. Working with the open Tynax platform, brokers and technology transfer professionals are freed to focus on transactions rather than researching and prospecting.

## IP market platforms

A number of companies now provide online **IP buying and selling platforms**, in some cases combined with opportunities to license. In Europe, for the first time, IP Auctions GmbH held a live **intellectual property auction** in mid May in 2007 (with 83 auction lots and a total of 210 patent families). The auction's lots were patents, licenses and brand rights from diverse technology sectors. IP Auctions is an independent member of a network of companies that specializes in patent evaluation, patent monetization and patent management. IP Auctions' objective is to commercialize first-class IP rights via auction, with numerous advantages:

- Auctions provide an extensive and structured overview of intellectual property rights from various areas of technology,
- The deconcentration of complex patent portfolios and their new composition very often establish the value of individual intellectual property rights in particular for use in related technology sectors,
- There is a substantial reduction in transaction costs. This is due to the largely standardised process that reduces lengthy negotiations. In the case of traditional bilateral patent transactions, these are often extremely extensive and time-intensive.

## Patent value funds

In the financial markets, **patent value funds** have been developed which effectively bring patents directly into the financial markets as commodities in their own right. In Europe, in late 2004, a special investment fund was created, the Patent Value Fund (PVF) who invests only in patent realisation and commercialisation. IPB, which is managing the fund, initiated it as a private placement. IPB's investors are interested only in intangible assets. In other words, the investment focuses purely on patent potential; the typical industrial risks and management risks are overlooked (Lipfert S., von Scheffer, G., 2006).

### 2.4.3 Problems of the European patent system

There is widespread criticism of the European Patent System for the following main aspects:

- **Lack of harmonization** and fragmentation of the national legal frameworks across the EU
- **Lack of efficiency** of the registration and enforcement system, often attributed to the additional translation and implementation costs due to the lack of a single EU space for patents.
- **Concerns about the Quality** of patents, that is a worry about the multiplication of patents in all fields, which may signal a gradual lowering of the quality criteria for patents approval.

Costs are considered to be the primary barrier by SMEs to using the formal system of IPR more intensively. This applies especially to patents. Patent costs can be distinguished among costs for filing, prior art search, maintenance/ renewal fees, translation and (possibly) litigation. The additional costs of validation (e.g. for translations) depend on the number of countries protection is sought for. It is also important to consider the costs for a patent attorney/agent (external costs) and also probable costs for enforcing the rights in case they are infringed. Patents applications in Europe require particularly high costs and time. According to the Commission Communication, in 2003 the time requested to grant a patent varied from 27 months in the US, to 31 months in Japan, to 44 months by the European Patents Office (same time for a 3 country or 13 country protection, it must be noted). Average costs varied from approximately 20,000 euros for a 13 country European Patent to 1,800 euro for a US patent. Another estimate by Roland Berger (see following exhibit) shows a price range between 46,700 euros for 8 countries covered and 30,530 for 6 countries covered.

**Exhibit 2-8: Total cost of a representative EPO patent**

Expenditure	Euro-PCT <sup>(1)</sup>	Euro-direct <sup>(2)</sup>
<b>Pre-filing expenditure (excl. R&amp;D)</b>	<b>9,130</b>	<b>6,240</b>
- In-house cost	4,190	2,540
- External cost	4,940	3,700
<b>Cost of processing</b>	<b>21,990</b>	<b>14,420</b>
- In-House Cost	5,680	3,070
- External cost	16,310	11,350
<b>Cost of validation</b>	<b>15,580</b>	<b>9,870</b>
<b>TOTAL</b>	<b>46,700</b>	<b>30,530</b>

(1) average: 8 countries covered by patent (2) average: 6 countries covered by patent

Source: Roland Berger Market Research, 2004

Recent studies have shown that a European patent designating 13 countries is about 11 times more expensive than a US patent and 13 times more expensive than a Japanese patent, if processing and translation costs are considered. For the total costs with up to 20 years of protection, European patents are nearly nine times more expensive than Japanese and US patents. If the analysis focuses on patent claims, the cost differences

increase further.<sup>28</sup> Claimants and defendants bear the risk of multiple litigations in several Member States on the same patent issue. This raises potential litigation costs and is a barrier against patents use, especially for SMEs. Due to the increase in the number of patent applicants, considerable backlogs exist at practically all patent offices. For the EPO, for example, the yearly amount of patent filings has increased by 50 % over the past decade, while productivity increased only by 30 % (Abbott, 2006). In principal, the EPO takes the approach of giving examinations more time in order to guarantee high-quality standards for the granted patents. In light of the “avalanche” of applications, however, this puts considerable strain on the examiners and triggered, for example, a strike at the EPO offices in Munich in early 2006. In addition, the high quality approach can be considered to be at least partly responsible for the cost differences between Europe, the USA and Japan described above. On the other hand, high quality patents imply fewer court and infringement cases.

Concerning the **quality of patents**, there is concern that the increased number of applications is leading to insufficient or incomplete “prior art” analysis, so that many patents are anticipated by others obtained in the same, or more likely in another patent system. There is concern that the level of innovation requested to grant a patent may be decreasing and the patterns of disclosure of the innovation are becoming less demanding than in the past. Moreover, patent offices receive their remuneration from patents issued: this is a clear conflict of interest, since refusing a patent is more costly than awarding one. Many SMEs believe, on the basis of anecdotal evidence, that patent offices grant patents to large enterprises more easily than to small ones, based on the higher reputation of larger companies and/or out of fear of their lobbying power.

These considerations show that there is a need to improve the efficiency, transparency and effectiveness of patent offices and of the overall process of patenting innovation.

## Towards a reform of the European patent system

Harmonization, efficiency and quality problems of the patent system are interconnected and are all relevant for ICT SMEs patents strategies. In order to solve them, the European Commission is leading an effort towards the reform of the patent system. The EC believes that a single Community patent would be the most affordable and legally secure answer to the challenges with which Europe is confronted in the field of patents and innovation, in order to reduce costs and improve effectiveness. The European Union does not have a single Community-wide patent, but a centralized authority (European Patent Office, EPO) with a centralised and quasi-judicial recourse system (Boards of Appeals). This system is ruled by the European Patent Convention (EPC) and allows to award a patent recognized in all EU countries, which remains a national patent. The jurisdiction over the matters of validity and infringements on a patent is still of the national courts. The European patent is basically a bundle of national patents. Industry associations such as EICTA and the European Software Association tend to support greater integration at the EU level.

The 2003 Council's Common Political Approach to achieve greater integration was not successful. To open again the debate the Commission launched in January 2006 a broad consultation, which confirmed the interest for an effective one-stop-shop patent system in

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<sup>28</sup> Bruno Van Pottelsberghe de la Potterie and Didier François, *The Cost Factor in Patent Systems*, Université Libre de Bruxelles Working Paper WP-CEB 06-002, Brussels 2006, see pp. 17 et seq.

Europe, both for grants as well as post-grants procedures, including litigation (European Commission Communication, 2007a). According to this consultation, there is little support for any (further) harmonisation of substantive patent law or schemes involving mutual recognition of national patents.

The European Councils of December 2006 and March 2007 stimulated the Commission to present an updated IPR Strategy Communication by early 2008. The European Parliament in October 2006 urged the Commission to explore all possible ways of improving the patent granting and litigation systems in the EU.

A proposal for a consolidated jurisdiction, at least for the appeal against national rulings, is the European Patent Litigation Agreement (EPLA), which has never been signed because of different major constitutional problems and contrasting views by Member States. Within the software industry, some stakeholders believe that EPLA may facilitate an increasing practice of permitting software patents, so OSS supporters tend to be against this legislation scheme.

Another attempt to streamline the process is the so-called London Agreement, promoted in October 2000 by ten EPC contracting states (Denmark, France, Germany, Liechtenstein, Luxembourg, Monaco, Netherlands, Sweden, Switzerland and the United Kingdom) in order to reduce translation obligations to only three languages. It is estimated that this would reduce translation costs for an average European patent by 31% to 46%, representing savings of around EUR 2,400 to 3,600 per patent. However the London Agreement is not active yet (it may be implemented in 2008).

The Communication “Enhancing the patent system in Europe” of April 2007<sup>29</sup> presents a compromise proposal based on the creation of a unified and specialised patent judiciary with competence for litigation, inspired by EPLA but partially based on national MS practices. The Commission is trying to build consensus around this compromise proposal.

Complementary measures are also being considered such as:

- The introduction of Alternative Dispute Resolution (ADR) in patents litigation, promoting mediation, conciliation and arbitration, an idea particularly interesting for SMEs because of its potentially lower costs;
- The introduction of Patent Litigation Insurance for SMEs, which is considered very difficult to implement.

#### 2.4.4 The software patents debate

Software protection has become a key competitive issue in the IT industry, because of the emergence of different business models linked with the Open Source Software movement. There is an ongoing conflict about the validity of software patents and their role in the competitive scenery<sup>30</sup>.

The European legislation does not recognise software patents as such (art. 52 of the

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<sup>29</sup> Commission Communication “Enhancing the Patent System in Europe”, COM 2007 165 final, april 2007.

<sup>30</sup> For additional evidence see also “The patent holder’s dilemma: buy, sell or troll” by Patricia S.Abril and Robert Plant, and Matt E. Thatcher and David E. Pingry “Software patents: the good, the bad and the messy”

EPC), but tens of thousands of Computer-Implemented Inventions (CII) patents have been granted in Europe in the last years, mainly in the ICT sector, involving also software innovation. Approximately 20% of CII patents each year are granted to SMEs. A definition of a CII is hard to find, but – according to the decisions of the Board of Appeals – any time when in a process or software the use of a hardware component is requested, there is a technical innovation and the patent can be granted. Those challenging the validity of CII claim that almost all software must be used on a computing machine (except software developed for purely academic purposes). Therefore, according to this position, the definition of CII is only a way to circumvent the limit of Art. 52 of EPC, and should be considered an illegal practice. This position has recently been confirmed by an authoritative ruling of the England and Wales court of Appeals (Macrossan case, [2006] EWCA Civ 1371), but different jurisdictions have different views.

According to the main industry actors, and to industry associations such as EICTA and BSA (Business Software Alliance), the existence of CII is a positive element. It allows to extend to the software industry the protection of the patent system, rewarding innovation and R&D investments. This is consistent with the WTO TRIPs Agreement requirement that patents be available for inventions in “all fields of technology”. In addition, without CII European firms would be weakened in front of US IT vendors, since the US Patents and Trademarks Office (USPTO) grants patents to software and business methods, thanks to a wider definition of the “technical nature” of an invention. According to these stakeholders, the CII patenting practice in Europe reflects the shift of the industry towards greater R&D investments in software and the substitution of hardware-based solutions (previously patented) with software-based solutions (which should not be excluded in principle from the same protection). These actors support the creation of the European Patent and are in favour of the EPLA agreement and the London agreement to harmonize the EU regulatory framework. Other industry groups, such as the Business Software Association, representing independent software vendors (ISV) believe that industry actors should be free to choose the IPR protection systems most appropriate to their business model and that “*Patentability should continue to be limited to technical solutions and should not be reduced or expanded, to include business methods*”. Some actors are in favour of software patents, but against use of patents that prevents interoperability. This is the case of ECIS (European Committee for Interoperable Systems), a group formed by large patent holders such as IBM, Oracle and Nokia.

The main opponents of software patents come from the free and open source software community. The most vocal group in this area is the Foundation for Free Information Infrastructure (FFII), a non-profit organization composed by independent software developers, patent experts and academics, whose goal is “establishing a free market in information technology, by the removal of barriers to competition”. The Foundation believes that CII patents for software “are a barrier to the free market in information technology” and that they “turned a clear set of rules, based on copyright, into unclear ones”. According to the FFII, software patents favour established players instead of innovators and aim at maximising profits, rather than innovation and knowledge diffusion. Because of the sequential nature of innovation in software, the larger patent holders would always be in a position to leverage older technology, on which the newcomer must base its innovation, according to this position. This allows the larger companies to obtain cross licensing or, worse, to stifle the ability of the smaller ones to compete and innovate. In addition, patents do not fit well the short development cycles of the ICT industry and the overall requirements of the knowledge economy.

But also the use of licences is not immune from conflicts. The FLOSS movement is in

favour of IP licensing models to make innovation a tradable good, as compared to patents which “monopolise” knowledge. Actually, according to the recent study on FLOSS impacts by UNU/MERIT, some large vendors are particularly critical of reciprocal licensing as being “anti-business” and preventing commercialisation, while approving of “permissive” licences such as the BSD licence, which allow FLOSS software to be appropriated exclusively into proprietary software. According to this study, instead, reciprocal licenses prevent competitors from taking software written by others and “commercialising” it as proprietary software, which would make it impossible for the original authors to benefit from modifications to their work. Most (about 70%) FLOSS is released under reciprocal licences, including Linux and MySQL.

The debate about software patents affects the ICT industry also in the US, but is particularly strong in Europe. In 2005, a proposed Directive to harmonise EU rules on CII patents (and therefore approve this practice and extend it to all EU countries) was rejected by the European Parliament, after a hot debate and strong protests by the Open Source Software community and other opponents of software patents. It seems unlikely that the ambiguity about the status and role of CII patents in Europe will be solved soon, while the issue continues to influence also the discussion about the general reform of the European Patent System.

#### 2.4.5 The challenge of open standards and the role of IPR

Standards development is a key element of the fast-changing ICT ecosystem, allowing diffusion of innovative products and services and interoperability between different systems, applications and networks. The development of open source software and the growing need for interoperability at all levels has raised the relevance of standards development.

There is an inevitable tension between standard development and IPR protection, since the first aims at the largest possible diffusion, while IPR tend to grant time-limited monopolies of inventions, in order to secure commercial rewards to the inventor. Within the ICT industry, the development of open standards to ensure the widest possible level of interoperability and avoid users “lock-in” in proprietary systems is promoted by the EU and main national bodies as a key success factors of market development. This is particularly important because, given the incremental nature of ICT innovation, ICT standards often build on technologies protected by IPR. For example, the GSM/GPRS/EDGE standards for mobile communications include IP developed by 400 companies and protected by 2,000 patents. This raises a dispute about what are reasonable licensing costs for IPR used in standards, or even if open standards should be exempted from licensing payments. A well known example of this conflict is the long-standing legal battle between Qualcomm, owner of many key patents, and Nokia about the licensing of certain GSM and UMTS patents on FRAND (Reasonable and Non-Discriminatory) terms. A resolution is expected within 2008 from arbitration. The US Antitrust because of competitors' accusations of illegal licensing practices is also investigating Qualcomm.

According to the ICT Taskforce working group<sup>31</sup>, there is a general perception that most

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<sup>31</sup> EU ICT Task Force, Working Group 2 “IPR for competitiveness and innovation”, Topic paper October 2006



standards organisations have been successful in establishing IPR Policies promoting the participation of a maximum number of companies under their RAND IPR Policy. This prevalent IPR licensing model for standards organisations require participants to voluntarily commit to license their patent claims that are essential to implementing the standard in question on Reasonable and Non-Discriminatory (RAND) terms. This still creates problems in practice, for example when companies who participate to the process wait to disclose their IPR and then ask for licence payments.

But some actors oppose the RAND approach, believing that open standards should be developed with a royalty-free model and otherwise non-discriminatory terms, and this would be advantageous particularly for ICT SMEs. This is the position of the FLOSS movement supporters. This was also the position of Sun Microsystems and UEAPME (European Association of Craft, Small and Medium-sized Enterprises) in the ICT Taskforce working group discussion. For Sun, openness means the ability of all interested parties to participate in the creation and management of the standard and everyone should be equally able to implement the standard, for no cost and with no restrictions. The company asserts that the first mover advantage bestowed upon standards participants enables sufficient recuperation costs to cover any revenue lost by royalty free licensing.

SUN and IBM also assert that the bottom-up approach of the European ICT industry to standards-setting cannot achieve interoperability because the resulting standards are typically biased towards industry interests and are not representative of “wider” industry interests. Moreover, following other paths to interoperability will lead to a proliferation of standards.

Key European ICT companies, especially Alcatel, Nokia, Philips and Siemens, favour an IPR policy, which they believe ensures maximum availability of IPR due to a binding commitment to license combined with the right of IPR holders to receive reasonable and adequate compensation for the shared use of their technology. They do not believe that this approach should be seen as opposition to a royalty-free IPR model. They are however concerned that the imposition of a royalty free licensing system (as the sole option) would create disincentives for broad participation, raising the risk that essential IPRs would not be made available for a specific standard.

Finally, there is agreement that ICT SMEs are under-represented in standardization bodies <sup>32</sup> and more attention should be paid not only to involve them, but also to be sure that they can access and use the knowledge embodied in the standards, as well as develop products and systems based on those standards (for example defining standard sub-systems). According to SME association NORMAPME, SMEs inputs and interests may be overlooked in standard development, while larger industries and other parties are better able to influence the development process.

This brief discussion shows the complexity of the issue and the close link between IPR policies and ICT standardization policies.

Our study did not include the standardization and interoperability theme as such, so these considerations were taken into account when analysing ICT SMEs IPR strategies, particularly in the case studies.

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<sup>32</sup> “EU Study on the specific policy needs for ICT standardisation” (ENTR/05/59), Brussels July 2007 - [http://ec.europa.eu/enterprise/ict/policy/standards/piper\\_en.htm](http://ec.europa.eu/enterprise/ict/policy/standards/piper_en.htm)

## 2.5 Summary

This study aims at producing original, unbiased and coherent evidence about the awareness and use of IPR by European ICT SMEs and the role of IPR in business strategies and competitiveness. ICT SMEs may have greater benefits from an effective IPR regime, but face greater barriers because of their minor resources and lack of specific expertise. This means that IP protection is an extremely sensitive issue, where policy makers have a considerable power to influence the development of the market and the competitive game.

### Topic and industry background

ICT SMEs are approximately 731,000 in the EU 25, but are very important for the dynamism and competitiveness of the European economy. They are highly innovative. According to a recent study carried out by IDC EMEA for DG INFSO, innovative ICT SMEs in the EU 25 are approximately 300,000, that is about 41% of the universe, and 10% are best performers leading the pack for R&D investments and profitability.

These firms must deal with increasing international competition, keep up with the pace of technological innovation, which is heating up again, and adapt to the reorganization of world supply chains, based on intensive networking. To do so, ICT SMEs need to develop original knowledge, to bring it to the market as fast as possible, to value it as an asset. Therefore they must learn to exploit the full range of IPR tools to improve their competitiveness.

ICT SMEs suffer from IPR problems resulting both from the specific characteristics of the ICT industry and the general weaknesses of SMEs. The most important are:

- The cumulative and relentless innovation process typical of the ICT industry, with short product cycles, not well suited to the slow mechanism of the patent system;
- The need by ICT SMEs to protect their inventions and know how from larger firms in the same industry;
- Technological innovation trends including multimedia convergence, increasing interoperability, ease of digital content copying and distribution, which are undermining traditional business models and leading to the emergence of new ones based on shared knowledge or open innovation;
- The need for more sophisticated IPR management also by SMEs, combining different tools, such as trade secrets or copyright, and techniques such as cross or out licensing of patents;
- The well-known problems of lower capitalization and lack of specialised human resources, which have traditionally hindered high-tech SMEs from exploiting IPR tools at best.

### Trends and challenges

The use of patents and other IPR, particularly trademarks, is growing strongly, especially in computer technology, telecommunications and electrical machinery (WIPO report 2008, data up to 2005). Unfortunately there is no specific data about ICT SMEs, but there

is evidence that the share of innovative ICT SMEs is growing, and that the share of ICT SMEs with formal IPRs is higher than in the past (see par.3.1). It can be deduced that ICT SMEs participate to the trend of increase of the use of IPR.

This increase is leading to the emergence of new organizations specialised in the provision of services for the use and exploitation of IPR, particularly patents (such as Technology Transfer Offices, Patent Exchanges, IP Market Places, Patent Value Funds). They could be very important to support ICT SMEs in their use of IPR.

Concerning the EU environment for IPR management the following problems emerge:

- ICT SMEs (not being able to handle filing, protection and litigation in multiple countries) need harmonization of the legal framework at the EU level, which is advanced for copyright, trademark and industrial design protection, but far from it for patents.
- The European Patent System is universally criticized for lack of harmonization, efficiency and high costs (especially of translations) but reform efforts have not been successful so far. The EC believes that a single Community patent would be the most affordable and legally secure answer to these challenges, in order to reduce costs and improve effectiveness. The EC is promoting a compromise agreement of reform, based on the European Patent Litigation Agreement (EPLA) for a consolidated jurisdiction and the London Agreement to reduce translation obligations and therefore costs.
- There is an ongoing conflict about the validity of **software patents** and their role in the competitive scenery, which divides ICT SMEs as well. The European legislation does not recognise software patents as such, but tens of thousands of Computer-Implemented Inventions (CII) patents have been granted in the last years in Europe, many of which protect software innovation. Main industry actors (including some ICT SMEs with rich patents portfolios) and industry associations such as EICTA approve CII as a way to protect innovation and to defend EU suppliers from US competitors (the US allows software patents). Many others, particularly supporters of the Open Source Software (OSS) movement, argue that software patents favour established players instead of innovators and aim at maximising profits, rather than innovation and knowledge diffusion.
- There is an increasing problem concerning the best way to deal with IPR in the **ICT standards** arena, a key element of the fast-changing ICT ecosystem. The growing need for interoperability at all levels has raised the relevance of standards development. Many SMEs and associations such as NORMAPME argue that ICT SMEs inputs and interests are under-represented in standards development. OSS supporters in addition argue that software patents represent a barrier to open standards development (a key goal of EU policy). There is disagreement also among main players (IBM, SUN vs Alcatel, Philips and others) about the definition of open standards and the way to deal with IPR in their development.

### 3 The state-of-play of IPR use in ICT-producing SMEs

This chapter presents the key data about the profile of ICT SMEs who use IPR, the main goals of their IPR strategies and the characteristics of their IPR portfolio, on the basis of the study survey data, compared with main sources. The analysis is focused on the following aspects:

- Level of use of IPR by ICT SMEs, with the profile of users and non users;
- Main goals of IPR Strategies
- ICT SMEs Use of Patents
- IPR Management
- IPR Enforcement and Violations
- Opinions about the IPR Regulatory Framework.

#### 3.1 Evidence on IPR use by ICT SMEs

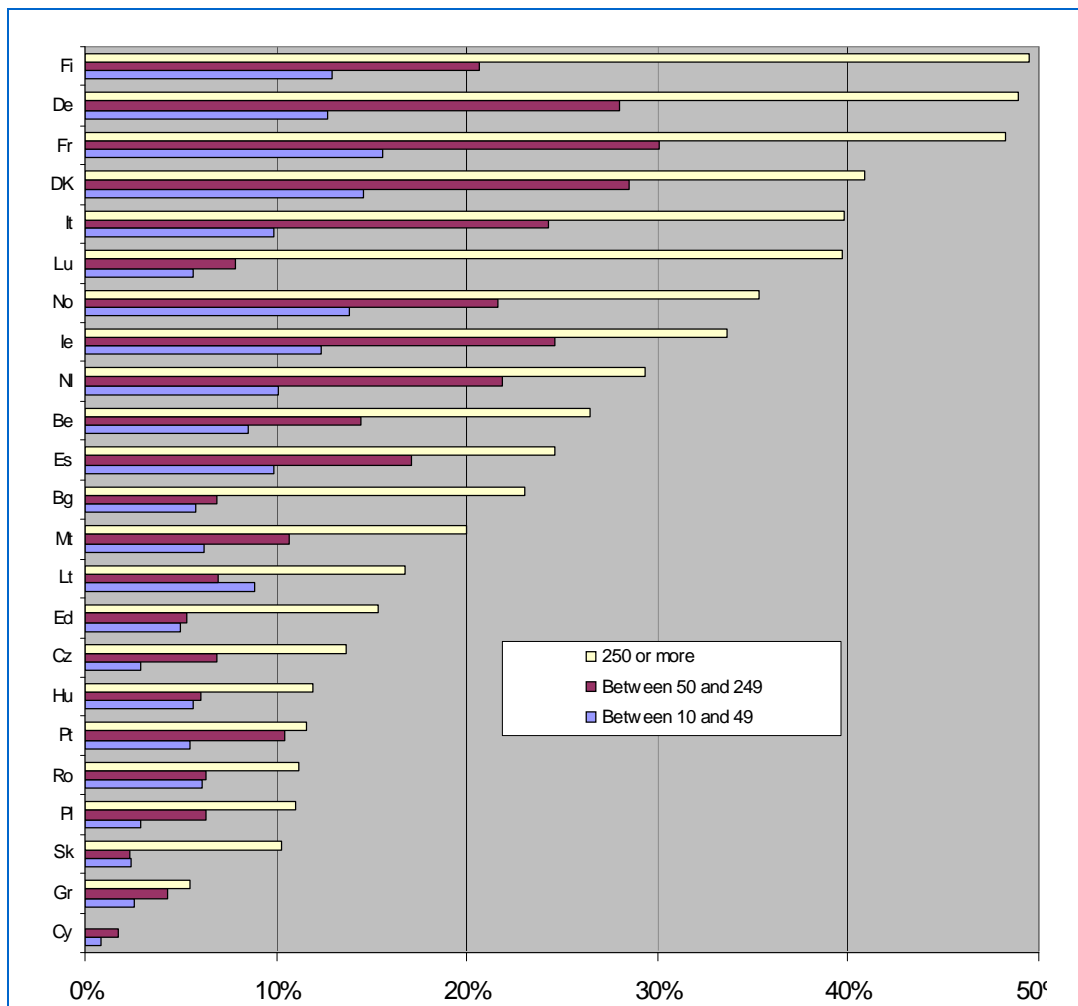
There is insufficient evidence about the way European SMEs in general and ICT SMEs in particular use IPR. Data is scarce and tends to focus on formal IPR, particularly patents. Moreover, statistical surveys on IPR usually do not include small enterprises, such as high tech start-ups, who instead are very likely to use IPR.

Existing data show that relatively few enterprises use formal IPR and even fewer of them are SMEs. Main sources show that the percentage of ICT SMEs using formal IPR (normally patents) is between 10-20%, with much higher rates for innovative SMEs of larger size and higher research budgets, up to 30-40%. The diffusion of other IPR such as copyright or trade secrets is higher, rising to half or more of the universe of innovative ICT SMEs.

There is a correlation with size (large enterprises are more likely to use IPR, particularly patents), with innovation (innovative enterprises use more IPR) and with revenue growth (enterprises using IPR tend to grow more). For example, according to the Community Innovation Survey (CIS 4, period 2002-2004, including only enterprises with more than 10 employees), SMEs between 10 and 49 employees consistently report less use of formal IP and non-formal appropriation methods than larger firms. This is generally attributed to lack of awareness and expertise, high costs and time needed to request and defend IPR, greater SMEs vulnerability to litigation, greater difficulty to reap returns from IPR use.

The CIS3 study documented slightly higher usage rates by enterprises with respect to trade marks. Informal protection methods are, by contrast, used much more frequently: trade secrets by up to 50 % of the small innovative enterprises in the UK; the strategy of relying on lead time advantage by around 40 % of small- and by around 44 % of medium-sized innovative enterprises in Germany. Variations by country are very high: high tech SMEs tend to show much higher rates of use of IPR in the EU Member States where high-tech industries are strong.

**Exhibit 3-1: Innovative enterprises that applied for a patent (% , 2004) by company size and country**

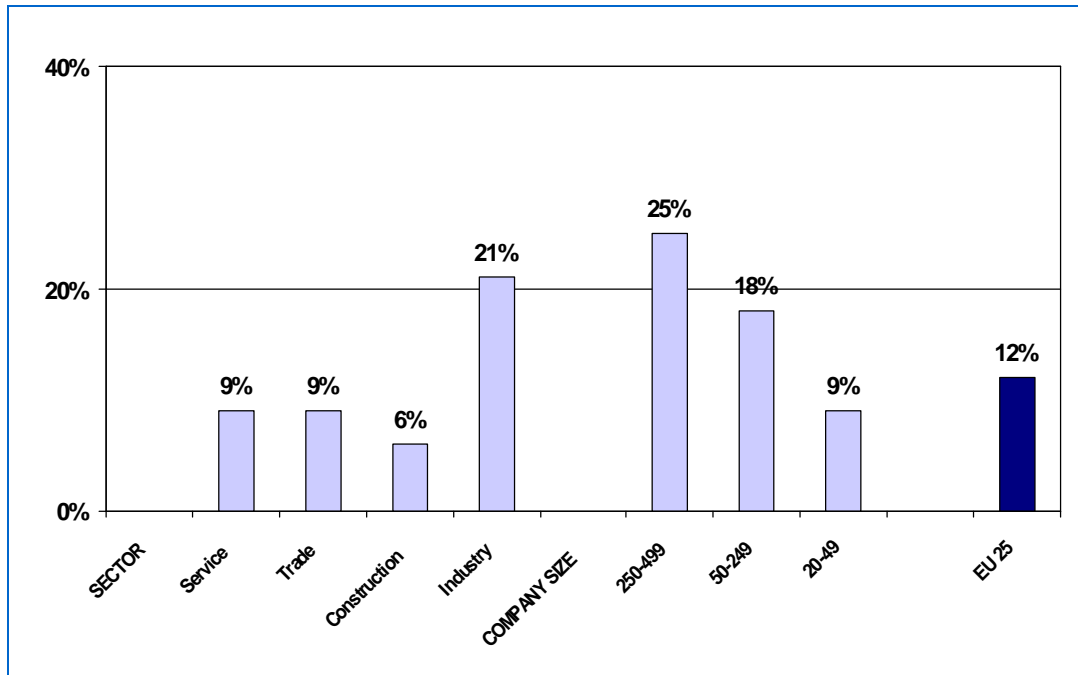


Source: Elaboration by e-Business Watch on CIS4 data

The 2004 Innobarometer survey shows that 12% of innovative enterprises<sup>33</sup> use patents and 14% trademarks. Considering enterprises with less than 49 employees, this percentage falls to 9%. But firms that are innovative and also "successful" (with an annual increase in turnover between 10 and 25%) are much more likely to use IPR: the Innobarometer shows that 41% of innovative successful firms have applied for a patent and 46% have registered one or more international trademarks.

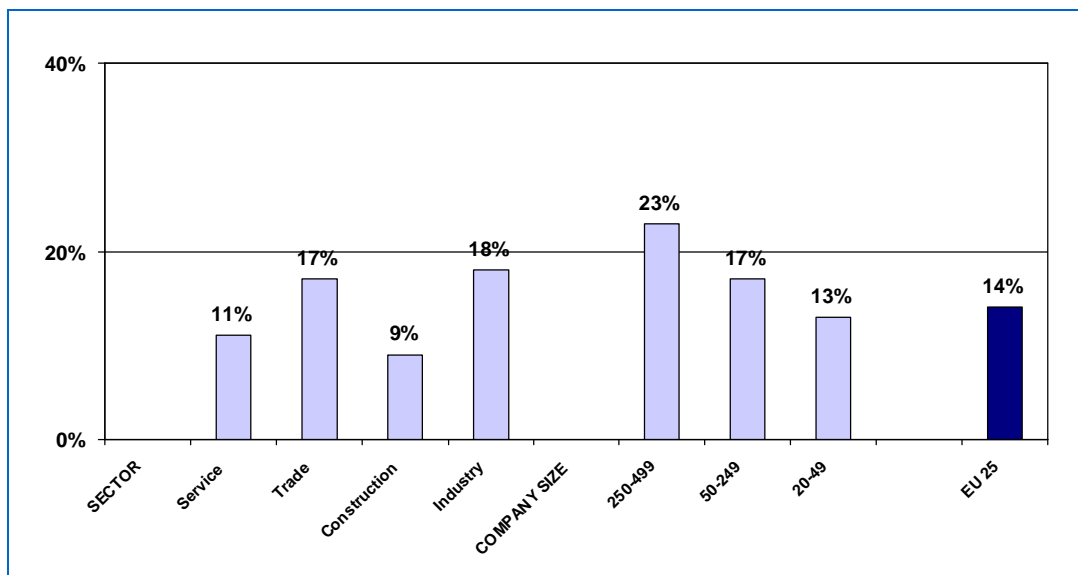
<sup>33</sup> The Innobarometer survey defines as "innovative" a company which has introduced innovative products or services in the last two years.

**Exhibit 3-2: Proportion of enterprises which have applied for patents in terms of different firm size and sectors, Innobarometer survey**



Source: Innobarometer survey, 2004

**Exhibit 3-3: Proportion of enterprises which have applied for trademarks in terms of different firm size and sectors, Innobarometer survey**



Source: Innobarometer survey, 2004

The first UK Intellectual Property Awareness Survey, run in 2006, with about 1,700 interviews, found that the percentage of SMEs owning patents ranged from 7% under 10 employees, to 17% for enterprises with 10 to 49 employees, up to 30% for enterprises with 50 to 250 employees. Almost half of the firms with more than 250 employees (41%) owned patents in the UK. This result was presented by the survey as the proof that awareness and use of Intellectual Property Protection (IPP) Tools is insufficient among

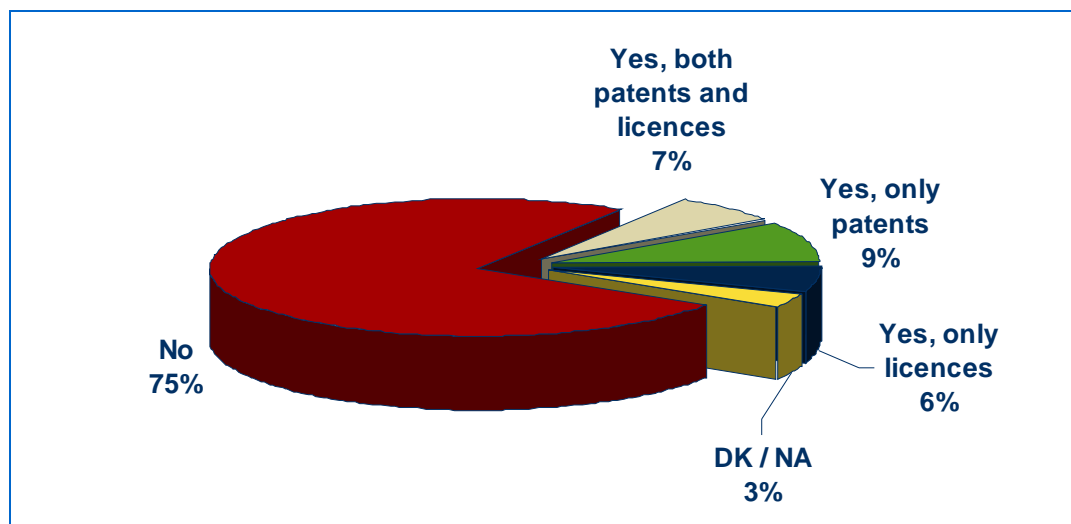


SMEs.

Other studies instead found much higher diffusion rates. A study about IPR practice by SMEs in the IT and biotech sectors in Nordic countries (Leogriff AS, 2005) found that 50% of interviewed firms had registered at least one patent application, and that many IT SMEs depended on copyrights for their IP protection.

A recent study<sup>34</sup> carried out by IDC EMEA for DG Information Society and Media at the end of 2006 analysed the strategies and behaviour of a representative sample of European ICT SMEs (in the same sectors of this study), selected for their capacity of innovation<sup>35</sup>. According to this study, about 22% of the innovative ICT SMEs in the sample requested patents or licences in the last 3 years. This share grows to 42% for ICT SMEs investing more than half a million euro annually in R&D, or to 36% in the case of firms with more than 100 employees (see following exhibits). This confirms the correlation between use of IPR (but only patents in this case), research budgets and size.

**Exhibit 3-4: ICT SMEs requesting patents/licences in the past three years (% of total respondents)**

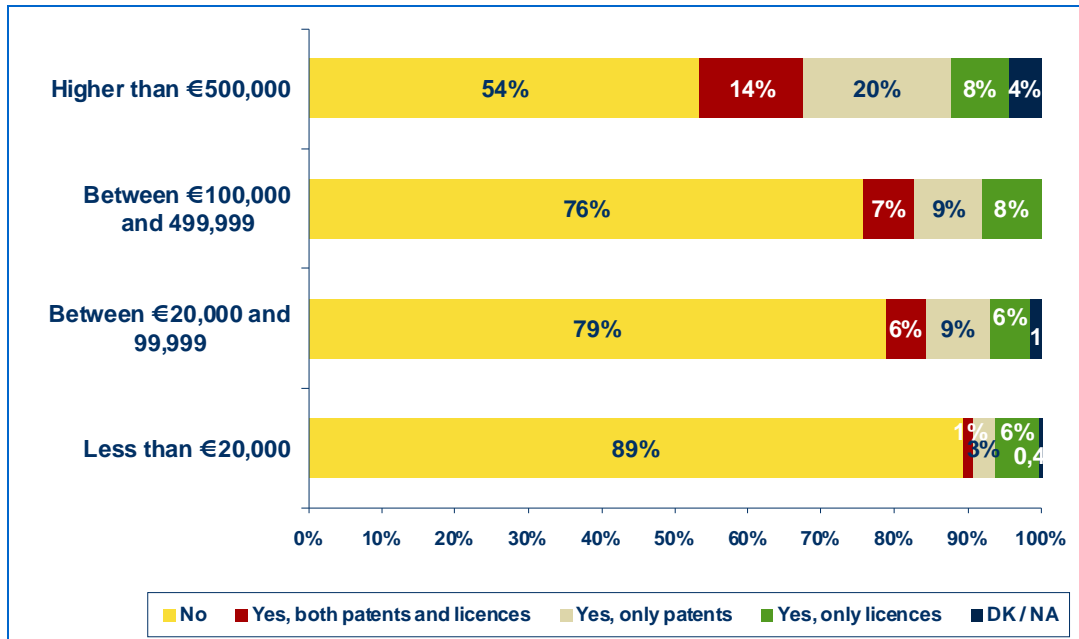


Source: Inventory of Innovative ICT SMEs in Europe, IDC 2007 Total sample=1,238

<sup>34</sup> "Study on Innovative ICT SMEs in Europe" October 2007, IDC EMEA for DGINFSO – Unit C2 - Strategy for ICT Research and Development.

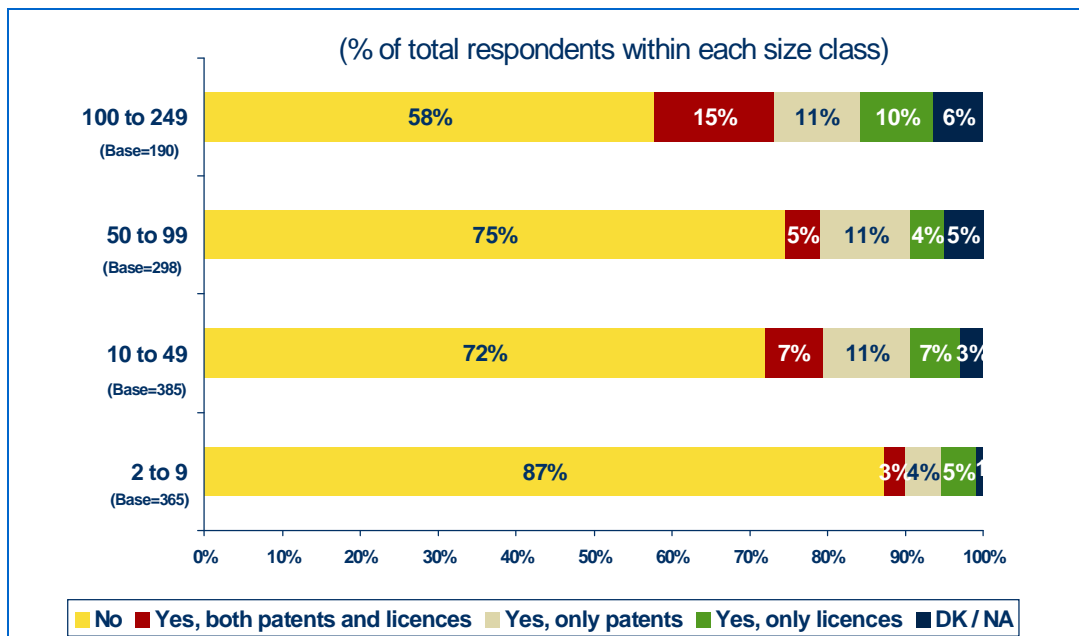
<sup>35</sup> The study sample included 1,238 innovative SMEs of the ICT industry sectors, selected through a telephone survey in the 25 EU Member States. The SMEs interviewed were screened to select those with innovative activities: all of them have introduced product or service innovation in the last year, and 84% of them have invested in research and technology.

**Exhibit 3-5: Patents/licences requested over the past three years, by level of annual R&D budget (% of total respondents within each range of R&D budget)**



Source: Inventory of Innovative ICT SMEs in Europe, IDC 2007 Base=741 (respondents who declared a specific range of value for annual R&D budget)

**Exhibit 3-6: Patents/ licences requested by company size class**



Source: Inventory of Innovative ICT SMEs in Europe, IDC 2007. Total sample=1,238

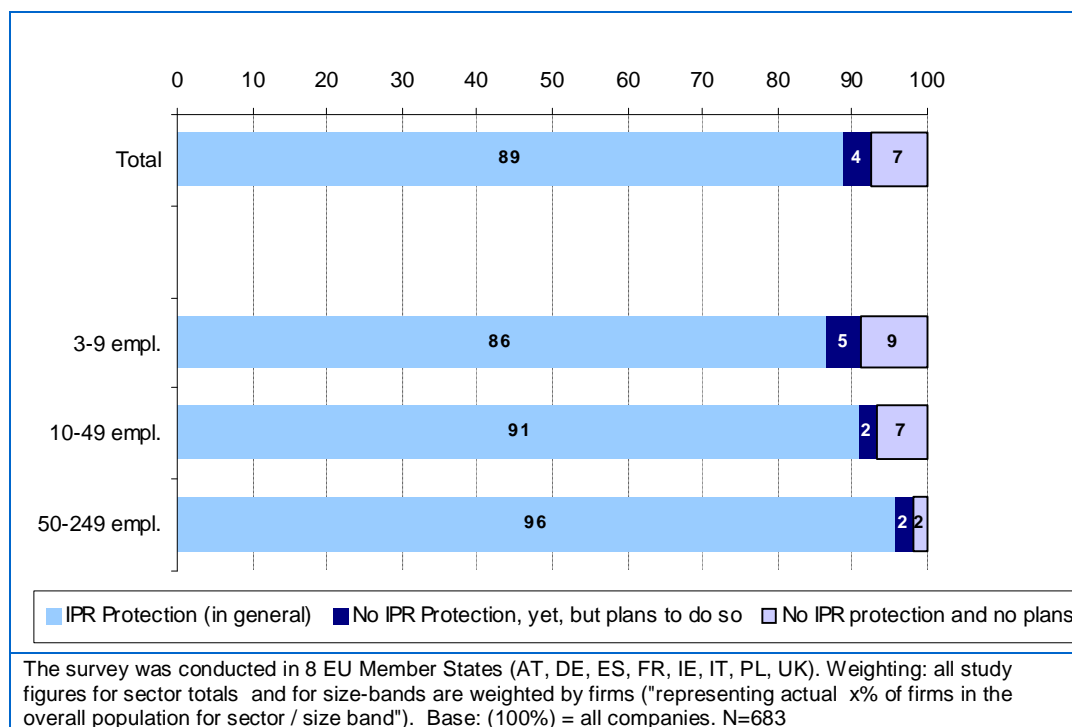
## 3.2 Level of use of IPR by ICT SMEs

### 3.2.1 Profile of users of IPR

The e-Business Watch survey targeted a sample of ICT SMEs in 8 EU Member States (AT, DE, ES, FR, IE, IT, PL, UK), reflecting by size and sector the structure of the universe, but **selected on the basis of adoption of IPR**. This resulted in 89% of the sample with some form of IPR (621 SMEs), 4% with plans to adopt (22 cases) and 7% without any plans, nor any IPR (40 SMEs) (see ex. 3-6). There is a correlation with size, that is large SMEs are more likely to hold IPR.

In other words, **this survey allows to analyse the profile and main characteristics of innovative ICT SMEs with IPR** versus those without. The survey included the full range of IPR, formal and informal, so that it provides a view of the characteristics of the IPR portfolio. Reaching the quota of IPR-using ICT SMEs was easier than expected. This means that the diffusion of other IPR (different from patents) among high-tech SMEs is probably much higher than usually estimated, and/or it has been growing in the last years (coherently with the main trends about IPR usage growth).

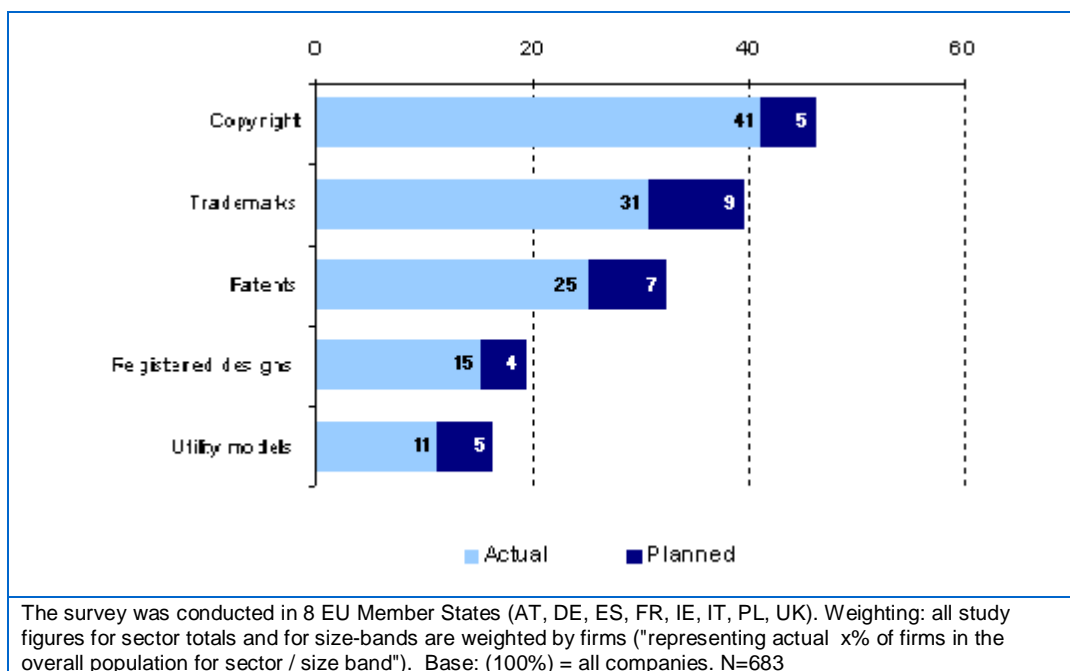
*Exhibit 3-7: ICT SMEs with some form of IPR, formal or informal (% of the sample)*



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

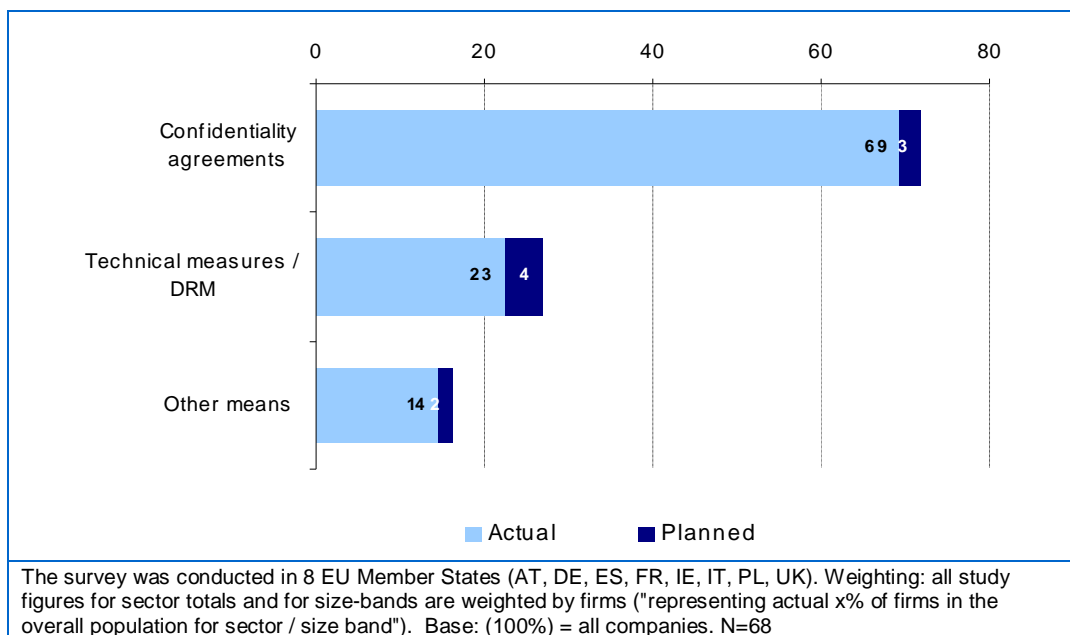
According to the survey's question "Which type of IPR do ICT SMEs use?" the most frequent tool is informal IPR (69% use confidentiality agreements), followed by copyright (41%) and trademarks (31%). Patents are chosen by approximately a quarter of enterprises, almost the same number use technical measures such as DRM. But there are also sizable minorities of firms who use registered designs, utility models and any other means.

Exhibit 3-8: Use of formal IPR by ICT SMEs (%)



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

Exhibit 3-9: Use of informal IPR by ICT SMEs (%)



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

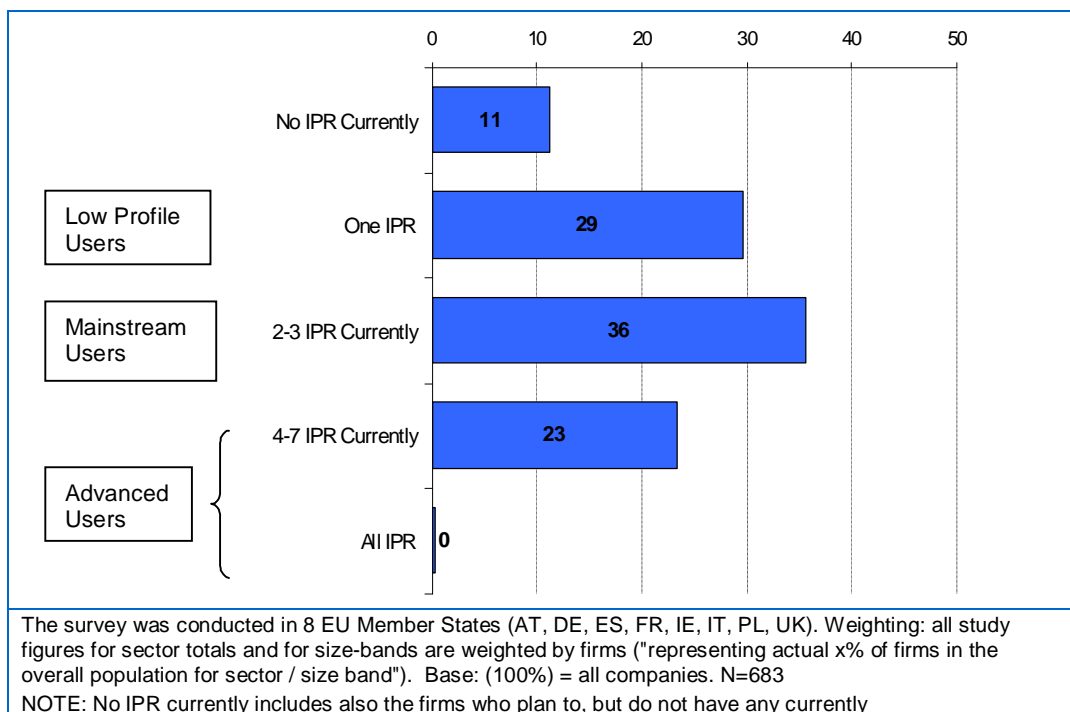
More interesting, this survey allows to analyse the range of IPR tools used by firms at the same time, that is the size of their IPR portfolio (ex.3-10) and the most frequent combinations of IPR tools, calculated using only the most frequent 5 tools, that is copyrights, patents, trademarks, CA and DRM. Based on this analysis we can classify ICT SMEs in terms of their profile of IPR use as follows:

- **Low Profile Users** (29%) a third of ICT SMEs only use one type of IPR: this is usually an informal tool, such as confidentiality agreements. More rarely it can be

copyright (5%) and very rarely patents (2%). They are more likely to be micro companies (they are 37% in the size class of 3 to 9 employees) and are almost evenly distributed across the ICT sectors.

- **Mainstream IPR Users:** this is the relative majority of our ICT SMEs (36%), including firms who use 2 or 3 different IPR tools. The most frequent combinations include copyright and some other formal or informal tool, or copyrights, patents and some other tool. The same firms very often use copyright and patents. There are also firms who only use informal tools (CA and DRM, 5% of them). In this category, and given the characteristics of the industry, copyright is the cornerstone of the IPR strategy. They are more present in the Software subsector (42%) and in the mid size class of 9 to 50 employees (43%).
- **Advanced IPR Users:** they represent about 23% of the ICT SMEs. Their portfolio includes 4 to 7 different IPR tools, and a tiny minority (0.2%) have claimed to have all the 8 types of IPR investigated by the study. These firms use the full range of IPR, both formal and informal, and are presumably well aware of their pro and cons. They most frequently use copyright, patents, Confidentiality Agreements and DRM. Advanced Use is correlated positively with size (they are more present in the larger size class of 50 to 250 employees (42%). They are slightly more present in Software and ICT services sector than in ICT Manufacturing (where they are 21%).
- **No IPR currently.** This group includes firms who do not have and do not want IPR (7%) and those who do not have them now but plan to do so in the future (4%). They are analysed in the following paragraph.

**Exhibit 3-10: IPR portfolio size, both formal and informal ( % of ICT SMEs )**

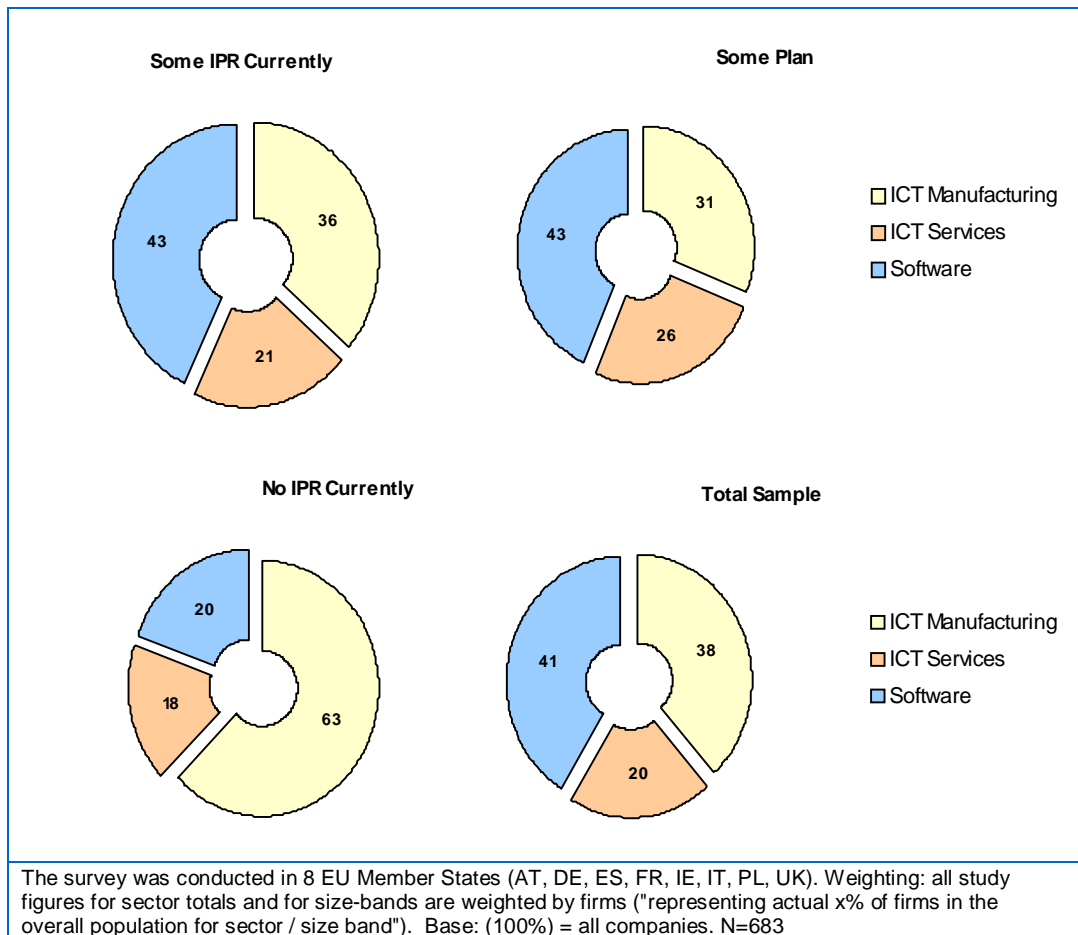


Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

### 3.2.2 Comparison between users and non-users of IPR

The comparison between ICT SMEs users and non-users of IPR highlights some interesting variations by size and by sector (see following exhibit), but not significant ones. Software and ICT services firms are the majority within the group of those with some IPR or planning to use IPR. Perhaps surprisingly, ICT manufacturing firms are the majority in the group of those non using IPR.

**Exhibit 3-11: Profile of users and non users of IPR by sector (% of ICT SMEs)**

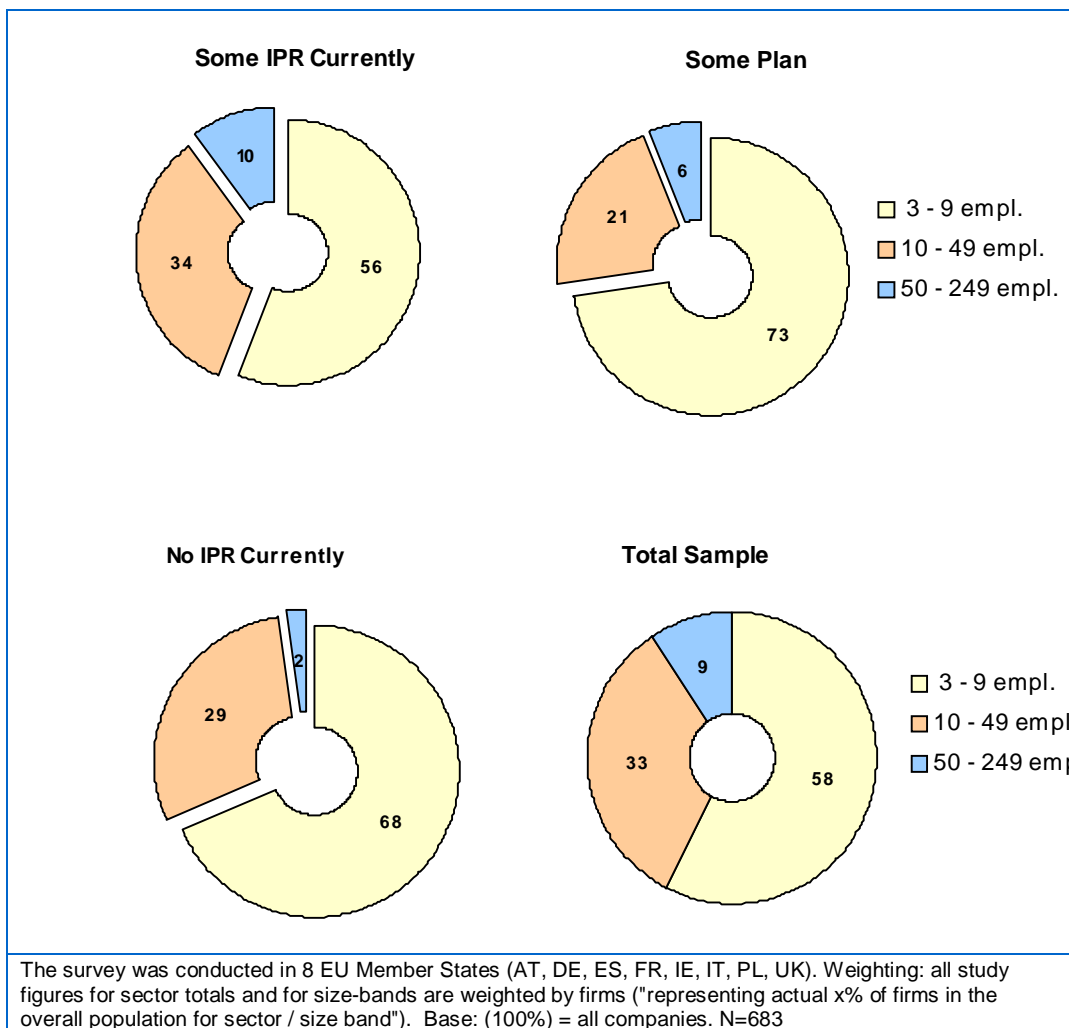


Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

Variations by size are larger, highlighted by the weighted sample. Firms with more than 50 employees are almost all IPR users (or planning to become users) while firms in the smallest class (3-9 employees) are more likely to be non-users and midsize firms are in an intermediate position. But the difference is not so large: micro enterprises represent 58% of the weighted sample, and 56% of the subgroup of IPR users. Based on these considerations, it appears that the choice of adoption of IPR depends more from the business model and market strategy adopted, than from the industry or the size of the firm.



Exhibit 3-12: Profile of users and non users of IPR by size class (% of ICT SMEs)



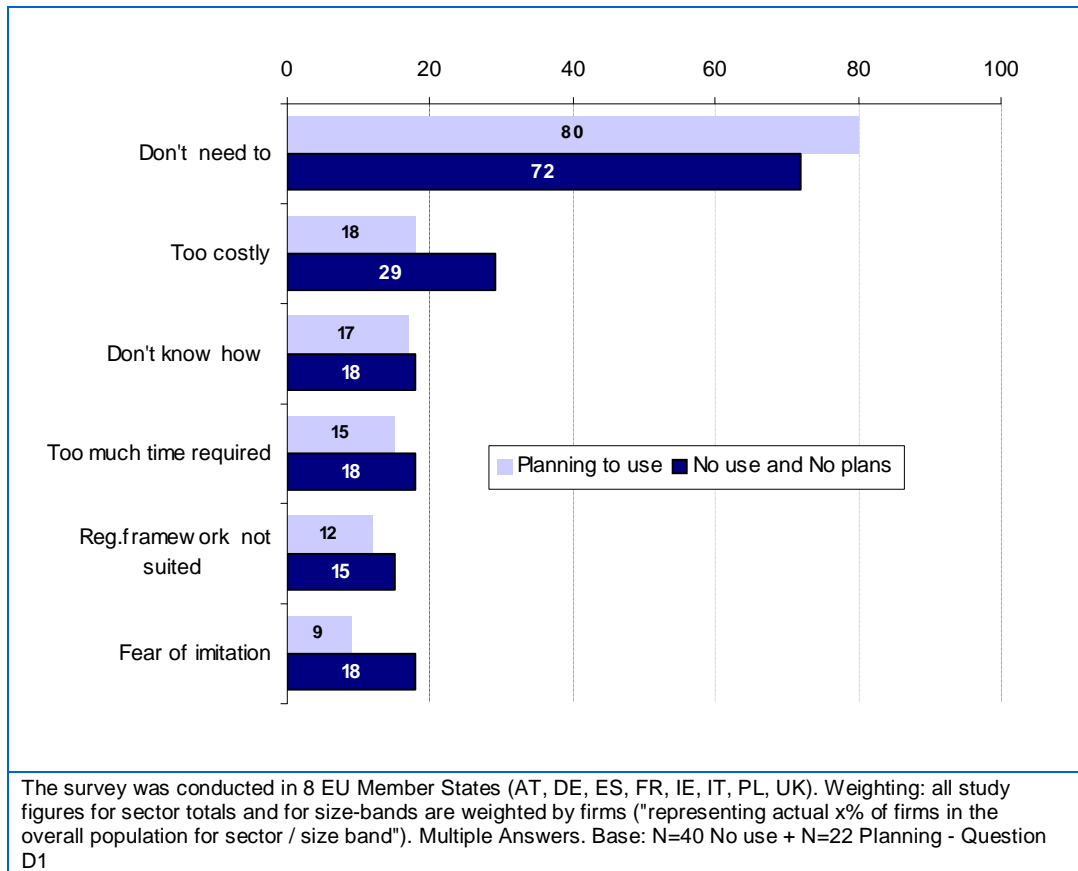
Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

The analysis of non-users motivations (presented below) highlights as the most important by far the lack of need for IPR (80% for those planning and 72% for non users). A third of non-users mention high costs as the key reason. The other barriers mentioned by literature as main obstacles for SMEs are quoted by small groups of respondents (18-20%): too much time, lack of knowledge, non suitability of the regulatory system. It is worth mentioning that non-users (18%) indicate their fear of imitation by competitors, as a risk which may follow the formalization of an IPR application for an invention. This points to a lack of trust in the formal IPR system, which may also characterise the high number of ICT SMEs using only informal IPR.

Overall, the main problem does not seem to be the weaknesses of the IPR system, but rather a lack of interest by enterprises. Whether this depends on a lack of awareness of potential benefits, or it is actually a sensible choice for a specific business strategy, remains to be seen.

**Exhibit 3-13: Reasons of non-use of IPR (% of ICT SMEs)**

**Companies stating they have not protected IP so far, or will not do so because...**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

### 3.2.3 Patterns of use of formal and informal IPR

The profile of the IPR portfolio varies by industry segment, with ICT manufacturing firms more likely to use patents, registered designs and utility models, as well as CA. In the software industry copyright naturally dominates, together with trademarks: the portfolio of the ICT services industry is similar to that of the software industry, with slightly lower rates of diffusion.

Notwithstanding these considerations, the range of IPR tools used is rather rich in each size class and industry segment, undermining preconceived expectations about a very limited IP protection by SMEs.

There is a strong correlation between the size of the firm and the use of formal IPR, with larger firms more likely to use them (*as shown by the following exhibits*). According to our survey, this holds particularly for patents, while copyright and trademarks are more easily used also by smaller enterprises. Informal IPR, and particularly Confidentiality Agreements, confirm their nature as the most exploited tool to protect IP, regardless of the size of the firm.

Exhibit 3-14: Use of formal IPR (% of ICT SMEs by size class)

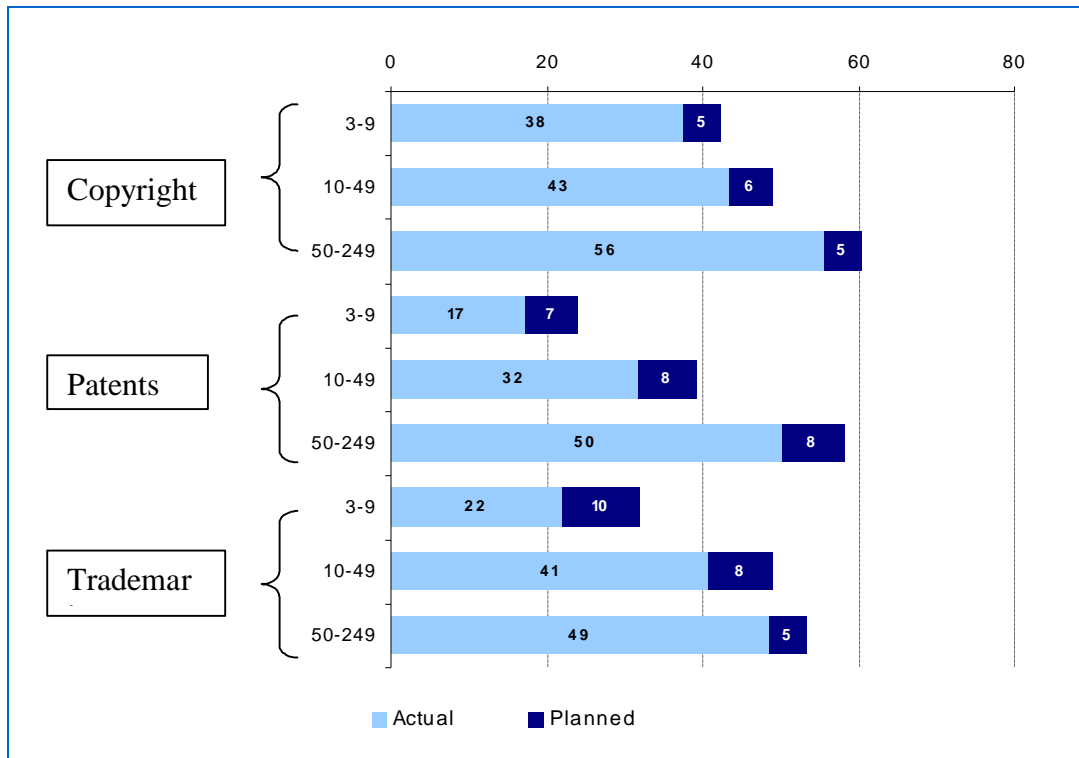
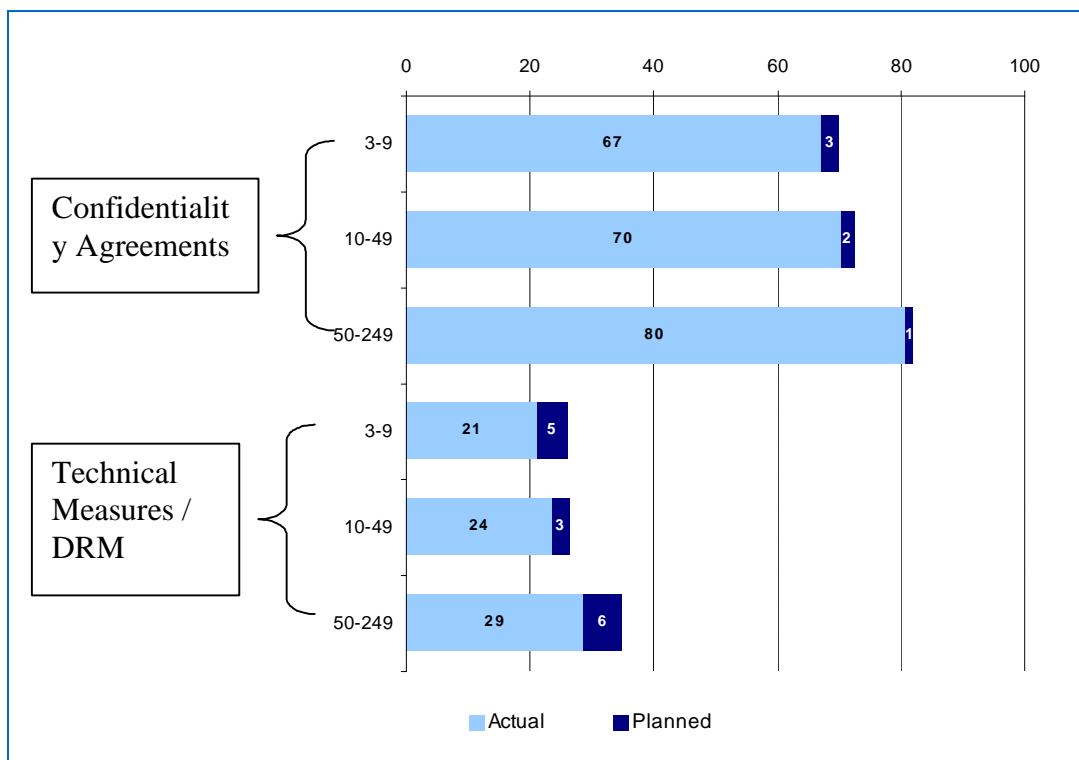


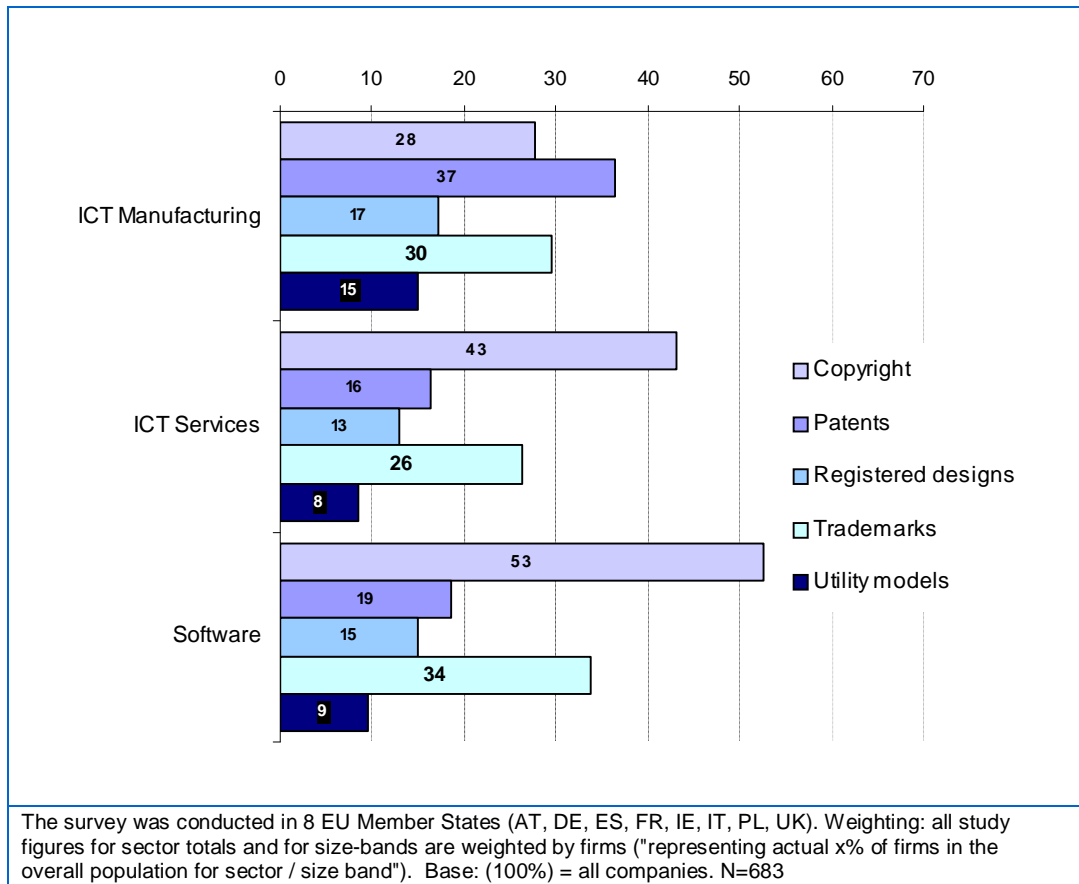
Exhibit 3-15: Use of informal IPR (% of ICT SMEs by size class)



The survey was conducted in 8 EU Member States (AT, DE, ES, FR, IE, IT, PL, UK). Weighting: all study figures for sector totals and for size-bands are weighted by firms ("representing actual x% of firms in the overall population for sector / size band"). Base: (100%) = all companies. N=683

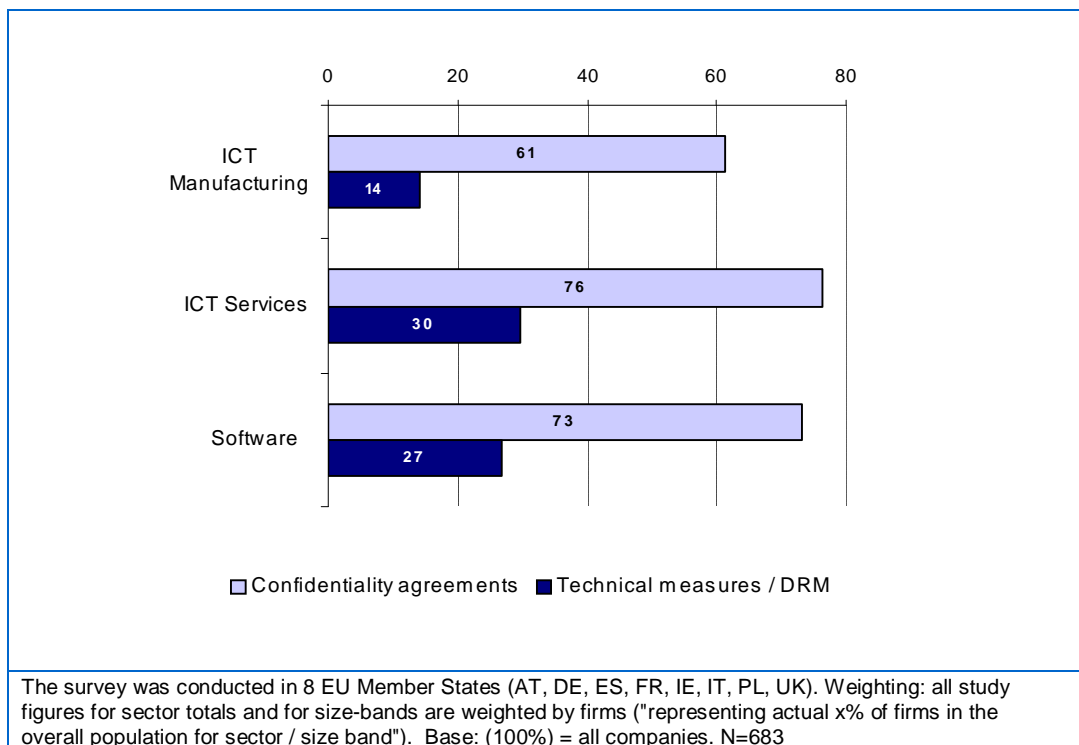
Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

**Exhibit 3-16: Use of formal IPR (% of ICT SMEs by industry segment)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

**Exhibit 3-17: Use of Informal IPR (% of ICT SMEs by industry segment)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

## 3.3 Main goals of IPR strategies

### 3.3.1 Main use of IPR by ICT SMEs

ICT SMEs are learning to use the full range of formal and informal IP tools to protect their research investments and defend their competitiveness in global supply chains. But there are many different ways in which IPR may be used for business goals. For example the World Intellectual Property Organization (Wipo)<sup>36</sup> indicates the following main drivers for SMEs adoption of IPR:

- **To Block Competitors:**
  - To formalize an exclusive right to an invention, preventing others from using it
- **To exploit innovation:**
  - To obtain access to new markets (e.g. by licensing another company to manufacture a new or improved product based on a patented invention and/or protected trade secrets);
  - To avoid wasteful investments in R&D by consulting patent databases and learning about recent technological developments;
  - To segment markets through different designs targeted to different customer groups;
- **To use IPR as assets and as a competitive advantage:**
  - To insure access to new financing opportunities (such as through securitization of IP assets) or support a request for funds to a financial institution, bank, business angel or venture capitalist.
  - To increase the market value of the company in the case of a merger or acquisition; obtain additional revenues through licensing or sale of IP rights;
  - to enhance the reputation of a company as a technology leader,
  - to create a corporate identity through a trademark and branding strategy;
- **In business alliances and business networks:**
  - To increase the bargaining power of the enterprise vis-à-vis business partners or investors;
  - To establish strategic alliances, joint ventures or other types of partnerships with other companies with complementary assets;
  - To set up a franchising system on the basis of the company's trademark and other IP rights;

Many studies confirm that the strategic use of IPR varies in small enterprises, and depends on the company's overall business strategy, the marketplace in which it operates, the size, economical resources, skills and level of technological sophistication it may benefit.

In the case of patents, for example, according to one of the more comprehensive surveys of business patenting and innovation patterns (Cohen et al., 2002), the most frequent

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<sup>36</sup> WIPO, World Intellectual Property Organization (2003a), Intellectual Property rights and innovation in small and medium-sized enterprises.

reason of applying for patents is protection: to prevent copying, prevent other firms from patenting (i.e. blocking) and prevent lawsuits. Patenting is important for more strategic reasons only for a small share of firms, typically, for use in negotiations (e.g. cross-licensing) to enhance reputation, or generate licensing revenue. There is also a “learning curve” of patents use, which starts with the more defensive use and tends to evolve towards exploitation as part of business and managements strategy (e.g. licensing, building a patent portfolio) to exploitation as a financial asset (i.e. to attract external sources of finance) (Kamiyana et al. 2006).

According to Gambardella et al. (2005), at the overall EU6 level, half of the patents are used internally (50.5%), that is, patents are exploited internally for commercial or industrial purposes. About 35% are not used: specifically, 18.7% are applied for strategic reasons and 17.4% are “sleeping” patents. Fifteen percent of the patents are exchanged in the market for technologies: 6.4% are licensed, 4.0% are both licensed and used internally and 3.0% are used in cross-licensing agreements. These figures vary across countries, technologies and applicant institutions. For instance, small firms are more likely to use their patents: the share of unused patents is 18% in small companies compared to 40% in large firms and universities. Also, small firms are more likely to licence their patents than large firms.

### 3.3.2 Goals of formal IPR use (excluding patents)

According to our survey, the majority of ICT SMEs use copyrights, trademarks, registered designs and utility models mainly to **exploit innovation**, in order to launch new products and services.

The other goals are mentioned by a minority of IPR users. Interestingly enough, the least important appears to be **blocking competitors**, which is one of the main reason to adopt IPR according to most sources.

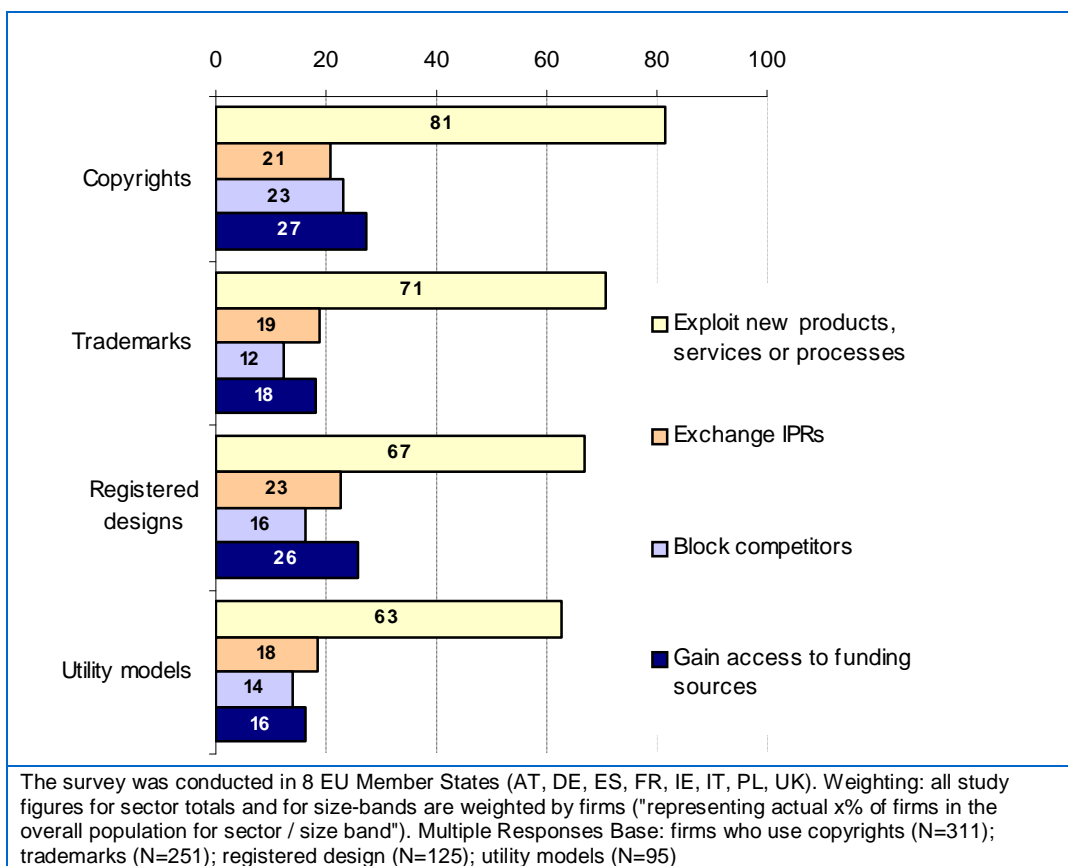
**Gaining access to funding** (using IPR as a financial asset, which is a fairly sophisticated strategy) is the second-ranking goal for copyrights and registered designs, followed by **Exchanging IPR** (one of the most common ways to use IPR in business alliances).

Registered Designs and Utility Models are mainly used by ICT manufacturing SMEs, while copyrights, as well known, are the tool of choice in the software and ICT services industries.

Overall, ICT SMEs IPR strategies appear coherent with the main drivers mentioned in literature, but also relatively more advanced than the average SME strategy, since the main goals are proactive (innovation, gain funding) rather than defensive (blocking competitors).



Exhibit 3-18: Goals of formal IPR use (% of ICT SMEs)



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

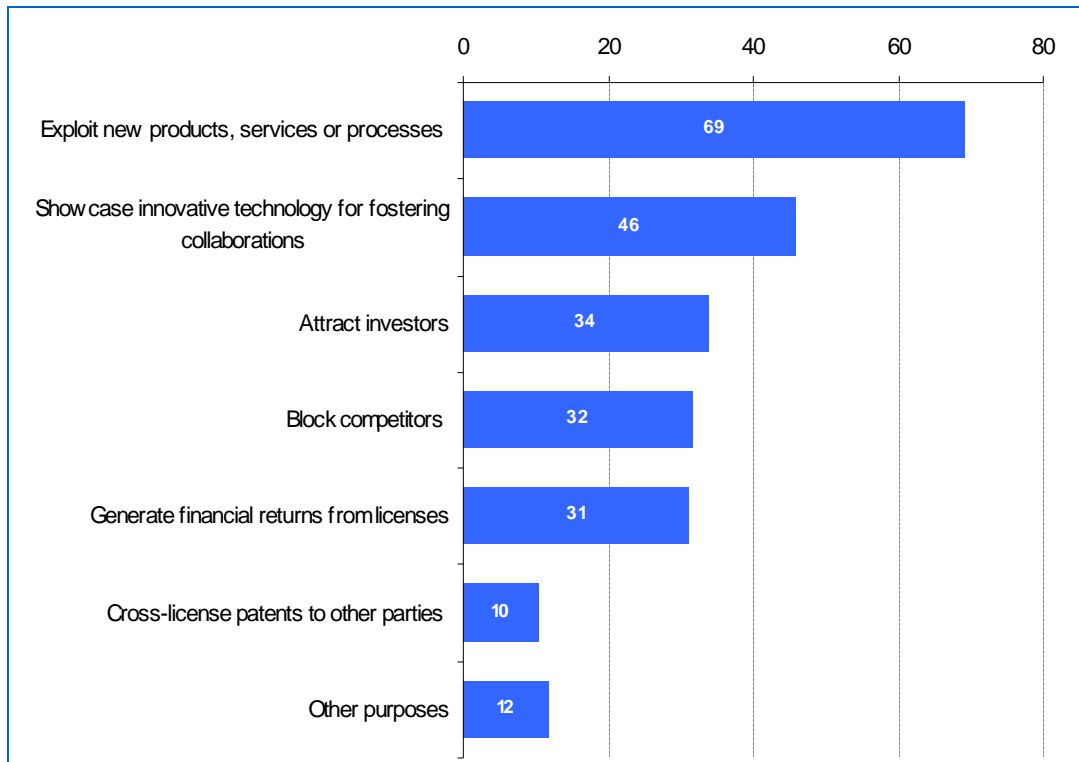
### 3.3.3 Goals of patents use

According to our survey, the majority of ICT SMEs use patents to exploit innovation, many of them (almost half) to foster collaborations. The next most important objective is to attract investors, and many (31%) claim to look for revenues from new products licences. Blocking competitors is mentioned by only a third of the SMEs, and ranks fourth in the list of goals.

As observed for other formal IPR, according to these answers ICT SMEs pursue a rather advanced patents strategy, aimed at innovation and networking developments. A sizable minority of ICT SMEs recognizes the role of patents as source or revenues and financial assets.

Cross-licensing is still a very limited practice, but this may depend also on the small dimension of patents portfolio. According to the survey, the average number of patents is 6, slightly higher in ICT manufacturing firms (8) than in Software firms (3). The average number of patents depends also on the firm size, ranging from 3 in firms with 3-9 employees, to 5 in firms with 10-49 employees, to 16 in firms with 50-250 employees.

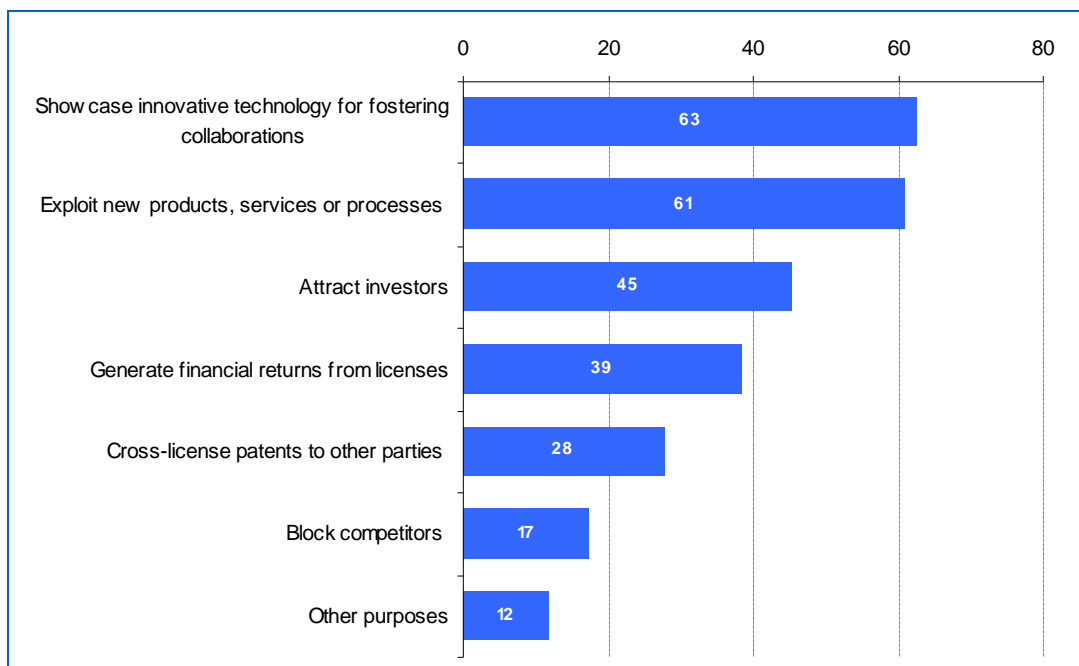
**Exhibit 3-19: Goals of patents use (% of ICT SMEs with patents)**



The survey was conducted in 8 EU Member States (AT, DE, ES, FR, IE, IT, PL, UK). Weighting: all study figures for sector totals and for size-bands are weighted by firms ("representing actual x% of firms in the overall population for sector / size band"). Multiple Responses Base: firms with patents. N=210

Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

**Exhibit 3-20: Planned use of patents (% of ICT SMEs planning to use patents)**



The survey was conducted in 8 EU Member States (AT, DE, ES, FR, IE, IT, PL, UK). Weighting: all study figures for sector totals and for size-bands are weighted by firms ("representing actual x% of firms in the overall population for sector / size band"). Multiple Responses Base: firms which plan to use patents. N=53

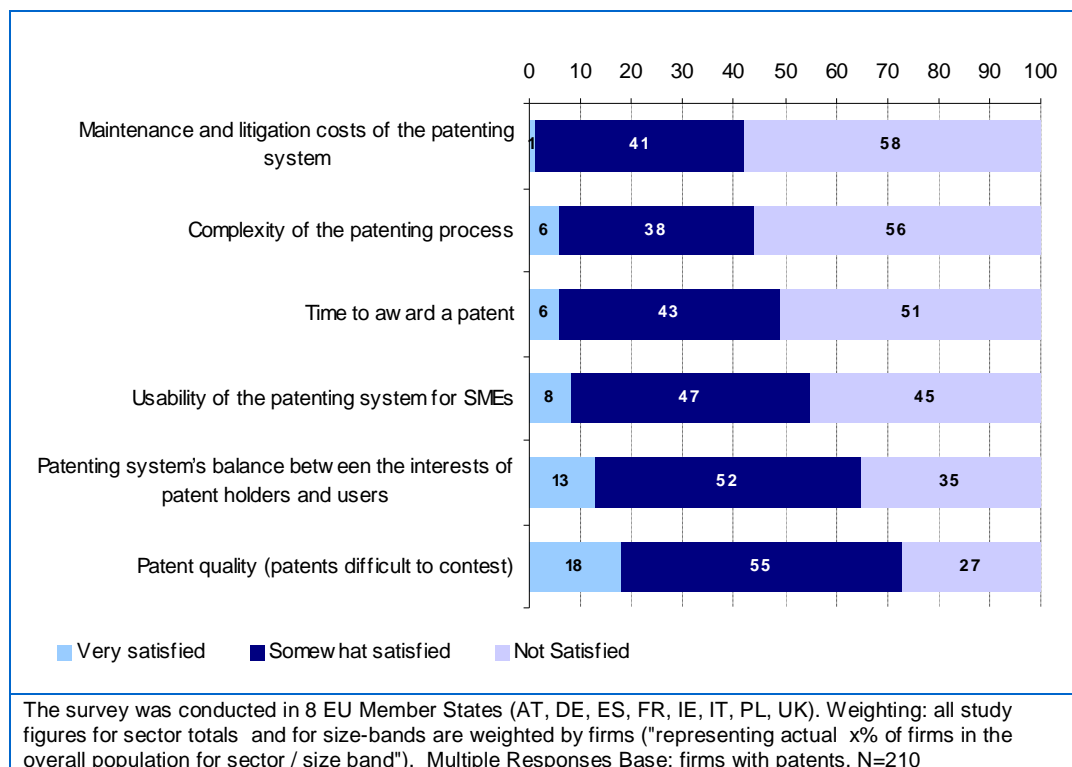
Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

The answers of firms who do not have patents but plan to do so are rather similar to the users' answers, with some telling differences (see Exhibit 3-20). Their first goal is to demonstrate their innovative capacity and consequently foster collaborations. Exploiting innovation through new products and services ranks second, followed by the need to use patents to attract investors. Other answers are similar, but blocking the competition ranks next to the last. It seems then that defending one's knowledge is not at all the key driver to become patents owners: reinforcing the competitive positioning of the firm with other actors in the value chain and possible funding partners is the most important driver.

It becomes interesting then to investigate the level of satisfaction of ICT SMEs patent owners with the Patent System, which is widely criticized. Our survey shows that the majority of ICT SMEs are not satisfied mainly with the maintenance and litigation costs, the complexity and time taken to award a patent of the system. In other words, their main problems concern the efficiency of the patent system process.

Concerning the ability of the patent system to satisfy their specific needs, our ICT SMEs are split: only 8% claim to be "very satisfied", but 47% are somewhat satisfied. On the other hand, 45% are not satisfied. The interpretation of these results may be ambiguous. It appears that the majority of ICT SMEs are reasonably happy with the capability of the system to balance the interests of patent holders and users, and the quality of patents. On the one hand, this seems to deny the intensive criticism of the patent system, including the suspects of unfairness towards smaller enterprises. On the other hand, we know that the harshest critics of the patent system tend to be in the software industry and probably do not hold patents, while the respondents are patent users and therefore have accepted the basic logic of the system.

**Exhibit 3-21: Level of satisfaction with the patent system (% of ICT SMEs with Patents)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

## 3.4 IPR management

### 3.4.1 Management organization

Effective management of IP rights may provide new business opportunities for companies with the appropriate skills, innovative capacity and resources to benefit from the range of options offered by the IP system. The problem is that many SMEs are not fully aware of the pros and cons of the different IPR tools, or do not have the capability to implement the most appropriate one.

According to a recent study by the Austrian Institute for SME research<sup>37</sup>, to achieve competitiveness benefits, SMEs must extend IP management to the full range of formal and informal IPR, and integrate IPR in the overall R&D and innovation strategy of the firm. On this, SMEs would simply follow the path opened by large enterprises, who are reorganizing their Patents management functions into IP management functions.

According to the analysis done over IPR adoption issues in Nordic countries (Leogriff AS, Moulin et al., 2005), in ICT SMEs typically:

- The management of IPR is done by the Chief Technology Officer or the Legal Director;
- Few companies actively engage in analysing the patent landscape, in Europe or in the USA. It seems that some companies prefer to ignore the issue;
- Companies engaged in Open source and Dual licensing of software tend to be proficient in the analysis of IPR: their often complex business models depend on the good formulation of ownership and rights of use in their licenses and contracts;
- "Development on demand" companies, that are developing custom software over client specifications, are often quite aware of IPR management issues;

Based on the evidence found in literature, IPR management strategies in ICT SMEs evolve most often from two different scenarios:

- If the company, from the beginning, has an IP-based strategy (as often happens with University start-ups or large corporations high tech spin-offs) the IPR Manager function is generally held by a founder/manager. Once the company is grown, the founder transfers that responsibility to an interested researcher or an IPR professional hired for the job.
- In other cases, where the firm starts to use IPR when the need for them arise, for example to exploit business opportunities, the management responsibility over IPR tends to be under the CTO (Chief Technology Officer) responsibility or (when applicable) the task of a legal director.

According to our survey, in the large majority of micro enterprises (3-9 employees) and mid-size ICT SMEs (10 to 49 employees, see following exhibit) IPR management is the responsibility of general management. Only half of larger ICT SMEs (50-250 employees) make the same choice, while 21% assign IPR management to the R&D or Technology Manager, or other managers. Only a few enterprises, in all size classes, appoint a manager or a Department specifically in charge of IPR. This confirms that for the majority

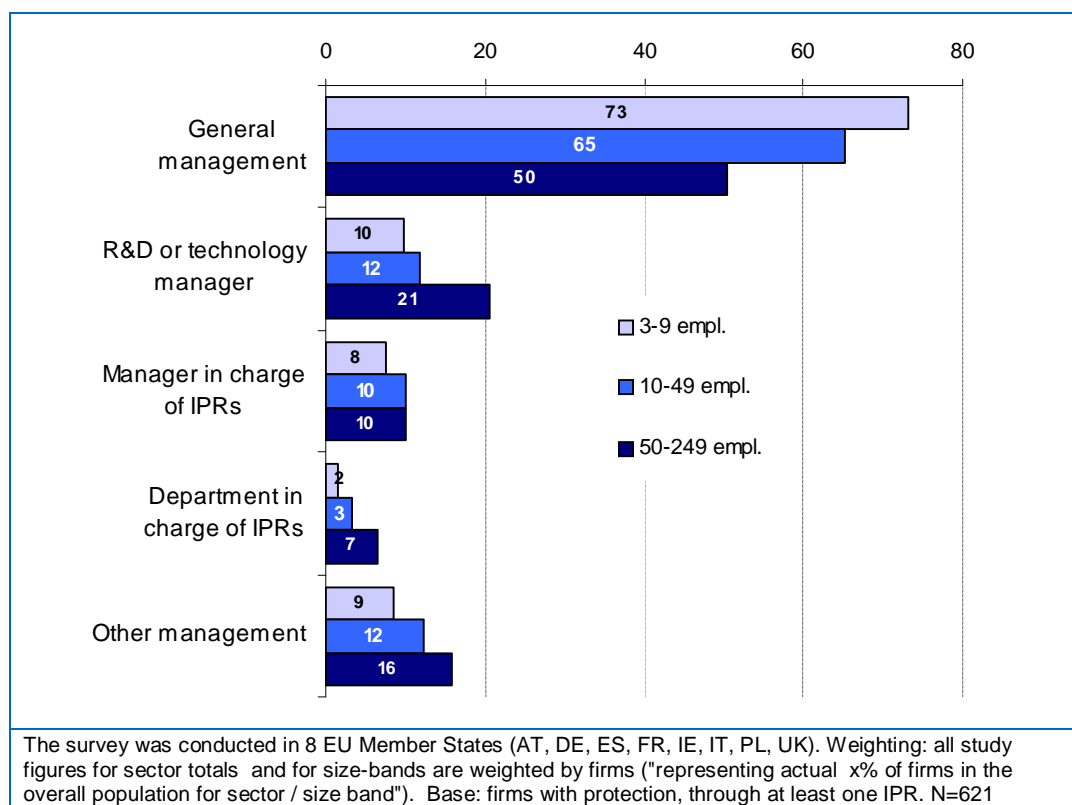
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<sup>37</sup> "Benchmarking National and Regional Support Services for SMEs in the Field of Intellectual and Industrial Property", 2007.

of ICT SMEs IPR are not worth of dedicated management. This situation means that most ICT SMEs do not dispose internally of the specific knowledge required to handle IPR issues. But only about 34% of ICT SMEs claim to rely on external consulting support to deal with these issues, most often those belonging to the largest size class, who also have the most advanced management practices.

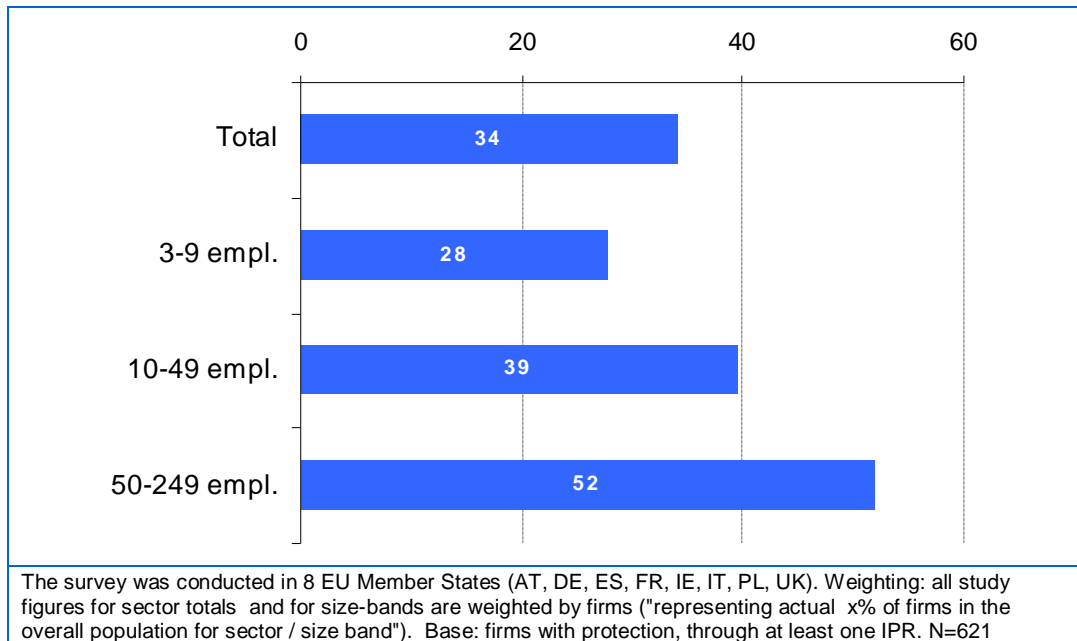
This approach to IPR management corresponds to the scenario designed by literature and to the main users profiles described above (par.3.2.1). Mainstream and Advanced IPR users are probably more likely to ask for external consulting support, because they have active IPR strategies so they need specific and legal input. Low profile users, or the Mainstream users with informal IPR, do not need sophisticated management or much consulting support.

**Exhibit 3-22: Who manages the intellectual property of the company, by firm size class (% of ICT SMEs)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

The external support is most often requested to a legal expert consultant (67% of cases). National or Regional Patent Offices provide support to one firm in four, but micro enterprises are more likely to rely on them. Innovation agencies or other agencies are starting to provide consulting services in this area for about 10% of enterprises, especially the smaller ones. The EC helpdesk or universities are mentioned only by a small minority.

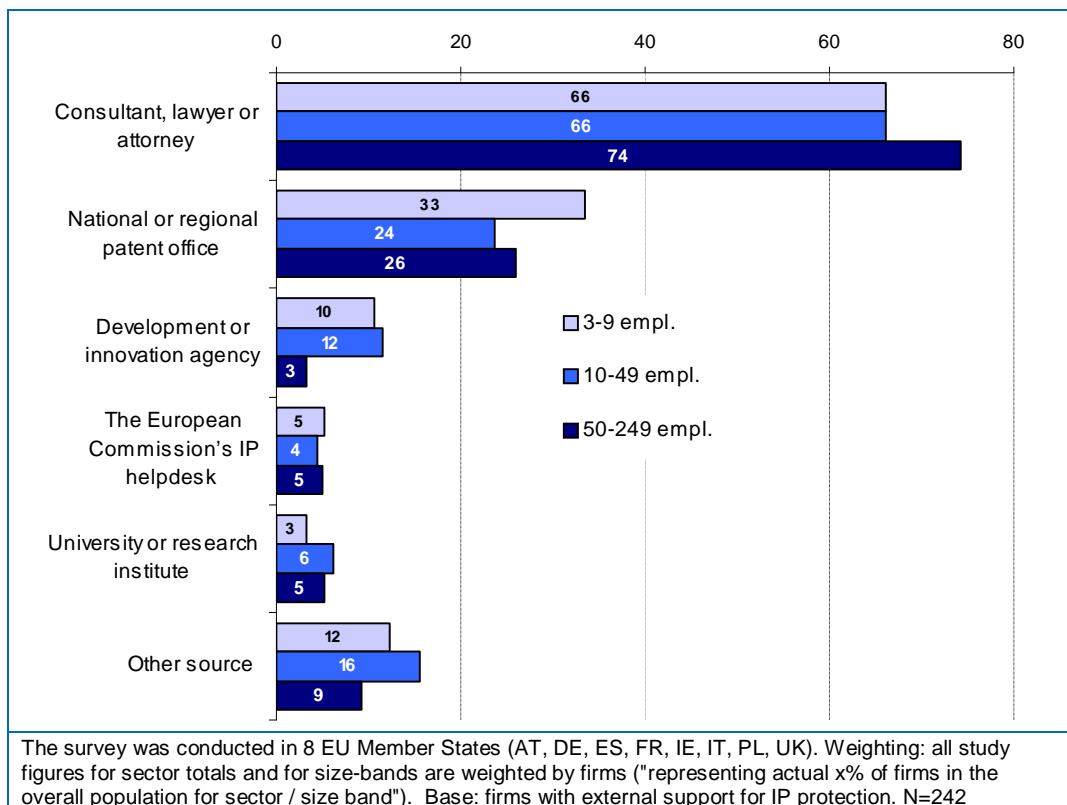
**Exhibit 3-23: Companies using external support for protecting IP (% of ICT SMEs)**

Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

A recent EC study on IPR support services for SMEs<sup>38</sup> noticed that ICT enterprises are more likely to use patent attorneys and legal experts than other industry sectors (this probably because of the peculiar nature of software patents). The study also noticed that in the past IPR support was automatically considered as patents only. Today both patent offices and innovation and technological development agencies are evolving towards offering a full range of supporting services for all the IPR portfolio, but the main bottleneck is the lack of staff with the required expertise. The study encouraged the EC to promote this evolution in order to respond to the more advanced IPR management needs of SMEs.

<sup>38</sup> "Benchmarking National and Regional Support Services for SMEs in the Field of Intellectual and Industrial Property", KMU Forschung Austria, Austrian Institute for SME Research, for PRO INNO Europe, Vienna 2007.



**Exhibit 3-24: Providers of external support for IPR management (% of ICT SMEs)**

Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

These considerations are confirmed by the IPR management practices of the ICT SMEs described in the case studies, who generally include IPR in R&D strategies or general management.

Only 3 firms out of our case studies (Eurotech, Net Insight and DXO Labs) mentioned specific internal procedures for IPR management such as:

- Incentives to R&D engineers to patent their inventions;
- Competitive monitoring;
- Patent searches;
- Internal IP committee to guarantee the alignment of the IPR strategy with overall enterprise objectives.

In one case (DXO Labs) there is a dedicated management organization, because of the strategic role of patents for their core business. DXO Labs is organized as follows:

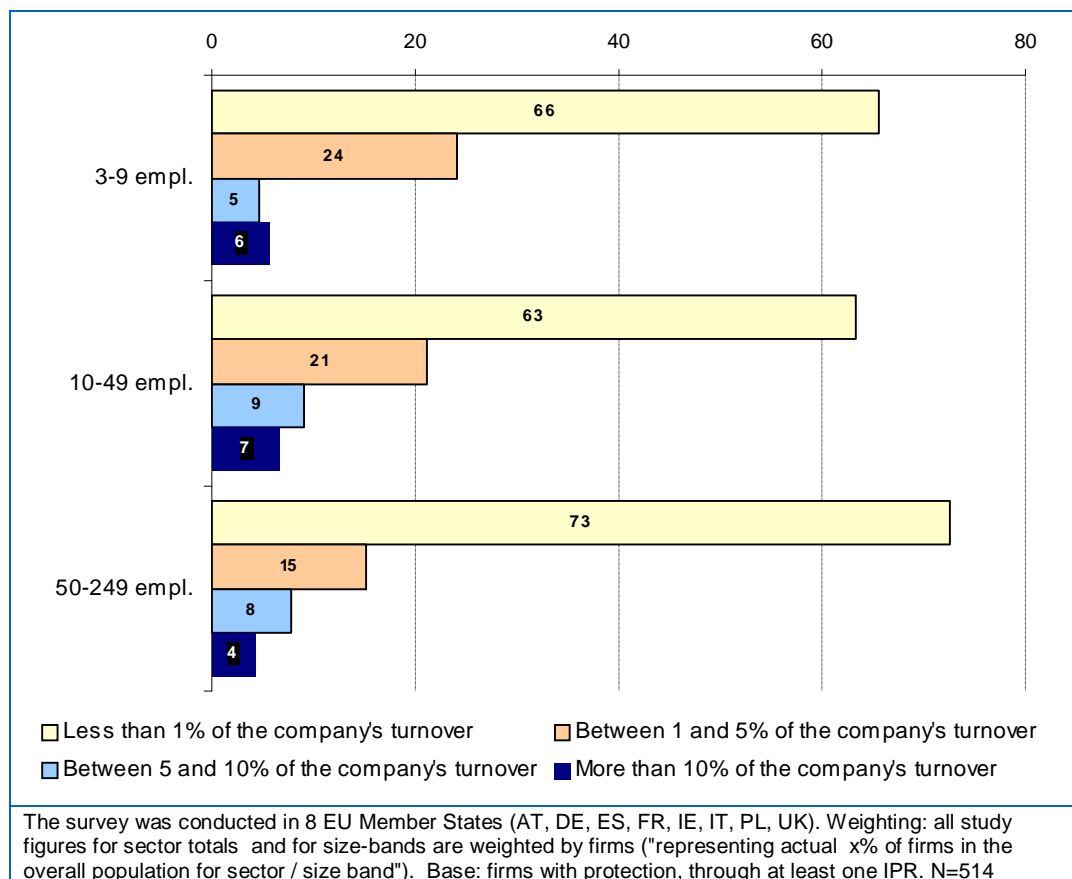
- A legal attorney is responsible of the contractual frameworks and protection of IP generated by DXO;
- Researchers are encouraged to develop innovations which can be patented, as part of their daily job;
- External patent attorneys are used, for example to file patents at the EPO;
- An IP Committee, composed by marketing and R&D directors, oversees IPR management and makes sure that IP protection is integrated and coherent with to R&D and business development activities.

### 3.4.2 Expenditures for IPR

The large majority of ICT SMEs claim to spend less than 1% of their annual turnover, or between 1 and 5%, for obtaining and maintaining IPR. This pattern does not present significant variations by sector or size class.

Only in the Software industry 9% of firms claim to spend more than 10% of their turnover for IPR, and another 8% spends between 5 and 10%.

**Exhibit 3-25: Expenditure for obtaining and maintaining IPR, in the past financial year, by sector (% of ICT SMEs)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

### 3.4.3 IPR enforcement and violations

Concerning management practices, one of the main problems for ICT SMEs is enforcement and litigation, if needed. For example copyrights, which are a key instrument in this industry, are not always managed appropriately. The Infringements of copyrights for proprietary software are rarely persecuted. Some small companies believe that it is too difficult to chase infringements, or that it is a phenomenon impossible to fight, or that illegal duplication may even help a product to become better known.

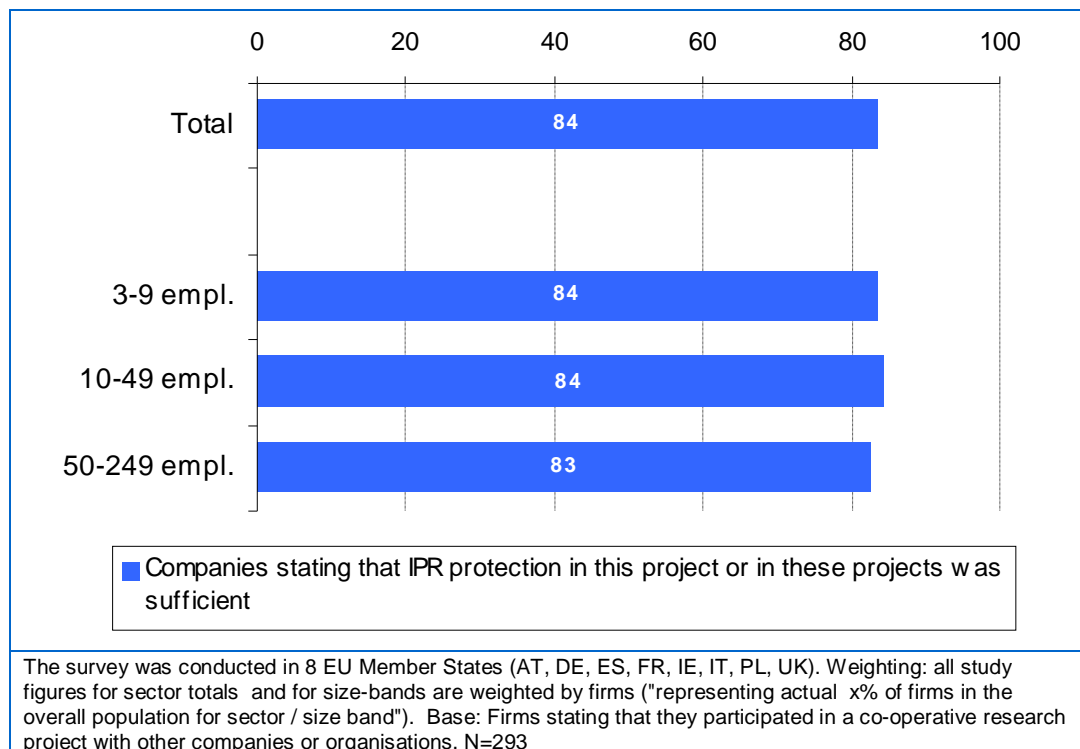
The survey results register that 83% of ICT SMEs observed no violation of their IPR in the past three years; similarly, 87% say they have not been involved in a legal dispute over IPR in the same period. Only 3% of firms have been accused of infringements of other companies' IPR in the last 3 years. According to the opinion of a director of EICTA, a 3% rate of litigation is not very high, since in most cases applying for a patent is

sufficient to achieve a deterrent effect against the competition. Another interesting aspect of IPR strategies is the frequency of use of other firms' IPR. According to our survey, only 18% of ICT SMEs have agreements to use other firms' patents, while 31% have agreements to use third parties' copyrights. There were not many problems in negotiating these agreements, according to over 80% of these firms.

### 3.4.4 IPR protection in cooperative research programmes

Public funding for research is often distributed through pre-competitive, cooperative research initiatives, such as the EU Framework Research Programme. According to the survey results, 40% of ICT SMEs have participated to some cooperative research programme, either regional, national or European. This is actually a high level of participation: in the IDC study on innovative ICT SMEs, only 22% of the sample had done so. A possible explanation is that firms with IPR are also more likely to invest in external research than average SMEs.

**Exhibit 3-26: IP protection in co-operative research (% of ICT SMEs participating to research projects)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

Cooperative research requires sharing prior knowledge, therefore protecting IP is a key aspect of the contracts ruling these projects. The majority of ICT SMEs participating to research programmes (84%) declared that IP protection was sufficient. Of those who didn't participate, 16% said that insufficient IP protection was a barrier against their participation.

The firms interviewed for the case studies have never participated to Research Programmes. Their main motivations not to were the complexity of the application process, the bureaucratic burden, and the long time interval between the demand and the

receipt of funding. A few comments are reported in the table below. Some of them, for example Comsys, participated to national research programs.

**Exhibit 3-27: Opinions regarding the development of IPR in collaborative research projects**

Company	Opinions regarding the development of IPR in collaborative research projects
Eurotech	European research programmes are considered to be too long (with a timeframe incompatible with products life cycle) and time-consuming in administrative tasks: have always been done NOT for strategical, core business technical developments.
Comsys	Comsys never took part in European research programmes as they are considered to be too long and time-consuming in administrative tasks. Comsys participated in several MAGNET projects in Israel (a research program deployed by the Ministry of Trade).
DXO Labs	DxO Labs' patents are a result of strong collaboration with a network of leading academic research centres and key individuals in applied mathematics. DXO, when collaborating with public researchers, is particularly interested to make sure that IP will be owned by the firm.
iMatix	The firm never participated to European research projects: the set-up of processes is too bureaucratic and time-consuming.

Source: e-Business Watch (2007)

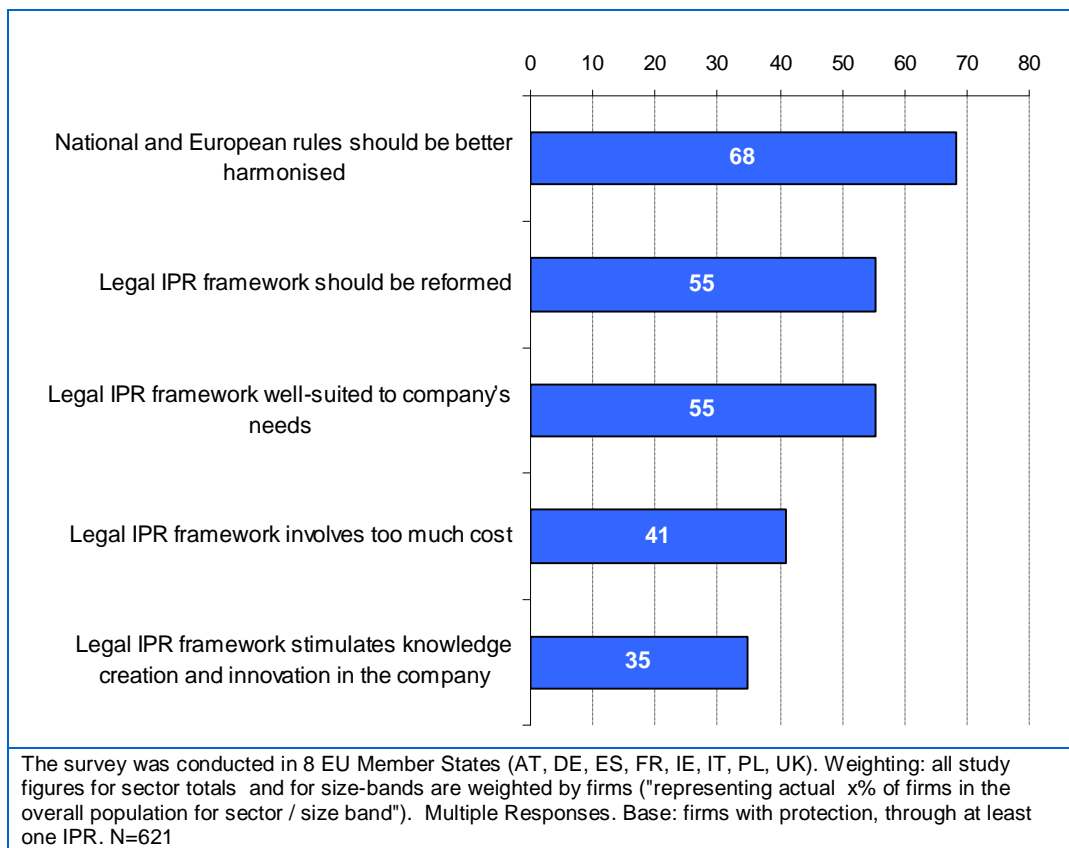
### 3.5 Opinions about the IPR regulatory framework

Existing literature identifies as main barriers preventing SMEs from an effective use of IPR their limited knowledge of the ins and outs of the IP system, lack of understanding of the contribution of IPR to their business strategy, but also a perception of inefficiency of the system (high costs, high complexity, long time to work) especially for patents. Many of these factors depend on the characteristics of the IPR Regulatory Framework. This study investigated these aspects by asking firms to agree or disagree with some main statements about the IPR Regulatory Framework (as shown in the Ex. Below).

Results are interesting. Dissatisfaction with the IPR system in general appears less widespread than expected, especially concerning costs, while most complaints concern the overall efficiency of the system, especially about patents (*see also par.3.3.2 about users satisfaction of the patent system*). ICT SMEs are very pragmatic and their opinions vary depending on their competitive positioning and the relevance of IPR for their business model, with advanced users more demanding in terms of reforms.

The statement that gained the highest agreement level by 68% of ICT SMEs is the need to better harmonize the national and European regulatory frameworks. This general consensus holds, with slight variations, across all size classes, ICT industry segments and even type of users. The demand of greater harmonization is naturally higher by patent users and advanced IPR users, but comes also from users of copyright and other tools, which are quite well harmonized at the EU level. This demand probably refers both to the patent problem and to a request for overall streamlining and reduction of red tape in such a sensitive field.

**Exhibit 3-28: Opinions on the IPR legal framework (% of ICT SMEs who agree)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

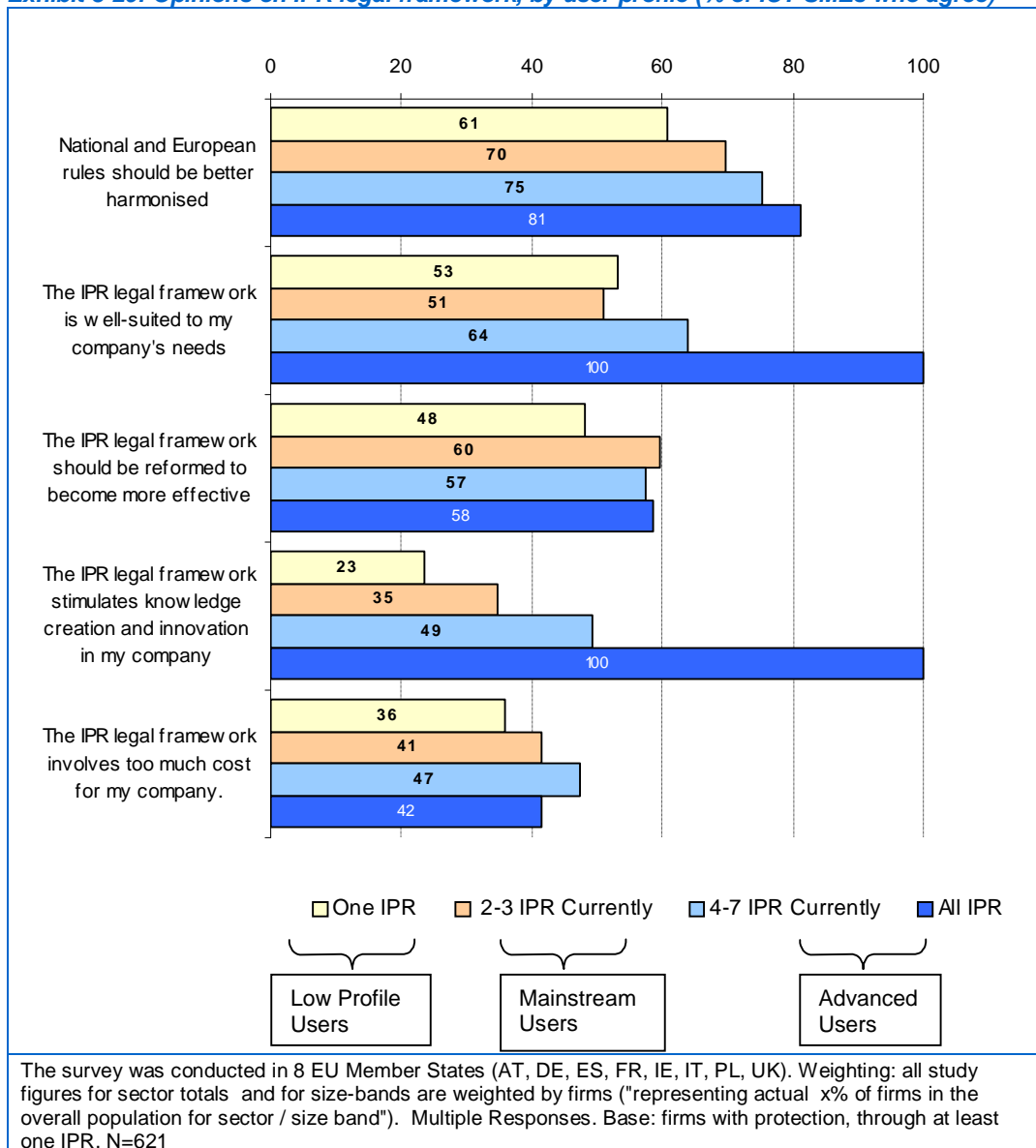
Two other statements gain the agreement of the majority of ICT SMEs (55%), even if they are apparently contradictory: that the legal framework is well-suited to one's company needs, and that the legal system should be reformed to become more effective. First of all, the respondents to these two questions are not all the same firms; about half of those who ask for reform also say that the system is unsuited to their needs. But the other half agree that the system is well suited but still should be reformed to improve its effectiveness. This points to a general call for improvement of the system.

ICT SMEs more satisfied with the suitability of the system are advanced users, while Low profile and Mainstream users are less so. The majority of ICT SMEs who use only informal IPR (CA and DRM) say the system is not well-suited to their needs, which may explain why they don't use formal IPR. Firms with patents are surprisingly more satisfied than others with the suitability of the system. Mainstream users, of which many use copyrights and CA or copyrights and patents, are more likely to ask for a reform of the system.

Complaints about costs of the IPR system are shared by 41% of the ICT SMEs, a sizable minority: this is surprising considering that costs have been traditionally considered the most important barrier against the adoption of IPR. Slightly more Advanced Users complain, rather than Mainstream Users. A more detailed analysis seems to show that patents users and informal IPR users are more likely to complain about costs. Logically, copyright users are much less concerned: but perhaps because they do not engage in enforcement and legal disputes against violations. Finally, only 35% of ICT SMEs agree that the IPR framework stimulates knowledge creation and innovation: again this is

shared by Advanced Users and mostly Patent users.

**Exhibit 3-29: Opinions on IPR legal framework, by user profile (% of ICT SMEs who agree)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

Compared to the analysis by size and type of IPR owned, the segmentation of opinions by ICT sector and class is less significant. Size and sub sector do matter, in general terms, (affecting available resources for example) but do not influence the opinions chosen as much as the profile of use and type of IPR tool. This confirms that IPR strategies and opinions are more closely related with the specific business model chosen by the firm, rather than with structural characteristics like class and sector.

## 3.6 Summary

This chapter describes the profile and characteristics of European ICT SMEs using formal and/or informal IPR, on the basis of a representative sample of IPR users (89% of the sample) and non users (7% + 4% who plan to adopt IPR but do not have them currently). Main considerations are:

- The majority of ICT SMEs use informal IPR (confidentiality agreements, 69%), while copyright is used by 41%, trademarks by 31% and Patents by 25%. Most firms have a varied IPR portfolio.
- The IPR portfolio tends to grow with the size of the firm. The study identified three main typologies of users (*ex.3.10*):
  - **Low Profile Users (29%)** with only one type of IPR, usually informal;
  - **Mainstream IPR Users (36%)**, the relative majority of ICT SMEs, use 2 or 3 different IPR tools. They are more present in the Software and ICT services industries and copyright is the cornerstone of their IPR strategy.
  - **Advanced IPR Users (23%)** of ICT SMEs: they use the full range of IPR, both formal and informal, with a portfolio of 4 to 7 different IPR tools. These firms most frequently use copyright, patents, Confidentiality Agreements and DRM.
- The majority of non users (72%) say they do not need IPR; only a third blame high costs (29%). They do not seem very concerned with other aspects such as lack of knowledge or non-suitability of the regulatory system;
- ICT SMEs adopt formal IPR to exploit innovation (in order to launch new products and services) and to gain access to funding. Blocking competitors is the least mentioned goal. Many ICT SMEs have progressed in the learning curve of IPR, described by literature, beyond the first stage, which is the purely defensive strategy.
- The majority of patent holders are not satisfied with the efficiency of the patent system (time, costs, complexity) but believe that the system does respond to their needs and is relevant for their innovation strategies.
- Management practices are not very sophisticated. Most companies assign IPR responsibility to general management, or R&D and technical management; only a few ICT SMEs have a dedicated IPR department or manager (the largest percentage is 10% of ICT SMEs between 50 and 250 employees). About a third of firms use external support services, usually legal experts. Advanced users are more likely to use specialised external support. The others probably feel the need less.
- The large majority of ICT SMEs claim to spend less than 1% of their annual turnover, or between 1 and 5%, for obtaining and maintaining IPR. This pattern does not present significant variations by sector or size class. Only in the software industry there is a slightly higher expenditure level.
- Most ICT SMEs observed no violation of their IPR on the past three years and have not been involved in legal disputes. There is little interest in pursuing violations.
- ICT SMEs ask for greater harmonization between national and European legal frameworks (68%) and for reform of the system to improve its effectiveness (55%). The demand of greater harmonization by patent users and advanced IPR users is



naturally higher, but comes also from users of copyright and other tools, which are quite well harmonized at the EU level.

- At the same time 55% of ICT SMEs say the regulatory framework is suited to their needs. This apparent contradiction probably reflects a demand not for a general overhaul of the system, but for streamlining and improvement.
- The majority of ICT SMEs who use only informal IPR (CA and DRM) say the system is not well-suited to their needs, which may explain why they don't use formal IPR

In conclusion, many ICT SMEs have IPR portfolios, more articulated than normally expected from SMEs, and use them for innovation and access to funding. However, only a minority can be defined Advanced IPR Users. The large majority do not have specialised IPR management, spend very little for IPR and are not much interested in pursuing IPR violations (some for lack of effort and some for choice, see the OSS community). The profile of ICT SMEs as IPR users is more differentiated by their business models and competitive positioning, which directly affects their IPR choices, than by structural aspects such as sector and size. Sector and size (especially size) matter, but the business model drives the IPR strategy.

## 4 IPR, business strategies and competitiveness

### 4.1 Overview

After analysing the way in which ICT SMEs use IPR, it is now possible to look closely at the role of IPR in ICT SMEs business strategies and their impact on competitiveness.

Competitiveness in the ICT industry is closely related with innovation, and IPR are an essential tool of innovation strategies. To keep up with the fast-evolving ICT competitive scenery, European ICT SMEs need to develop original knowledge, to protect it and to bring it to the market as fast as possible. They must cooperate and compete in global value chains, exploiting their know-how and defending themselves from piracy and counterfeiting. A recent IDC study<sup>39</sup> of these firms, based on a survey, estimated that innovative ICT SMEs, who are successfully meeting these challenges in the EU 25, are approximately 300,000, that is about 41% of the universe (which was the same of this study). These ICT SMEs show a positive correlation between intensity of R&D, innovation and economic performance, measured as turnover and profitability growth. Most of these SMEs define themselves as Continuous rather than Occasional Innovators, managing a continuous innovation process, a typology identified by OECD. The IDC study found a correlation between ownership of patents and innovation performance (*see also par.3.1*), but did not investigate in depth their IPR strategies. That study pointed out that successful ICT SMEs are more engaged in high profile innovation strategies than in the past: since IPR are useful when a firm produces original knowledge and innovation, this explains well why IPR portfolios are of rising importance for ICT SMEs competitiveness.

This was confirmed by our survey, since the majority of ICT SMEs declare that IPR are important for their business model, with 34% declaring it as very important (*ex.4.1.*).

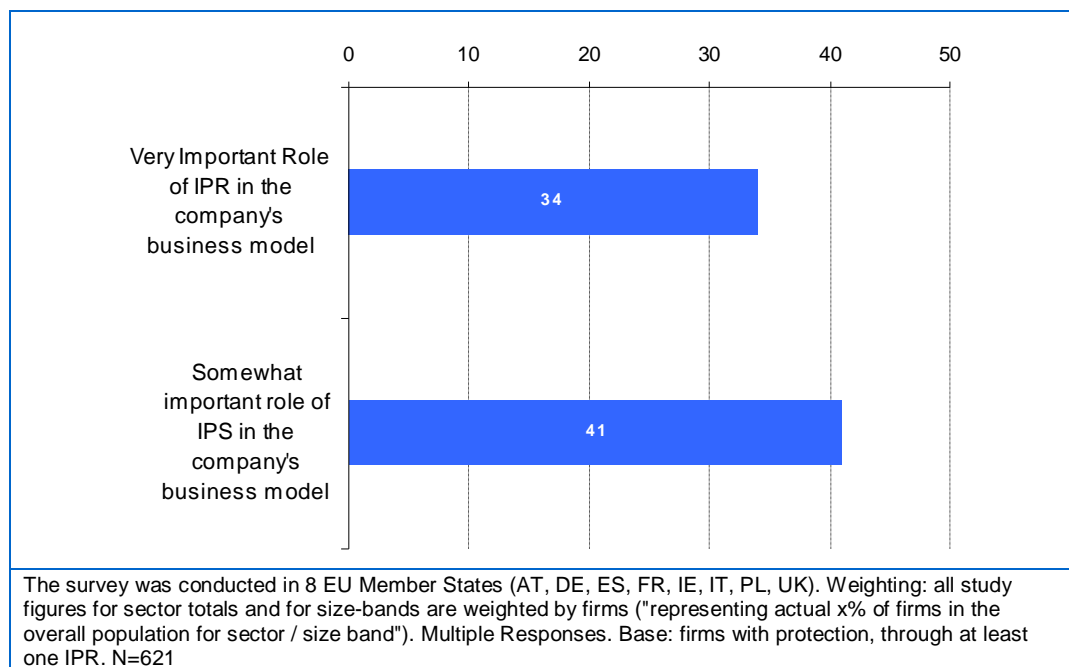
More specifically, the ICT Taskforce workgroup on IPR and competitiveness identifies the following ways in which IPR affect ICT SMEs competitiveness:

- IP protection enables SMEs to attract investment capital and to access finance, to the point that some start-ups adopt business models with patents as their core assets;
- Small innovative firms are far more dependent than large ones on the income derived from technology licenses, to fuel ongoing innovative work;
- Protecting original knowledge through IPR reinforces competitiveness against larger rivals, when cooperating in manufacturing networks, extended value chains, or for example cooperative research programmes;
- IPR tools like trademarks and registered design help to build corporate identity through branding.

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<sup>39</sup> “Study on Innovative ICT SMEs in Europe” October 2007, IDC EMEA for DGINFSO – Unit C2 - Strategy for ICT Research and Development.

**Exhibit 4-1 : ICT SMEs opinion on the role of IPR in their business model (% of ICT SMEs on total)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

Given this context, this chapter analyses the role of IPR in business strategies as follows:

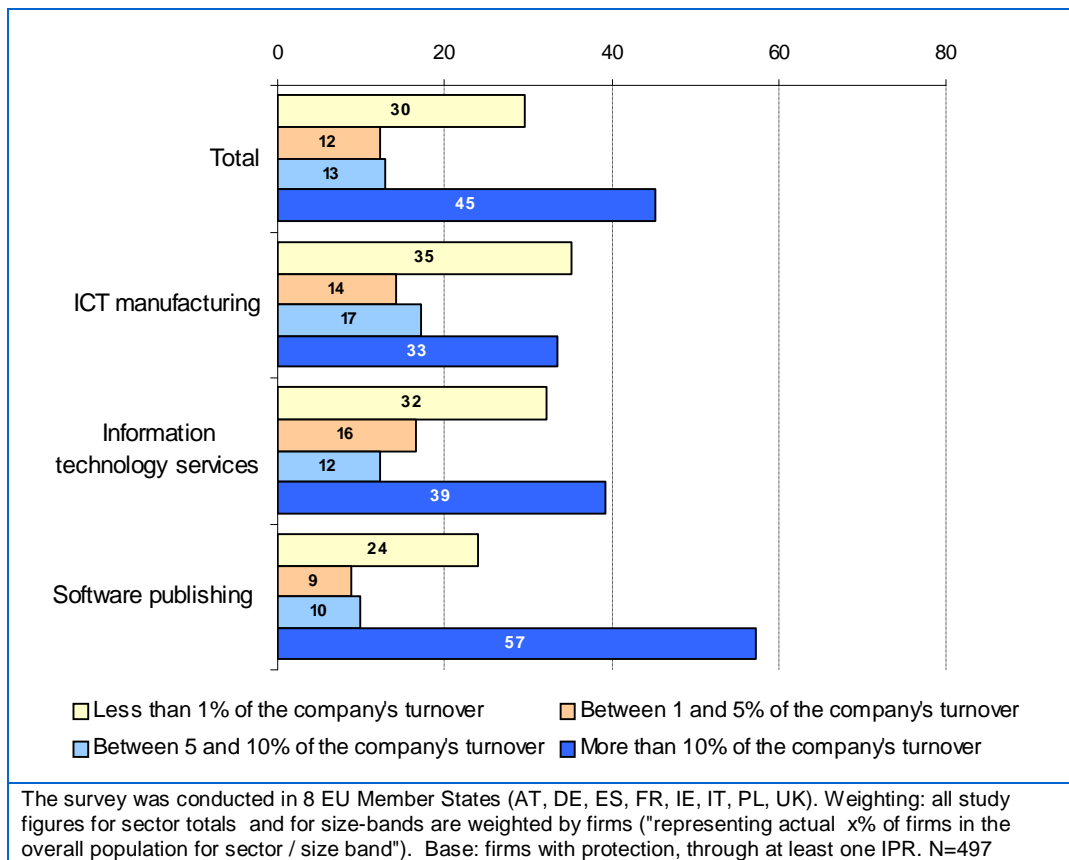
- Analysis of the link between IPR and revenues, based on the survey data;
- Analysis of the link between IPR and business development (including turnover, market share and employment growth), based on the survey data;
- Analysis of the main IP-based business models in the ICT industry, and the impact of IPR on competitiveness and business strategies (based on desk research and the case studies)
- Specific analysis of ICT SMEs active in the Open Source Software business model.

## 4.2 IPR and ICT SMEs economic performance

### 4.2.1 IPR and revenues

The main use of IPR, as indicated in the previous chapter, is to protect innovative products and services. An objective way to analyse the impact of IPR on business development is to measure the share of revenues, coming from products and services protected with IPR.

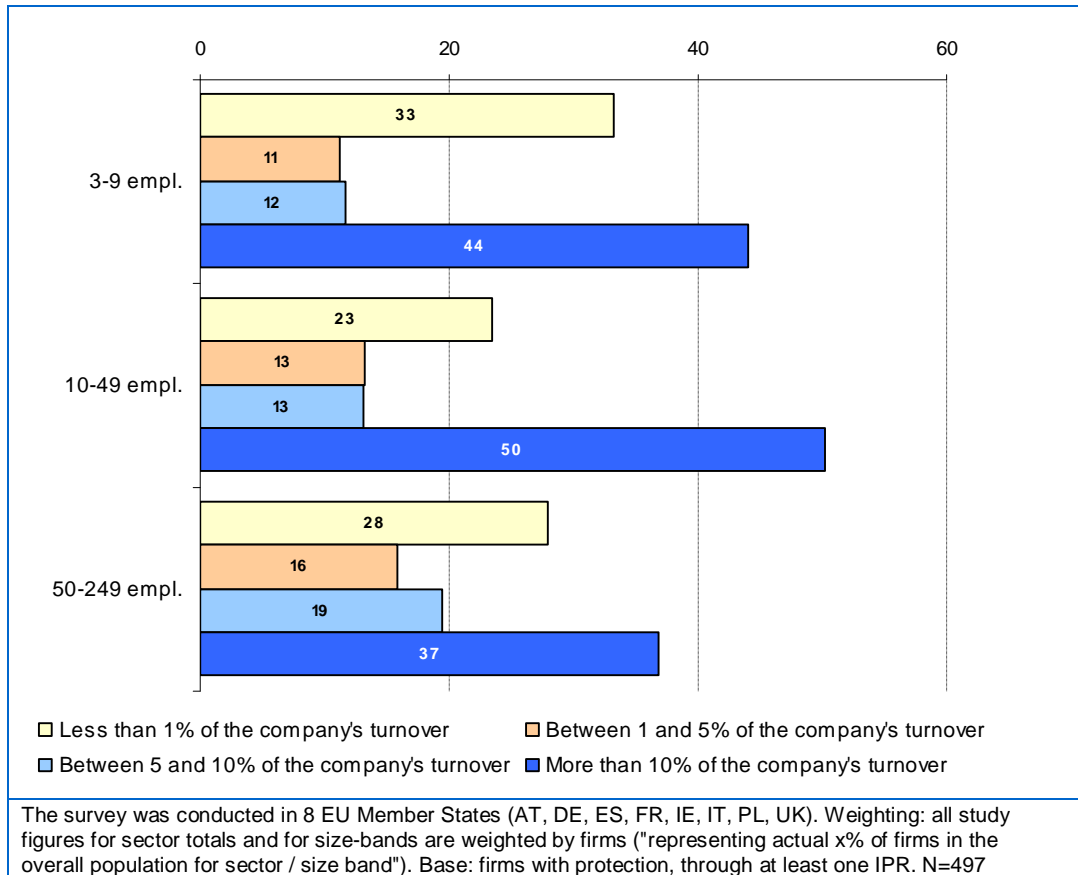
**Exhibit 4-2: Distribution of ICT SMEs by sector and level of revenues from protected products, services or processes - in the past financial year (% of ICT SMEs)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

According to the study survey, ICT SMEs are split in two main groups: for 45% of firms these revenues are more than 10% of turnover in the past financial year, while for 30% of them they are less than 1%. In other words, in the first group IPR are quite relevant, while in the second group they are insignificant. For the other ICT SMEs, these revenues vary between 1% and 10% of turnover and can be defined of marginal relevance.

**Exhibit 4-3: Distribution of ICT SMEs by size and level of revenues from protected products, services or processes - in the past financial year (% of ICT SMEs)**

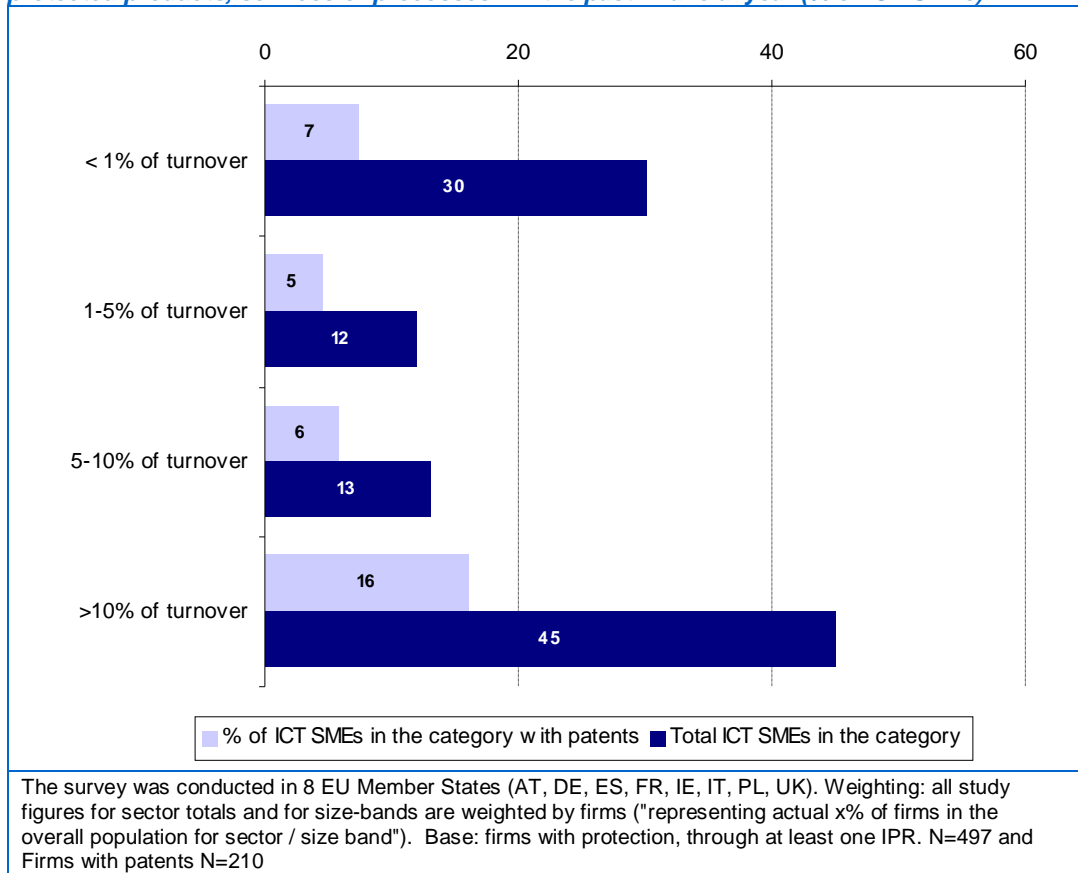


Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

ICT SMEs with higher revenues from protected products and services are more present in the Software sector than in ICT manufacturing and services (probably because these revenues come from software protected by copyright). There is a positive correlation with size (they are more present in the larger size class).

Revenues from protected products should be relevant especially for firms with patents. Considering that ICT SMEs with patents are 25% of total, more than half (16% on the total sample) fall into the group with higher revenues from protected products. But there is also 7% of them where these revenues are less than 1%: perhaps they use their patents in a defensive way rather than to increase their revenues.

**Exhibit 4-4: Distribution of ICT SMEs by ownership of patents and level of revenues from protected products, services or processes - in the past financial year (% of ICT SMEs)**



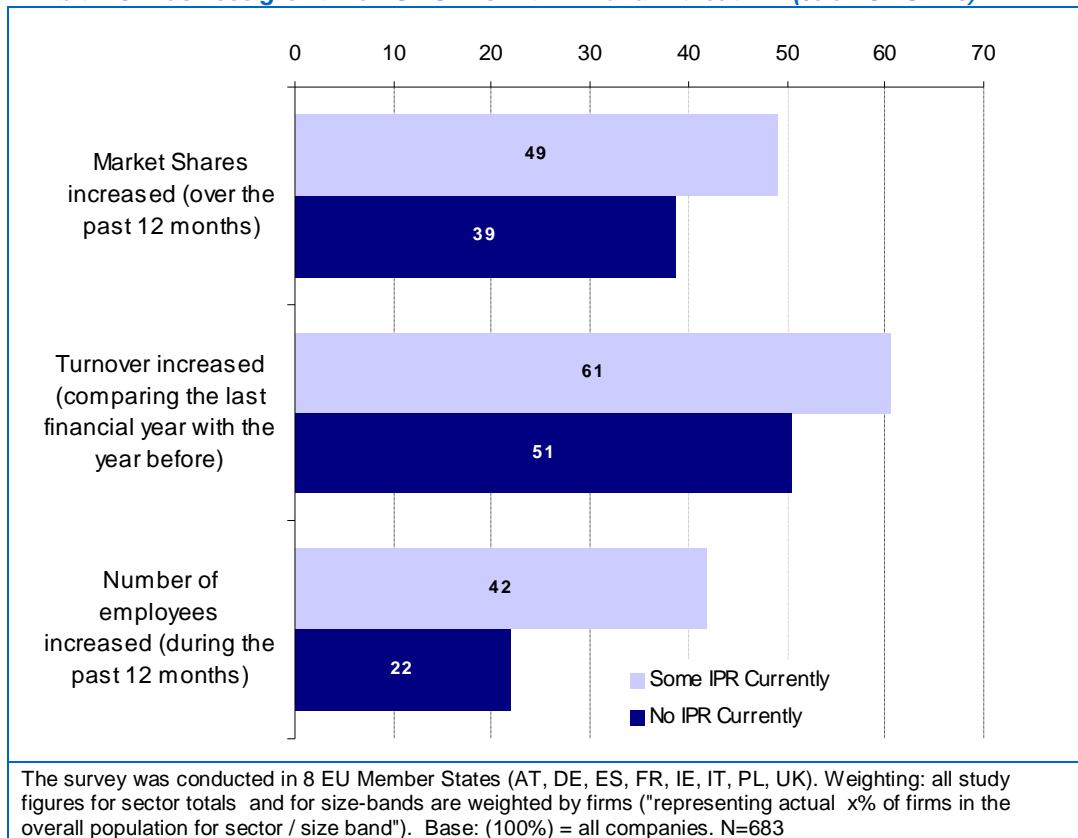
Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

#### 4.2.2 IPR, turnover and market share growth

It is extremely difficult to establish a causal link between the use or IPR and profitability/revenues growth dynamics. Even the ICT SMEs interviewed for the case studies, for whom IPR are a cornerstone of their business model, were not able to define a direct quantitative impact. But it is possible to investigate the correlation between IPR and business growth. The survey analysed the link between the size of IPR portfolio and three main parameters of business performance: turnover, market share and employment growth. Since the level of growth is self-declared by interviewees, it was decided not to ask about profits, which are even more subjective and difficult to compare than turnover.

According to the study survey, there is definitely a correlation between the ownership of some IPR and business performance. As shown in exhibit 4.5, 49% of ICT SMEs with IPR increased their market share, while only 39% of those without IPR did. Similarly, 61% of firms with IPR saw their turnover increase in the last year, while only 51% of those without IPR did. And finally, the share of ICT SMEs with IPR who increased their employees is twice as high as the share of firms without IPR who also increased employment (42% vs 22%).

**Exhibit 4-5: Business growth for ICT SMEs with IPR and without IPR (% of ICT SMEs)**



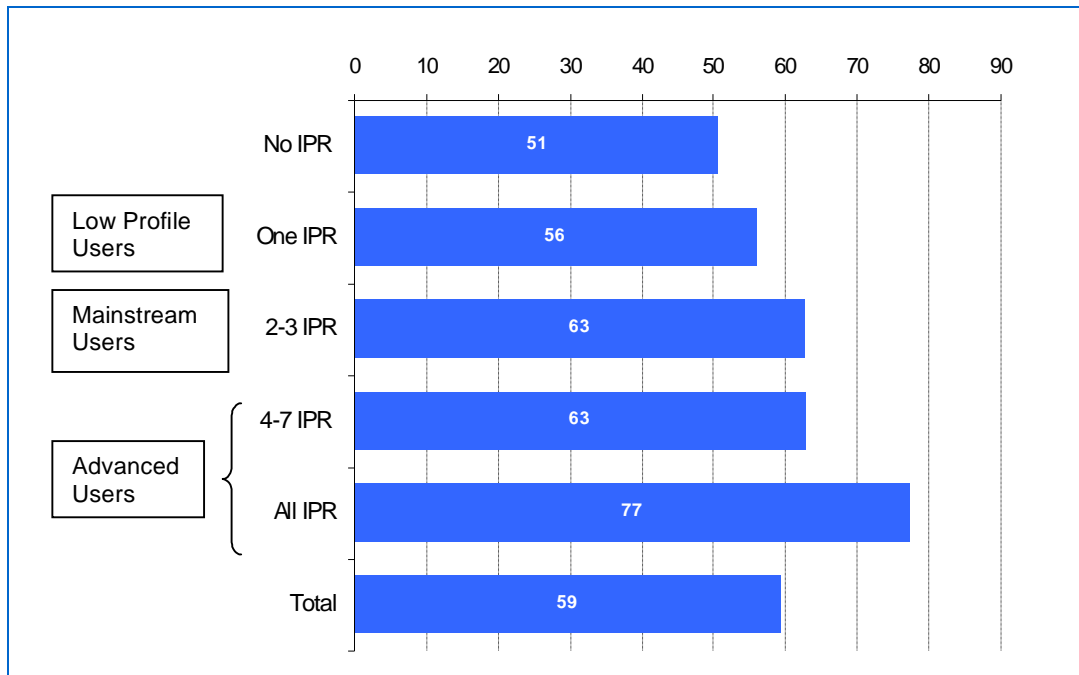
Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

More important, the share of enterprises with turnover growth in the last year is positively correlated with the size of IPR portfolio (ex. 4.5). 56% of Low Profile IPR users (with only one IPR) have seen their turnover increase, while 63% of Mainstream and Advanced Users did, and 77% of very advanced users with all IPR types in their portfolio. From the point of view of the composition of the IPR portfolio (ex.4.6), firms with patents are more likely to grow, while firms with informal IPR are even less likely to grow than firms without IPR.

The share of ICT SMEs with market share increase is also constantly higher for those with IPR compared to those without IPR (ex.4.7) for all sectors and size classes. A similar correlation can be seen for SMEs declaring employment growth (ex 4.8).



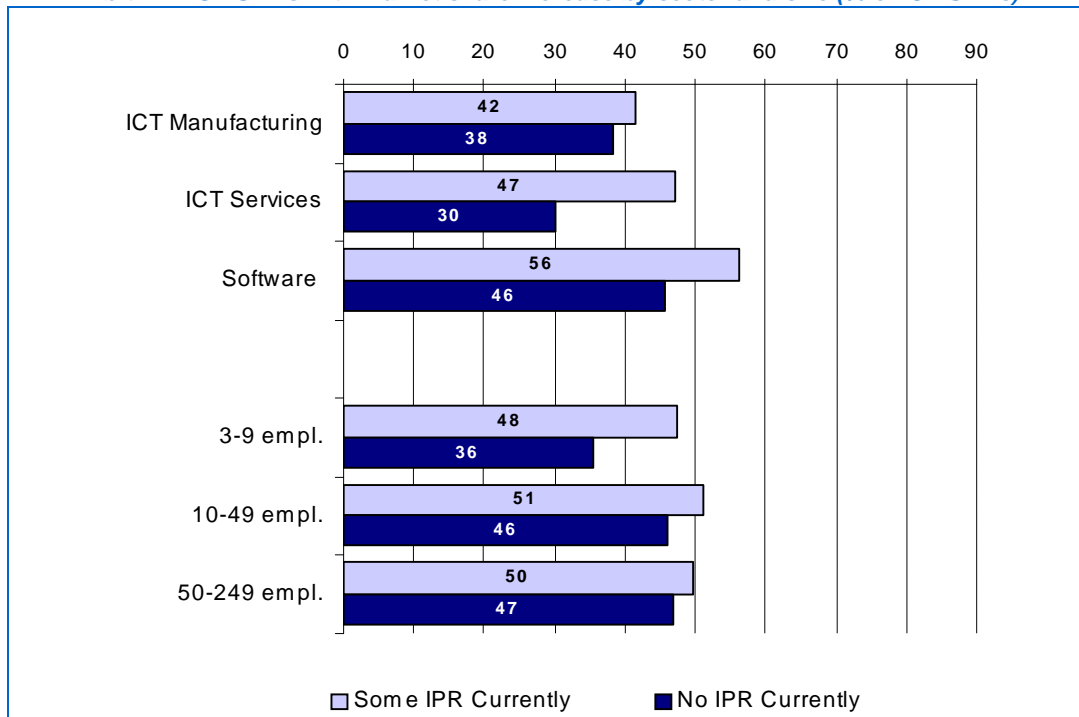
**Exhibit 4-6: ICT SMEs with turnover increase by size of IPR portfolio (% of ICT SMEs)**



The survey was conducted in 8 EU Member States (AT, DE, ES, FR, IE, IT, PL, UK). Weighting: all study figures for sector totals and for size-bands are weighted by firms ("representing actual % of firms in the overall population for sector / size band"). Base: (100%) = all companies. N=683

Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

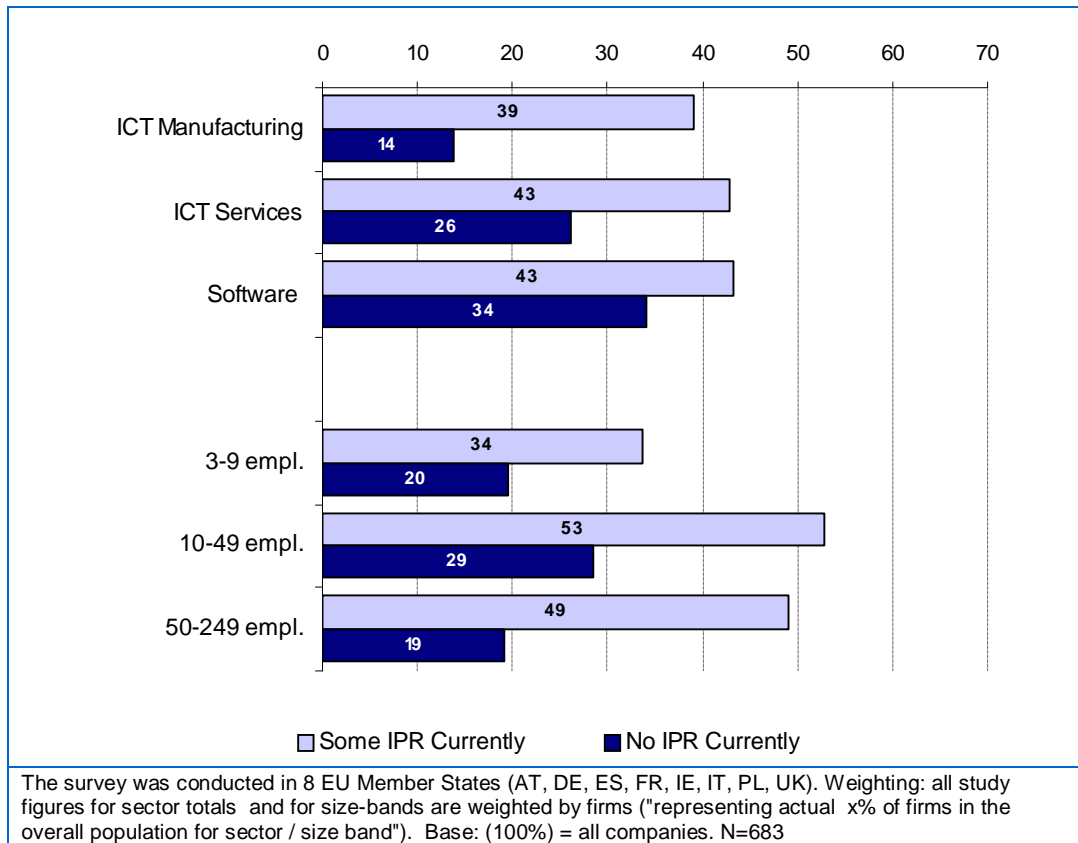
**Exhibit 4-7: ICT SMEs with market share increase by sector and size (% of ICT SMEs)**



The survey was conducted in 8 EU Member States (AT, DE, ES, FR, IE, IT, PL, UK). Weighting: all study figures for sector totals and for size-bands are weighted by firms ("representing actual % of firms in the overall population for sector / size band"). Base: (100%) = all companies. N=683

Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

**Exhibit 4-8: ICT SMEs with employment increase by sector and size (% of ICT SMEs)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

### 4.3 IP-based business models in the ICT industry

#### 4.3.1 Main typologies of business models

The evolution of the value chain in the ICT industry is leading to increasing specialization of the different actors, with knowledge-intensive tasks such as R&D and design increasingly outsourced to dedicated firms, within complex global networks (see also par.2.5.1). This creates the opportunity for newly emerging business models based on the creation and exploitation of IPR, essentially new market niches. They can be divided between "pure" IP-based business models, where IP is the most important, if not the only, source of revenues, and other innovation models, where ICT SMEs use IPR to participate in supply chain networks. We provide here a brief description of these main typologies of these business models and then a description of how our case studies fit into these typologies.

#### Start-ups based on IPR

University spin-offs and high-tech start ups are often built upon original IPR as their core competitive asset. A recent study by the European Commission, "The value of Patents for today's economy and society", has demonstrated that many European start-ups adopt business models that use patents as core assets. Such enterprises generally have limited capital and tangible assets and largely depend on intangible assets to succeed in the

marketplace. The innovative idea is usually the main asset of the company during its start-up phase and the basis on which it will seek investors to take the product or service to market. For technology-based entrepreneurs and start-ups it is critical to find ways of appropriating their innovative ideas, products and processes in order to survive in the marketplace, obtain a competitive edge and have a credible business plan to present to investors (WIPO, 2003).

### IP-based new technology based firms

For a vast number of SMEs operating in the ICT sector, royalty revenues from the licensing of their copyrighted works (i.e. in the software sector) is generally the main or only source of income. The existence of a well-functioning copyright and related rights system is crucial for their survival. But there are also other firms of this kind, who do not engage in manufacturing (“fables” firms without factories, for example in the embedded components market) and rely on patents licensing to build their revenues.

### Open innovation models

Some SMEs in the ICT sector choose to adopt open models of innovation, in which they increasingly rely on external sources of knowledge and technology to complement their internal innovation capabilities (Chesbrough, 2003; OECD, 2002). Such a model of innovation management entails more collaborative research and greater in-sourcing of technology from other innovating organisations, often through technology licences. In the ICT sector, innovation requires extensive and costly R&D, so the structure of R&D needs to be adapted to generate additional income to fund it. This requires more openness at each stage of the innovation process: patenting in the early research phase, university collaborations and complementary technology in-sourcing during R&D phases, licensing out, spinning off, transferring non-core technologies and building alliances in the business development phase (Kamiyana et al., 2006).

### Innovation based on cooperation

When participating to innovation networks or economic value chains, many small firms choose to co-operate with established firms to gain access to complementary assets as downstream manufacturing and distribution facilities. In such cases, patents can be an effective mechanism for technology transfer, allowing the small firm to profit from royalty streams generated by the sales of products and services offered by business partners.

### Case studies and IP-based business models

The case studies were selected among firms with proactive IPR strategies, that is generating IPR themselves. They do not correspond “exactly” to the literature definition of the business models (reality is never as coherent as literature) but they correspond sufficiently to be classified into the different typologies, as indicated in the table below. This will allow to investigate the impact of IPR in the different typologies of business models, based on the case studies experiences.

In our opinion, the Open Source Software business model is a subgroup of the “open innovation” model, because the firms draw their revenues from protected products (copyright) and operate in open networks sharing innovation development.

**Exhibit 4-9: ICT SMEs Case studies by typology of business model**

IPR-based Start-Up	IP-based NTBF	Open Innovation/ OSS	Innovation based on cooperation
Sensitive Objects	Array Technologies	Fluendo	Eurotech
	Comsys	IMatix	Net Insights
	DXO Labs		Vierling

Source: e-Business Watch 2008

### 4.3.2 IPR-based start up

Sensitive Objects is a good example of an IPR-based start up business model. It was created in 2003 as a spin-off of the Wave and Acoustic Laboratory of the French Science National Research Center (CNRS), to bring to the market a break-through technology in the field of man-machine interfaces.

**Exhibit 4-10: Case study sensitive objects: key aspects of business model**

Company Name	Sensitive Objects
<b>Core Business</b>	University spin-off Development, manufacture and sale of human-machine interfaces (HMI) as part of physical objects (i.e. solid state or virtual keyboards)
<b>No. of empl.</b>	26
<b>Relevance of R&amp;D*</b>	Very High
<b>IPR Portfolio</b>	9 Patent Applications, trademarks
<b>IPR Strategy</b>	IPR ensure a return for investors and provide security in using the products.
<b>IPR Impact</b>	IPR as assets. The patents portfolio allowed to receive venture capital and remains a key component of the core value of the company
<b>IPR Issues</b>	Long waiting time after filing patents applications

(\* R&D costs less than 10% of total revenues: Low. From 10% to 20% of revenues: Medium. From 20% to 30% of revenues: High. More than 30%: Very High)

Source: Business Watch (2007)

Sensitive Objects used patents applications to gain funding from venture capital. The patents portfolio is defined as a key component of the value of the company, a core asset. Revenues were 1 million in 2007 but should go up quickly to several millions in the next years. Sensitive Objects is an American-style start-up, planning to grow fast, bringing to the market its technology and including production, not only development, in its activities. They are registering patents in all main international markets.

In this case, all revenues will be from IPR-protected products, while direct revenues from IPR (such as licenses) are not particularly important. Therefore the impact of IPR on the bottom line is actually indirect, while being critical. Sensitive Objects has few direct complaints about the patent system, save the long waiting time to process applications.

### 4.3.3 IP-based business models of new-technology based firms

There are three different examples of NTBF in our case studies: for all of them IPR are the main source of revenues, with a strong reliance on patents, and without production facilities. They are also known as “pure-play IP” actors. But their competitive positioning is quite different.

**Exhibit 4-11 : Case studies Array Technologies, Comsys, DXO Labs: key aspects of business model**

Company Name	Comsys	DXO Labs	Array Technologies
<b>Core Business</b>	Design and license of IP-protected digital baseband solutions for electronic components for GSM/EDGE, UMTS and Mobile WiMAX networks	Development and licensing of Intellectual Property (software IP and silicon IP for embedded architectures) for the digital imaging chain	Design and sale of patented software technology based on array logic
<b>No. of empl.</b>	90	100	8
<b>Relevance of R&amp;D*</b>	Very High	Very High	Very High
<b>IPR Portfolio</b>	30 Patents	20 Patent families, trademarks, secrecy, confidentiality agreements	1 Patent Family, trademarks, copyrights, secrecy

\* R&D costs less than 10% of total revenues: Low. From 10% to 20% of revenues: Medium. From 20% to 30% of revenues: High. More than 30%: Very High)

Source: e-Business Watch (2008)

Array Technology (ex. 4-11) for example is tiny: it started like an IPR-based start-up, but has been around since 1996. They are focused on a very specific technology (array-based) which is a base component of many other software applications. With 1 million euro of revenues, slowly growing, AT business model focuses on high-level innovation for a small market niche.

Comsys and DXO Labs (ex. 4-11) instead address larger markets (wireless networks and the multimedia market respectively), with larger patents families. Comsys is similar to many NTBF based in Israel, who often end up being bought and incorporated by a large firm. Comsys is based on a virtuous high technology development cycle based on high research investments. DxO, a French company, has a similar model. 90% of its staff is engaged in research, and the firm has developed strong collaborations with a network of leading academic research centers and key individuals in applied mathematics.

These firms are typical of the new evolution of the semiconductor industry. Today, up to 60% of a designed SOC (System-on-a-chip, all components of a computer or other electronic system into a single integrated circuit or chip) is said to consist of purchased IP<sup>40</sup>. This means that SOC design process is evolving towards a model similar to software, characterized by independent developers, small firms, a lot of IP reuse, IP repositories and libraries and specialized SOC design environments and tools.

The prevalent business model in this field is based on a combination of license fees and

<sup>40</sup> See <http://www.electronicweekly.com>.

royalties (on production) paid to the designers of the technology. But there are also other emerging schemes, such as the subscription model (practiced by firms such as Synopsys), where the customer use the IP freely, as long as they have subscribed to the license; or the foundry subsidized model, typically practiced by the foundries, who will provide certain IP to their customers, as long as they then use their production facilities.

**Exhibit 4-12 : Case studies Array Technologies, Comsys, DXO Labs: key aspects of IPR strategies**

Name	Comsys	DXO Labs	Array Technologies
<b>IPR Strategy</b>	The IP development itself is the core business of the company. Continuous IPR development is a natural consequence of the growth of the company into new markets and with new product lines	Patents are a way to protect the technology that could be copied by competitors or customers (as large manufacturers of digital cameras). Also, serve to put the company in a stronger position: increase value, image, and possibly sell the products.	To have a strong protection of a technology that is embedded in other software products or used by large corporations.
<b>IPR Impact</b>	Patents as the key asset, IP the main source of revenues, fabless model	IPR is the main source of revenues	Patented Technology is the main source of revenues (80% the total), with services at 20%
<b>IPR Issues</b>	The cost of patents is growing; Comsys estimates the cost of one patent registration in \$40-50K each/country. Up to date Comsys spent close to \$1M on IPR procedures alone	High cost for patenting: not only to award and maintain a patent, but especially for the official translation in other languages. A single European patent would be recommended. Also, DXO apply for patents only in fields where it can detect eventual infringements	A pan-European patent should be granted, and costs for applying abroad, also out of Europe, should be reduced

Source: e-Business Watch (2007)

The best known example of this IP-based business model in the semiconductor arena is ARM, a Cambridge-based, high-tech company (with 1,659 employees at the end of 2006 and revenues totalling 483,6 million dollars). ARM licenses its IP to a network of 'Partners', semiconductor and system companies who use the company's IP in a wide variety of applications, ranging from mobile handsets and digital set top boxes to car braking systems and network routers. These Partners utilize ARM's IP designs to create and manufacture microprocessors, peripherals and system on-chip designs, paying ARM a license fee for the original IP and a royalty on every chip or wafer produced. In order to maximise the range of users of ARM products, the company provides also a range of tools, software and systems IP to facilitate adoption and incorporation. According to the specialised press "ARM's technology is not overly reliant on any single customer, and although the chip market is cyclical, with more and more household goods going digital

*the future looks bright for ARM*.<sup>41</sup>

But pure-play IP providers, at least in the semiconductor industry, suffer from economies of scale problems. These firms normally have limited budgets for research investments, while customers are asking for more and more complex Integrated Circuits: only those with the capacity of meeting up-front costs for the needed IP, shouldering considerable risks, will remain. At the moment it seems that there will be increasing consolidation between IP firms (one example is the acquisition of Artisan by ARM) as many IP vendors are losing money<sup>42</sup>.

In conclusion, pure-play IP business models are inherently exposed to high risks, because of the need to keep investing in R&D and remain one step ahead of the competition in technological innovation. In addition, they must invest in the management and enforcement of their IPR portfolio.

From the point of view of the regulatory framework, these firms are mainly concerned with the patent system, and criticize the high costs and time needed to register patents, rather than its overall organization.

#### 4.3.4 The case of patent trolls

A specific case of IP-based business model concerns patent licensing and enforcement companies (PLECs — or 'trolls' to their detractors). They play a role similar to TTOs, but in the private sector, as they seek to find and realize the potential value of under-utilized IP assets. For some of these organizations, fees from licensing are the only source of income. Supporters of patent trolls underline that such companies increase the liquidity of IPR, by providing a ready market for patents unexploited by their inventors. Furthermore, these firms may facilitate legal access to IP, by pooling (licensing, aggregating) patents governing a certain technology from different origins/inventors. Finally, by activating "sleeping" patents, PLECs increase the incentives and rewards for inventors and therefore contribute to innovation development.

By contrast, critics point out that patent trolls raise the level of royalties and licences due by a manufacturer or supplier. This increases production costs, both because of more intensive monitoring of patents databases (to avoid infringements) and of higher due payments. All in all, patent trolls can be highly successful on their own and improve the functionality of the innovation market. But they are much more inclined than other firms to start litigations, or other legal actions, to protect their IP-based revenues, so they may be a potential threat to other companies, especially when they find and resurrect older patents.

One such example is IP Innovation, a firm who filed a lawsuit in October 2007 against RSA and Novell, for violating three patents related with windowing user interfaces. The same firm previously started a lawsuit against Apple for selling OS X with "workspaces provided by an object-based user interface that appear to share windows and other display object" (the patent in question dates back to 1984 via references in a 1991 filing by Xerox, which actually linked to GUI concepts drafted in the 1970s on the company's

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<sup>41</sup> Source: [www.arm.com](http://www.arm.com), <http://www.independent.co.uk/> (The Investment Column: ARM survives and prospers in 'chips with everything' age ) Edited by Andrew Dewson , Published: 27 April 2007.

<sup>42</sup> See "Semi IP sector is a lost cause", by Mark LaPedus 08/02/2007 <http://www.eetimes.com>.



Alto workstations). This is an attempt to leverage formal protection, assigned to a concept (the windows interface) which has been for a long while a market standard. Since it is not even the original inventor who is trying to profit from this litigation, it is difficult to see how this behaviour may contribute to the better functioning of the market or to innovation development. Patent trolls have the potential to influence negatively the IP market balance.

#### 4.3.5 Cooperative innovation models

Three of our case studies, Eurotech, Net Insights and Vierling, are ICT manufacturing firms, quite large and rapidly growing (actually Eurotech recently outgrew the 250 employees mark and is no longer, properly speaking, an SME). They have rich IPR portfolios and IPR is central to their business models. They fall into the cooperative innovation business model, since they play an important role in the globalized supply chains of the ICT market, as specialised sub-suppliers of major vendors and suppliers.

Their positioning (*ex.4.13*) is an evolution of the traditional “specialised SME sub-supplier” role, adapted to the greater need for fast technological innovation and higher R&D intensity. Compared to the past, though, they are much less involved in direct production. Two of them (Net Insights and Vierling) outsource production, and even Eurotech is gradually outsourcing production to lower cost countries. They are global niche leaders; they focus on technological development and oversee closely their production partners, so that the quality of their products is up to the needed standards. By raising the level of value added of their products, through research and innovation, these ICT SMEs are successfully defending their competitiveness.

As shown by the following table (*ex.4-13*), all three SMEs have a rich IPR portfolio, carefully managed, with many patents. Compared to IP-Pure Players business models, who gain their revenues directly from sales of IP, these firms earn also part of their revenues from IP-protected products and services. The main goal of their IPR strategies is to protect their R&D investments and maintain the competitive advantage of the results of their innovation. They all consider IPR as a valuable asset, and they are getting to the point where they can use their portfolio as a tool to trade IPR in international alliances and business networks. It is clear that IPR trading, such as cross licensing, has a dimension threshold, and most SMEs are too small to have the resources, the skills and the willingness to play this game, even if it provides good returns and competitive advantages.

All these firms complain about the high costs and the inefficiencies of the patent system. The less-satisfied firm, Net Insight, is also the smaller one, which may affect its ability to invest in IPR and achieve returns (such as the cross-licensing deals). But Net-Insights has also moved to a business strategy based on open standards: this seems to create some conflicts with the strategy to develop and protect proprietary intellectual property. The company says that using patents is now a constraint rather than an opportunity, and that it has had difficulties in achieving patents because of the similarity of its work to that of some competitors. This could be interpreted to say that if a firm is at the cutting edge of innovation, patents are the best tool to protect IP: when a firm is focused on interoperability, by necessity it cannot diverge too much from other technologies, and this makes it more difficult to claim for patents for its innovations. At the same time the firm cannot stop investing in research. So perhaps patents are not well suited when a firm

must stay only half a step in front of competition (something which is well known and much debated in the software industry).

**Exhibit 4-13: Case studies Eurotech, Net Insight and Vierling: key aspects of the business model**

Company Name	Eurotech	Net Insight	Vierling
<b>Core Business</b>	Production of embedded computing components and customized solutions. Increased outsourcing of production	Global producers of IP TV appliances, with a core business in R&D, and an outsourced model for production	Development and production of measurement devices for the TLC industry. Custom development and outsourced production
<b>N. of empl.</b>	286	80	230
<b>R&amp;D*</b>	High	Very High	Medium
<b>IPR Portfolio</b>	15 Patents, registered design, trademarks	25 Patents families, trademarks, security measures to protect Know-how	7 active patents plus 22 filed and pending patents, 4 trademarks, copyrights and trade secret
<b>IPR Strategy</b>	To raise an entrance barrier against competition and to differentiate products. To respond to the risk of being sued by competitors for patents infringement (i.e. being in the position to set cross-licensing agreements)	At the beginning, patents were valuable in accessing finance. Now IPR as a necessity for protection against litigation and assets to use for cross-licensing. Focus on open standards.	To keep a competitive advantage, protecting R&D investments against competitors. To use IPR in marketing proving Vierling's innovative potential and the company's image
<b>IPR Impact</b>	Patents give a competitive advantage in the commercialization of products in very competitive international markets and permit the firm to outsource its production activity	IPR are valuable assets	IPR are not licensed out so that there is no direct revenue stream. They are used to prove the technological value of the company
<b>IPR Issues</b>	Growing costs of the patents portfolio	Costs for patents are too high and using patents more of a constraint	High costs, and management resources needed

(\* R&D costs less than 10% of total revenues: Low. From 10% to 20% of revenues: Medium. From 20% to 30% of revenues: High. More than 30%: Very High)

Source: e-Business Watch (2008)

## 4.4 IPR and the open source software business model

According to IDC analysis, OSS is not a market segment, but a software development and distribution model cutting across all of the software industry. (see also par. 2.5.3) A different use of IPR, based on licensing rather than patenting, is the key feature of the

OSS business model, so it is particularly interesting to analyze the ways in which OSS firms use IPR and its correlation with business growth.

As shown in the following figure, based on IDC research, OSS business models are segmented by IDC on the basis of two main dimensions:

- The end-product form factor, that is whether the OSS code is a stand-alone product, an embedded functionality, or a complementary product;
- The revenue source for the firm, depending on whether it is software, hardware, services or content.

*Exhibit 4-14: IDC's open source software business model segmentation*

		Revenue Source			
		Software	Hardware	Service	Content
End-Product Form Factor	Standalone Product	Create OSS product	Not applicable	Sell attendant service(s)	Not applicable
		Sell commercial rights			
		Develop CSS product enhancements			
	Embedded Functionality	Develop derivative CSS product	Embed inside hardware product		Embed inside content product
		Create mixed OSS+CSS product			
	Complementary Product	Create mixed OSS+CSS package	Package with hardware system		Package with content
		Upgrade to same-stack-level CSS product			
		Sell higher-stack-level CSS product(s)			

Source: IDC, 2007

While OSS software, by definition, is not sold with a proprietary license, there are several ways in which developers still earn money from it. Companies will most often use mixed models. For example the commercial rights business model, also known as the dual-license business model, involves a vendor offering the OSS project code under two distinct licenses. One license complies with the definition of an open source software license. Practically speaking, this means a company will usually use the code for internal purposes and will not redistribute it. Quite often, the first license will be the GNU General Public License (GPL). The second license allows individuals and companies to redistribute and/or embed the OSS project code in derivative or enhanced products, without the viral effect of the GPL. Vendors pay the license holder a fee for these commercial rights.

A case in question is MySQL software, which is offered both as open source and as a commercial license. This dual offer ensures both a rapid growth of users that download the software for free and contribute to debugging and improvements, and revenue from users that do not wish to share the results of their developments, and prefer to pay a licence. It is crucial for the companies using dual licensing that they control and own all parts of their software; in practice they need to write all code inhouse and handle carefully the improvements developed by their open source community in a special way, so as not

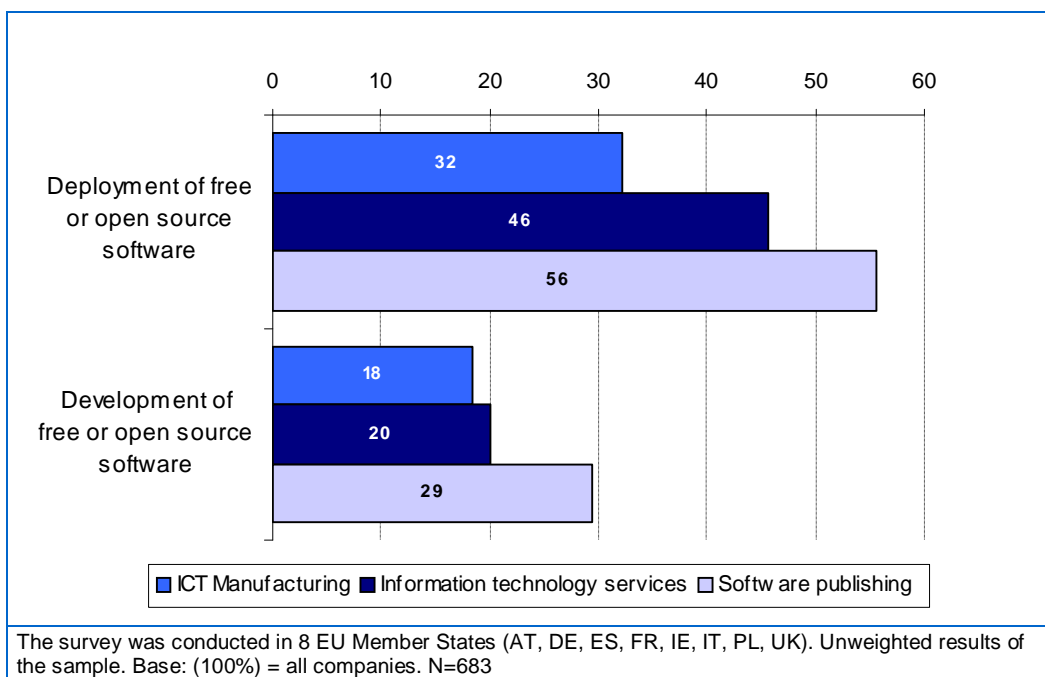
to mix the open source and commercial versions<sup>43</sup>.

Clearly, the choice of IPR tools is an integral part of the OSS business models. While some software firms are “pure” OSS, many IT companies use both the OSS and the proprietary software models, and use varied IPR depending on the business case.

#### 4.4.1 Evidence from the survey

In our study sample, selected on the basis of IPR use, 45% of SMEs are involved with the deployment of OSS: they represent 56% of the software firms, but also 46% of ICT services firms and 32% of ICT Manufacturing firms (ex. 4.15). This is a confirmation of the diffusion of OSS across all the segments of the ICT industry. The share of ICT SMEs engaged in development of OSS is 23%, but represents about a third of software enterprises and about 20% in the other two segments.

**Exhibit 4-15 : Deployment and development of FLOSS, by firm sector (% of ICT SMEs)**



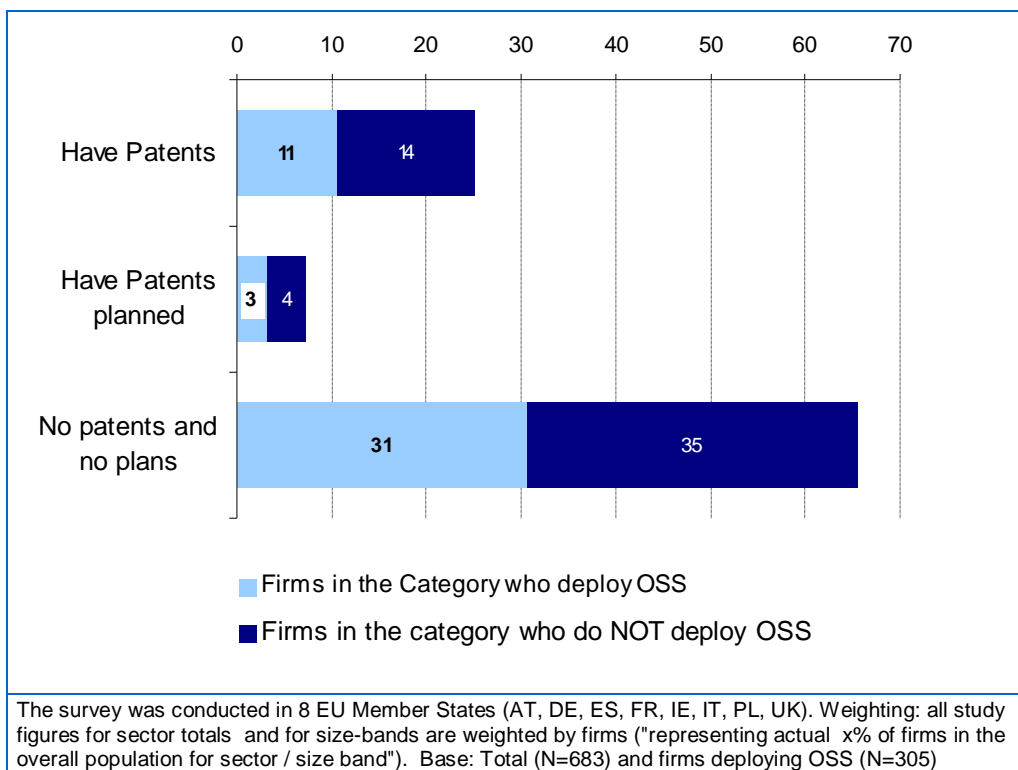
Source: e-Business Watch Survey “IPR in ICT SMEs”, September 2007

An interesting observation is that 11% of ICT SMEs are engaged in the deployment of OSS, but at the same time hold patents; this means that a little less of half of ICT SMEs with patents are also deploying OSS.

A similar percentage (12%) of ICT SMEs have patents and are engaged in OSS development. This means that approximately one in two of ICT SMEs with patents are also developing OSS. It is possible that they use patents for other product lines rather than OSS. This confirms that ICT SMEs have a very pragmatic attitude about IPR and OSS, and adapt their IPR choices to their business strategy.

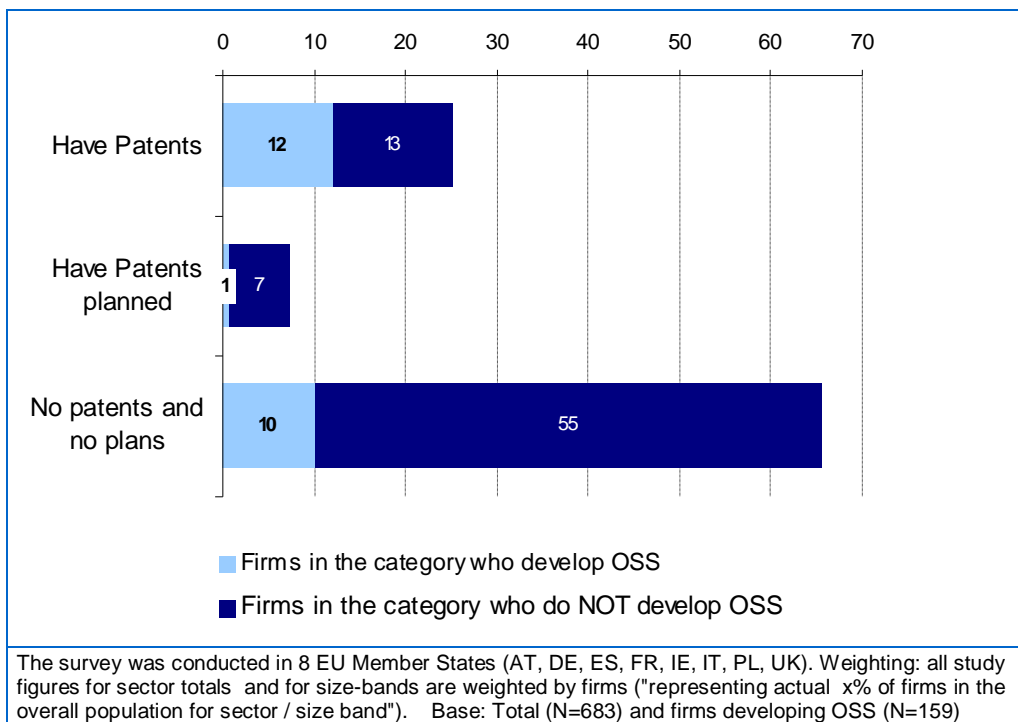
<sup>43</sup> Source: Intellectual Property Rights and Nordic SMEs, Leogriff, 2005.

**Exhibit 4-16: Deployment of OSS considering firms with and without patents (% of ICT SMEs)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

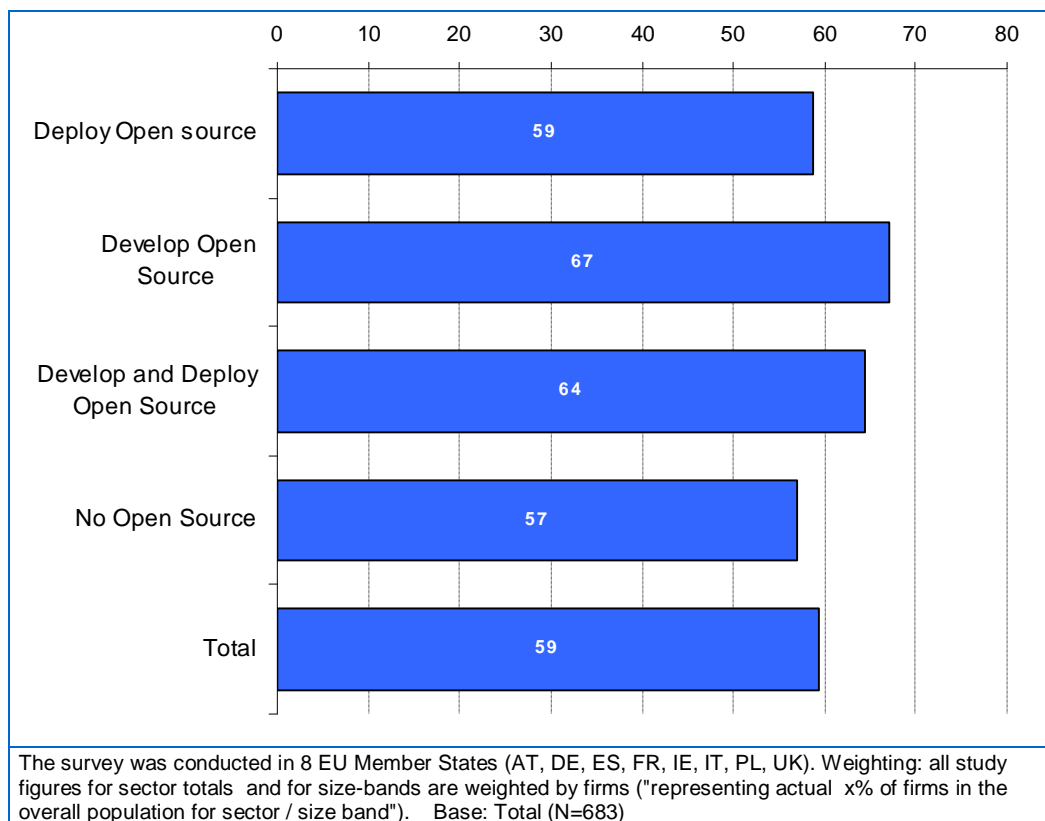
**Exhibit 4-17: Development of OSS considering firms with and without patents (% of ICT SMEs)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

According to our study, ICT SMEs engaged in the deployment of OSS are neither better nor worse than the average sample from the point of view of turnover growth. Instead, firms engaged in the development of OSS or both the development and the deployment, are more likely to show turnover growth (see ex.4-18). These firms tend to be high performers and to have a proactive IPR strategy.

**Exhibit 4-18: Percentage of ICT SMEs with turnover increase by type of OSS activity (% of ICT SMEs)**



Source: e-Business Watch Survey "IPR in ICT SMEs", September 2007

#### 4.4.2 OSS business models: Fluendo and iMatix

Two case studies allow to analyze the OSS business model. Both companies are "pure" followers of the OSS movement and do not believe in patents.

They are:

- **Fluendo**, a small Spanish software company, founded in Barcelona in 2004, specialised in delivering products and consulting services on Unix and Linux multimedia platforms, with a little less than 1 Million euro revenues.
- **iMatix** founded in 1998 in Brussels, Belgium, to research and develop new technologies and innovative products for the internet. iMatix is an active participant in standards and industry workgroups and a corporate patron of the FSF (Free Software Foundation).

Both firms gain their revenues from IP protected products and services.

**Exhibit 4-19: Open source software case studies**

Company Name	Fluendo	iMatix
<b>Core Business</b>	Open source and proprietary software development	Open source and proprietary software development
<b>N. empl.</b>	10	10
<b>R&amp;D</b>	Very High	High
<b>IPR Portfolio</b>	Copyrights, trademarks, trade secrets	Copyrights, trademarks
<b>IPR Strategy</b>	Copyright is seen as the key tool to protect the firm's IP, connected with the core business. Copyrights have to be managed carefully especially for the open source software	Copyrights are used to protect investments in R&D and product development. Trademarks to protect investment in reputation. Trade secrets protect confidential designs. All IPR are used in an easy and effective way.
<b>IPR Impact</b>	Revenues come from IP protected products and services	Revenues come from IP protected products and services
<b>IPR Issues</b>	In order to produce software interoperable and compatible with others legal help is needed. Patents are more of a risk than a competitive weapon. The firm is too small to trade IPR and negotiate for licenses	The patent system is largely unusable: it is too expensive (10-20k Euro minimum for patent), slow (it takes 5-7 years to get a patent), inappropriate for software, and litigation risks are too high

(\* R&D costs less than 10% of total revenues: Low. From 10% to 20% of revenues: Medium. From 20% to 30% of revenues: High. More than 30%: Very High)

Source: e-Business Watch (2008)

iMatix has a particularly strong position against software patents. The company believes that the patent system is largely unusable being too expensive, slow, inappropriate for software. The time needed to acquire a patent is much too long (5-7 years), the average cost for a patent too high (10-20k Euro), the lifespan of rights is too long, litigation risks too high. Copyrights, trademarks and trade secrets instead are the best forms of IP for the IT sector, allowing open competition and fostering market growth. iMatix points out that at least once they were forced to give up the development of a product, because they could not use a small component blocked by a patent claim. From their point of view, their competitiveness depends on the production of interoperable and compatible software, which requires open standards, which are constrained by software patents.

Fluendo has less of a fighting attitude, but they too consider patents as more of a risk than a competitive weapon. Even if they decided to patent, they do not have the resources to enforce them and pursue litigation if necessary. Fluendo underlined the need to invest also in the proper management of copyright and licensing, which is particularly important in the OSS environment.

Both Fluendo and iMatix are very small innovative enterprises. In their case IPR, and particularly copyright, are essential tools to operate their business and avoid to be swept away by large competitors. It is understandable that software patents, however called, are considered by them more a threat than an opportunity.

Both enterprises reflect the positioning of small software developers in the OSS community. Even if their opinion may be considered as too strong, they express legitimate concerns about the way to grow their business protecting themselves from larger competitors.



## 4.5 IPR, business strategies, standardisation and interoperability issues

ICT SMEs live in a global digital “ecosystem” where innovation is a must, but is built upon extensive interaction and networking. Market success requires standardization and interoperability, which forces compromises and uneasy alliances among competitors. There are plenty of niches, but some games are of the “winner takes all” type (see Microsoft, Google). This environment is characterized by built-in conflicts, where IPR may and are used as weapons as well as tools. It is important therefore to look more closely also at the main factors affecting these conflicts (see also *par.2.6.4*).

It is no easy puzzle for the policy maker to devise fair “rules of the game”, to balance these contrasting interests. This is particularly relevant for ICT SMEs, since small innovative firms may gain greater benefits from an effective IPR regime, but face greater barriers, because of their minor resources and lack of specific expertise.

A consultation meeting on EU Standardization Policy for the ICT sector was held on 12 February 2008 in Bruxelles<sup>44</sup>, attended by over 300 high-level representatives of industry, government, standardisation organisations and other interested bodies, highlighting the critical issues under discussion. There was general agreement on the need to establish a High Level Policy Group and revise existing policies, to accelerate the development of open standards and improve interoperability in areas where there are still gaps (for example eGovernment). This should also create the conditions to increase the contribution of European ICT SMEs to standardization, paying attention that they are not constrained by stronger players. After the meeting, European Commission Vice-President Günter Verheugen indicated that, if there was sufficient support, the Commission would be willing to consider the revision of current legislation to establish a strategic policy platform for ICT standardisation.

From our case studies analysis, the issue of IPR emerges as affecting competitive positioning and standards development, as follows:

- In the software arena, the sequential nature of innovation and the need to build interoperable systems make it difficult to justify an excessive use of the monopolistic protection granted by patents. Apart from “pure” supporters of the FLOSS movement, who contest patents in principle, several ICT SMEs agree that established players often use patents to restrain competition. According to Bruno Robine, director of an ICT SMEs association in France, small enterprises have a “window” of opportunity of about 18 months to exploit their innovations before their larger competitors are able to copy it. The long time needed to register patents prevents them to be useful in this kind of scenario.
- The potential of abuse by “patent trolls”, that is the multiplication of patents increasing the burden of costs for innovation development, is worrying for small firms, but not only them. As declared by Mark Lange (Senior Policy Counsel of

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<sup>44</sup> “European ICT standardisation policy at a crossroads: a new direction for global success” Report of the Open Meeting held in Brussels, 12 February 2008, prepared by the Open Meeting Rapporteur Henry J F Ryan - <http://ec.europa.eu/enterprise/ict/policy/standards/cf2008/20080212report.pdf>.

Microsoft)<sup>45</sup>, there is a common interest for all size firms to reduce trivial patents.

- The role of IP in the electronic components design business is becoming very similar to that of the software industry, raising similar competition problems. For example Comsys, the Israeli firm holding several patents for innovative electronic components for wireless networks, experienced difficulties with the GSM/GPRS/EDGE standards, a huge block of standards gathered from 400 companies and including 2,000 patents. It cannot be easy to innovate, without interfering with some of these patents, or having to pay so much for their licenses to weaken one's offering. The firm owning most of the critical patents for this standard, Qualcomm, in fact has been accused of limiting competition through charging too much money for its licenses. It cannot be healthy for the development of innovation to let a single firm become the "gatekeeper" of critical technologies in some global markets.
- There is possibly a inherent contradiction of the open standards environment, where IP must be protected to be recognized and rewarded, but technology solutions, in order to be interoperable, may not be sufficiently exclusive to be patented. This happened to one of our case studies. Net Insight, producer of IP TV appliances, started life as an IPR-based start-up with a rich portfolio of patents, very useful to gain financing from venture capital funds. Now the firm has moved to a business strategy based on open standards, investing extensively in standardization. The firm had problems in filing new patents, because of similarity of some of its technologies to other competitors. Its managers now find patents more of a necessity and a constraint than a business opportunity.

## 4.6 Summary

Competitiveness in the ICT industry is closely related with innovation, and IPR are an essential tool of innovation strategies. This chapter looks at the role of IPR in ICT SMEs business strategies and their impact on competitiveness under two main aspects, the impact on revenues and the role in their business models.

The study found a correlation between IPR use and ICT SMEs business performance as follows:

- The majority of ICT SMEs in the survey (75%) declared that IPR are important for their business model, with 34% saying it is very important (*ex.4.1.*).
- An objective way to check this is to measure the share of revenues coming from products and services protected with IPR. According to the study survey, from this point of view ICT SMEs are split in two main groups: for 45% of firms these revenues are more than 10% of turnover in the past financial year, while for 30% of them they are less than 1%. In other words, in the first group IPR-related revenues are quite relevant, while in the second group they are insignificant.
- According to the survey data, the intensity of use of IPR is positively correlated with turnover and market share growth. First of all, ICT SMEs with IPR are more likely to declare turnover, market share and employment increase, than firms without IPR.

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<sup>45</sup> Sectoral e-Business Watch Workshop Summary, "IPR for Competitiveness: Challenges for European ICT SMEs" Paris, June 4th, 2008

The likeliness to show turnover and profit growth increases with the size of the IPR portfolio, since a higher percentage of ICT SMEs in the group of advanced IPR users are growing (77%), compared to the group of Low profile IPR users (where 56% are growing).

- From the point of view of the composition of the IPR portfolio (*ex.4.6*), firms with patents are more likely to grow, while firms with informal IPR are even less likely to grow than firms without IPR. This points to a correlation between the sophistication of IPR use and successful business performance.

The evolution of the value chain in the ICT industry is leading to increasing specialization of the different actors, with knowledge-intensive tasks such as R&D and design increasingly outsourced to dedicated firms, within complex global networks. The emerging business models based on the creation and exploitation of IPR are:

- **Start-ups based on IPR**, such as university spin-offs, who use patents as core assets to attract venture capital and succeed in the marketplace. For our Sensitive Objects case study, a French spin-off, all revenues come from IP-protected products and the patents portfolio is defined as a key component of the value of the company
- **IP-based new technology firms** gather all their revenues from licenses and royalties of developed IP. Three of our case studies (Array Technology-Denmark, Comsys-Israel and DxO Labs-France) fall in this typology, focusing on design and development and outsourcing production. This model has grown fast in the semiconductor industry. These firms are inherently exposed to high risks, because of the need to keep investing in R&D and remain one step ahead of the competition in technological innovation. They complain about the high costs of patents.
- **Cooperative innovation business models** depend on IPR as a competitive advantage but gain their revenues from IP-protected products and services. IPR allow these ICT SMEs to increase sales and market share in competitive global markets. Three of our case studies fall in this typology: Eurotech, Net Insights and Vierling are ICT manufacturing firms, large SMEs and rapidly growing, acting as specialised sub-suppliers of major vendors and suppliers in the globalized supply chains of the ICT market. They are global niche leaders; they focus on technological development and oversee closely their production partners, so that the quality of their products is up to the needed standards. They have a rich IPR portfolio, carefully managed, with many patents. They all consider IPR as a valuable asset, and they are getting to the point where they can use their portfolio as a tool to trade IPR in international alliances and business networks. This activity requires a sizable IPR portfolio and is usually beyond the scope of most high-tech SMEs.
- **Open source software business model:** OSS is not a market segment, but a software development and distribution model cutting across all of the software industry, characterized by a different use of IPR, based on copyright and licensing rather than patenting. Two of our case studies, Fluendo and iMatix, are “pure” followers of the OSS movement, believing that patents are ill-suited to this market, even if they develop proprietary software as well. Both firms gain all of their revenues from IP-protected products and services. The case studies show that IPR management is an issue also for these firms, because the licensing and copyright regime requires specific knowledge and skills. They are the strongest critics of the patent system, because of high costs of application and enforcement, risks of

litigation and general inefficiency. Besides, ICT SMEs in this area are concerned that patents are used by larger competitor to block the market and undermine their competition, reducing innovation potential.

- The conflicts between IPR protection, particularly patenting, and standardization and interoperability, particularly open standards, were underlined by some of the ICT SMEs. This is a complex issue, requiring a delicate balancing act among the interests of all competitors, because the patenting regime is not completely suited to the innovation development paradigm emerging in software and other industry segments, such as chip design.

## 5 Case studies

### 5.1 Introduction and overview

The case studies were selected among ICT SMEs using IPR, in order to focus on the implications of this use for their business strategies and, possibly, economic results. Two of the software enterprises adopt an open source model (which implies a different view of IPR). One of the manufacturing enterprises is active in the semiconductor industry. The selection was also driven by the need to achieve a balanced mix in terms of business activities (sub-sectors), company size-bands and countries. Medium SMEs are slightly over-represented in the case studies sample because they are more likely to use IPR and they are more present in the ICT Manufacturing Industry.

*Exhibit 5-1: Case studies by sector and size*

	Micro SMEs (3-9 empl.)	Small SMEs (10-49 empl.)	Medium SMEs (50-250 empl.)	TOTAL
IT Manufacturing		1	2	3
TLC Manufacturing			2	2
IT Software and Services	2	1	1	4
TOTAL	2	2	5	9

Source: Sectoral e-Business Watch (2007)

The case studies represent well the various business models related with different IPR strategies to be found in the ICT industry, as follows:

- IT manufacturing: one established enterprise (Eurotech) and one start-up with a business model based on IPR (Sensitive Objects).
- TLC manufacturing: 2 enterprises (Net Insight and Vierling) producing devices for TLC service providers.
- Semiconductor industry: 1 firm (Comsys designing processors for mobile networks).
- ICT software and services: two firms relying on IPR (Array Technologies and DXO Labs) and two with an open source model (iMatix, Fluendo).

The sample includes 8 case studies from Europe and 1 from Israel, a country with the highest concentration of innovative ICT start-up and high tech SMEs outside of the Silicon Valley. Israel's ICT SMEs population is financed largely by venture capital firms who generally insist on IP to defend new enterprises assets. In addition Europe is interested in emulating Israel's ability to generate and grow high-tech SMEs so the Israeli case studies are particularly relevant for this report.

The following table summarizes the main focus of the case studies. The cases are presented in detail in the following pages, ICT manufacturing first (5 case studies) and then software and services (4 case studies).

**Exhibit 5-2: Case studies by focus and country**

Case Title	No. of employees	Country	Case Focus
Eurotech	286	Italy	A fast growing enterprise with a large portfolio of patents and other IPR. IPR are used mainly to protect against competitors (even if other uses, as licensing and cross-licensing, are seen as possible).
Net Insight	80	Sweden	Another fast growing SME active in a highly competitive and dynamic marketplace for next generation IP (Internet protocol) TV solutions. The firm believes patents are more a necessity than a way to improve business results.
Sensitive Objects	26	France	A public research spin-off, founded in 2003, that has filed 7 patents. IPR represent the core asset of the company and the reason why it was financed by venture capital.
Vierling	230	Germany	Vierling is using IPR not so much as a direct competitive weapon, but more as a defensive mechanism of its know-how.
Comsys	90	Israel	Comsys designs processors for mobile networks, with an IP-based and fabless (no factory) business model. Large part of the staff is devoted to R&D and the firm holds a portfolio of 30 patents in the field of mobile and cellular technologies. It represents a category of new-technology based firms choosing a business model based only on know-how development.
Array Technologies	8	Denmark	Array Technologies is a small software firm, based in Copenhagen, with revenues coming 80% from licences of patented technologies and 20% from services.
DXO Labs	100	France	This software firm develops and licenses Intellectual Property (software IP and silicon IP for embedded architectures). With 20 patent families, the company has high focus on Innovation and IP production. Its business model relies interestingly on IPR.
Fluendo	10	Spain	The firm is both developing an open source solid multimedia framework for software developers and producing, over this framework, proprietary products. Its business model relies only on copyright, while patents are not used.
iMatix	10	Benelux	iMatix has experience in open source software development but also custom software development. The firm participates to standard setting initiatives and is a good witness of ICT SMEs possible alternative strategies.

Source: Sectoral e-Business Watch (2007)

## 5.2 Eurotech, Italy: using patents for competitive advantage

### Abstract



Founded in 1992, with the goal of playing a key role in the embedded computing market at first, Eurotech is now a group of companies with a strong degree of complementarities, in the new "pervasive computing" sector within the electronics market. It has headquarters and facilities in Europe, the US and China. In order to continue to penetrate new emerging markets, Eurotech is focusing its R&D activities in high growth fields such as high-performance computers, embedded computers, network computers, wearable computers and smart sensors.

The firm is investing in all means to protect its IP, and is developing a large portfolio of patents, trademarks and registered designs, mainly used to strengthen its production against that of competitors, helping the commercialisation of state-of-the-art technologies in very competitive marketplaces (even if other uses of patents, such as licensing and cross-licensing, are seen as possible in the future). The impact on business results is seen mainly in growth of sales and reinforced relationships with large clients or OEM partners. The trend to invest in IPR, observed also in growing costs for this activity, is the result of the high focus of the company on R&D activities as its core business, while the production of devices is progressively outsourced to lower-cost providers.

#### Case Study fact sheet

• Full name of the company:	Eurotech Group
• Location (headquarters/main branches):	Italy / US, Europe, China
• No. of employees:	With 286 employees at 31 December 2006 <sup>46</sup> .
• Main business activity:	Production of nano-PCs and embedded components
• Primary customers:	Large manufacturers (mainly in transport and defence sectors), OEM partners
• Year of foundation:	1992
• Turnover in last financial year (€):	50.8 million euros (2006, +70% from 2005)
• Most significant market area:	US, Europe
• Focus of the case study:	IPR portfolio strategy and management

### 5.2.1 Background and business model

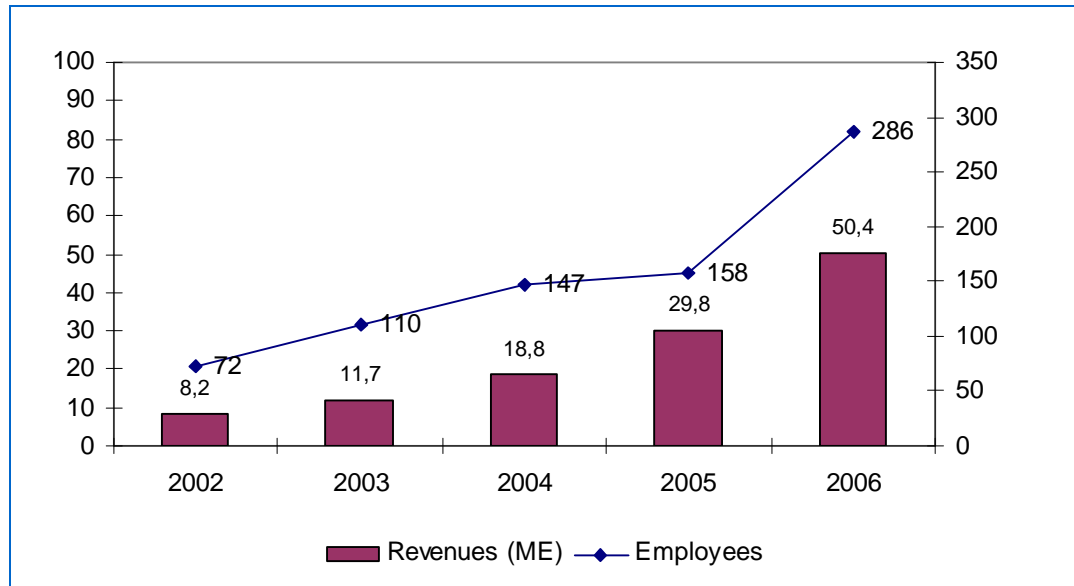
Eurotech Group main business activity is the production of nano-PCs and embedded computers: with headquarters in Italy and offices worldwide (in US, Europe and China), the company employed more than 280 employees at the end of 2006 and is rapidly

<sup>46</sup> The Eurotech Group is experiencing a rapid growth, mainly due to acquisitions, and employees are 540 at the end of November 2007, but for the scope of the present study, as strategies considered are those of previous years (from 2004 to 2006) the size is that of an SME.



growing with acquisitions (turnover for 2006 totalled 50.8 millions euro, with an increase of 70% from 2005, see the graph below). It is an example of an SME growing beyond the threshold, so its strategies are particularly interesting.

**Exhibit 5-3: Growth of revenues and employees of Eurotech Group**



Source: Eurotech, 2007

Eurotech produces nano-PCs and high-performance computers (HPCs), with 91% of revenues coming from nano-PCs and the remainder from HPCs. Nano-PCs are miniaturised electronic modules and systems geared toward the transport, medical, industrial and defence sectors. HPCs, featuring high computing capacity, are geared towards universities, research institutions and computing centres.

The group is highly specialised, and after a first phase of consolidation of its competencies in the embedded technologies sector, it has started a strategy of growth and internationalisation through acquisitions of enterprises operating in the same market, with the support of funds from institutional investors and thanks to the quotation on the Italian Stock Exchange in November 2005. The US is the most important market area for the group (41% of revenues) followed by the European Union excluding Italy (27%).

From its foundation, the Eurotech group has seen R&D as the most important part of its business model: devising high value, innovative solutions, it is able to anticipate future market trends and develop for its customers different choices of architecture for the miniaturisation of special-purpose computers. At the moment the engineering and research functions account for 49% of the workforce of the group.

From the beginning it has also chosen to comply with industry standards specific of its sector (as the PCI, Peripheral Component Interconnect, standard), but in addition to standard products, available in its catalogue, Eurotech offers personalised solutions. Revenues come for the most part from the sale of Eurotech products, and only in very limited percentage (0.8%) from associated services.

The production model for all the companies of the group is based on outsourcing and is in constant evolution to ensure more production capability at competitive costs.

### 5.2.2 IPR adoption model

As the group is at the same time investing in R&D and collaborating with third parties, such as public research centres and manufacturers, the protection of intellectual property developed has been found to be critical from many different points of view.

A portfolio of 32 patents (30 of them registered between 2004 and 2007), 23 trademarks (22 of them registered between 1999 and 2007), and 11 designs, has been registered in order to:

- Enter global markets with stronger commercial strength thanks to high value technologies (i.e. the patents serve to strengthen the products against those of competitors).
- Be stronger in response to possible actions made by competitors that could try to enter the same marketplace with very similar products. A sort of an entrance barrier and a means to differentiate and strengthen products.
- Respond to the risk of being sued by competitors for patent infringement (i.e. having its own patents, the company is in a position to set cross-licensing agreements).
- Have stronger relationships with clients, both users and original equipment manufacturing (OEM) partners.

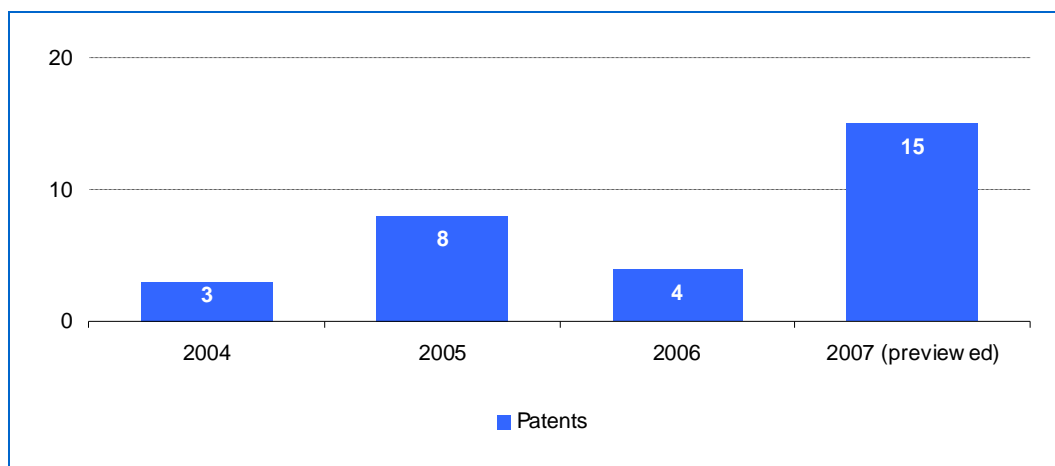
Countries chosen for patents are those with more interesting markets for the company.

An internal department, a small structure (2 employees), is dedicated to dealing with the bureaucracy for obtaining and maintaining IPR.

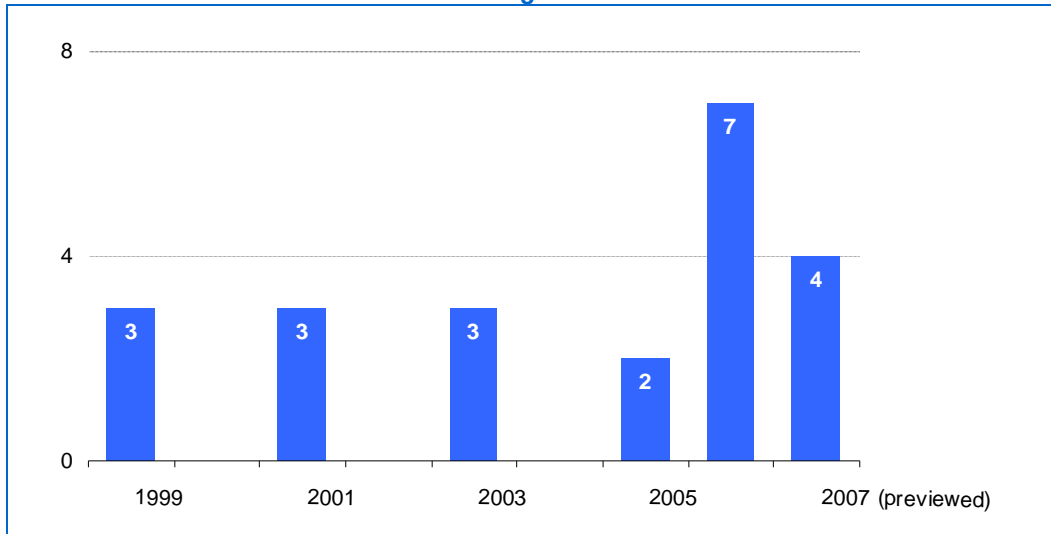
The company has used the expertise of external lawyers in order to build on its intellectual property, and in case of litigation, has solved them in the initial phase.

Regarding trademarks and registered designs, these means of protection are easily obtained via automated procedures in the R&D phases, while in general obtaining patents is a more complex task. This is because, as patents need to be granted in different countries (Europe, the US or the Far East) problems encountered by the firm are the divergence of procedures and the length of time. An issue is also that rules should be enforced in the Far East, as the competition is moving rapidly to those countries.

**Exhibit 5-4: Number of Eurotech patents registered between 2004 and 2007**



Source: Eurotech, 2007

**Exhibit 5-5: Number of Eurotech trademarks registered between 1999 and 2007**

Source: Eurotech, 2007

The company has no experience about IPR issues connected to the participation in European research programmes, as those collaborative research projects have always been done not for strategic, core business technical developments. European research programmes are considered to be too long (with a timeframe incompatible with product life cycles) and time-consuming in administrative tasks: those aspects reduce the flexibility and time to market of a new development in the field of nano-technologies. Also these research frameworks do not guarantee the possibility of exchanging or re-using the developed intellectual property, as no protection can be provided if one partner in the project doesn't agree to do it. A common patent is possible, but all partners have to agree on the procedure.

According to Eurotech, local research programmes (such as those provided at regional or state levels) are more functional for industrial developments in private companies (even if in Italy the time to obtain incentives is often too long). In general Eurotech has a growing budget for IPR (about 3% of the total investment in R&D), and this is explained both by the increasing costs for awarding and maintaining IPR, and the higher propension to protect IP inside the company. No IP insurance is in place at the moment, but the firm is considering the possibility to have it later.

### 5.2.3 Impact on company performance

The use of IPR is widespread in the company's marketplace: even small companies, that are often very innovative and growing fast, are using patents to protect their inventions. As a consequence, one first reason for Eurotech to protect its invention is the need to catch up competitors practices in the marketplace. There are also many benefits coming out from the use of IPR, that can be summarized in:

1. Patents and trademarks permit to have more valuable products.
2. Protection of the technology benefit also OEM partners.
3. Patent protection is useful in production outsourcing agreements.

4. A patent portfolio can facilitate negotiations to access other patents licences.

Regarding Eurotech, there is evidence of a positive impact of IPR, especially patents, on the growth of revenues (even if a quantification of patents contribution is not feasible). This is mainly a consequence of the fact that, with patents, products are seen as more valuable by potential customers (which typically are large manufactures) and can be more easily sold in international markets (patents raise products and firm reputation). Trademarks are as well important to protect the brand of those products.

Customers and OEM partners are also enjoying the benefits of patented inventions, as they may use Eurotech nano-PCs embedded in their products with the certainty that the technology used is protected against violations of the IP. Protection, that relates to a technology that is embedded in a new product, benefits also the new end product. Instead, a competitor using a non-protected technology embedded in its solution, could be more easily damaged by a copy of its own products, that could enter in the market at a lower price.

Patents protection also allows the firm to outsource in part its production activity (lowering the production costs) with the guarantee that partners entering in the industrialisation chain are not using Eurotech inventions for different purposes.

At the moment Eurotech patent are not licensed, and there are no cross-licensing agreements: this fact depends probably by the need to build a larger portfolio. Having actually 32 patents was important in some cases for Eurotech, in order to conclude an agreement to access other patents licenses (paying royalties and fees that were arranged in order to benefits both the parties).

#### 5.2.4 Lessons learned

The Eurotech experience is very positive regarding the use of IPR and also of patents, which are seen as a valuable tool directly linked not only to the production of new innovative products but also to marketing efforts in global markets. In fact, Eurotech considers patents to be necessary to achieve so many different facets of competitive advantage (outsourcing of production, insurance against litigation, product differentiation and company reputation) that they are very well connected and central to the overall company strategy, even if costs for patenting are growing.

#### 5.2.5 References

Research for this case study was conducted by Elena Vaciago, senior researcher IDC Italy, on behalf of the Sectoral e-Business Watch. Sources and references used:

- Interviews with Giampietro Tecchiolli, Chief Technology Officer of the Eurotech Group, June 2007.
- Company annual report, brochure and presentations to analysts.
- Eurotech Group Website: <http://www.eurotech.com/IT/ilgruppo.aspx>.

## 5.3 Net Insight, Sweden: IPR as a necessity

### Abstract



*Net Insight is a successful high tech company founded in 1998 and based in Stockholm, Sweden, that is growing rapidly in a highly competitive and dynamic marketplace of next generation IP TV and media transport solutions. With a strong focus in R&D, and an outsourcing model for production, the company is investing in building up sales strength in order to expand in global markets. The primary way Net Insight protects its products is by adopting security solutions (as antivirus, firewall and so on) against the threat of loss of important information. Net Insight also actively works to patent its products to prevent technical forgeries and maintain its technical lead. Net Insight currently has a patent portfolio covering 25 patent families, each of which includes patents or patent applications in multiple countries. At the moment, countries covered mostly are the United States, Germany, France and UK in Europe, Sweden. The firm has experienced from the beginning the difficulty of protecting inventions using the patent system. It is not always possible to apply for a patent if a competitor is doing something similar and there is an amount of resources to take, not only money but also internal personnel to invest in patents. The firm believes patents are more a necessity than a strategic option to improve business results.*

#### Case study fact sheet

• Full name of the company:	Net Insight AB
• Location (headquarters/main branches):	Stockholm (Sweden), with US and Singapore subsidiaries
• No. of employees:	90
• Main business activity:	Production of appliances for IPTV and cable TV networks
• Primary customers:	Television broadcasters, production companies, Telephony and service operators
• Year of foundation:	1997
• Turnover in last financial year (€):	SEK 134.8 million (€14.57 million) in 2006, + 48% from 2005
• Most significant market area:	Europe ( 81% of revenues), remaining part from US (18%) and a few small initial but important orders from Asia (1%)
• Focus of the case study	IPR strategy in a former start up, now employing an open standards model

### 5.3.1 Background and business model

Net Insight was founded in 1997 in Stockholm (Sweden) to produce appliances for IPTV and cable TV networks. Today, with revenues that totalled 14,6 million euros at the end of 2006, has 90 employees and subsidiaries in US and Singapore.

Net Insight's business concept is to produce, market and sell products and services for the broadcast and broadband markets of new television and video services, delivered to companies and households over broadband or upgraded cable TV networks (with optimal utilisation of network capacity, video, sound and data are transmitted over the same

infrastructure). Net Insight addresses three main markets that demand high quality from their video traffic:

- Networks for broadcast and media — Television and media companies that send large amounts of video traffic within and between different production units for studio editing, as well as network operators and satellite companies (German television companies WDR and ZDF, Dutch UPC, French GlobeCast, Danish Broadcast Service Denmark, Finnish YLE and Swiss SRG).
- Networks for digital terrestrial TV and mobile TV — Television companies and operators that build new distribution networks in the transition from analogue to digital terrestrial television. Included in this segment is also the fast growing market for mobile TV. On January 1, 2008, the definitive transition to the digital terrestrial TV network will be completed in Sweden. Some 50 countries are waiting to do the same in the next three years.
- Networks for cable TV and IP TV services — Telephony and cable TV operators that want to be able to offer telephony, data and video services in a bundled solution over IP (Internet protocol) networks.

The majority of Net Insight's sales are made in Europe, North America and Asia. Net Insight's customers are broadcast and media companies, cable TV providers, network owners and telecom operators.

Regarding products, Net Insight's Nimbra platform consists of network switches that are optimised for cost-effective video delivery. Net Insight's products are produced at Kitron and Flextronics, two strong international cooperation partners. Before a new product is sent to production it has undergone numerous tests to meet Net Insight's high standards of quality. Today a number of automated tests are made at the system level where the latest software goes through up to 30,000 tests daily.

The firm has 90 employees, the majority of whom work at the headquarters in Stockholm. Seven people work in the US subsidiary Net Insight Inc. Since February 2007 Net Insight has had a sales office in Singapore to meet the increasing demand for the company's solutions in the APAC region. 49% of employees are in R&D, 34% in business development and sales, the remainder in administration and logistics.

Net Insight was founded in 1997 (after being preceded by 10 years of intensive research at Ericsson and the Royal Institute of Technology in Stockholm) and was first listed in 1999: since July 1, 2006, it has been listed on the Small Cap (NETI B) list for Swedish shares on the Stockholm Stock. The first profitable quarter was achieved at the end of 2006.

Revenues come mainly from IPTV and cable TV operators (64% of total sales), which are interested in the first two families of products: devices for broadcast and media networks, digital terrestrial television and mobile TV networks. An emerging market is devices for IPTV/cable TV networks. Sales of related services (such as software, training, service and support), a clear focus for Net Insight in recent years, grew by 140%, and today account for a share of 19%. The proportion of indirect sales (37%) has also risen during the year in accordance with the partner strategy.

Net Insight competitors are global companies such as Alcatel, Cisco/Scientific Atlanta, CCor, NDT Network Electronics, IpiTek, Medialinks, Opticom, T-vips and Thomson.

### 5.3.2 IPR adoption model

The primary way Net Insight protects its invention is adopting security solutions against the threat of loss of important information. The firm has experienced from the beginning the difficulty of protecting inventions using the patent system. It is not always possible to apply for a patent, if a competitor is doing something similar, and there is an amount of resources to take, not only money but also internal resources, to invest in patents.

Net Insight actively works to patent its products and technology to prevent technical forgery and maintain its technical lead. The patents also offer the opportunity of future revenues through technical licensing to cooperation partners. Net Insight currently has a patent portfolio covering 25 patent families, each of which includes patents or patent applications in multiple countries. At the moment, countries chosen to apply for patents are: the United States, Germany, France and UK in Europe, Sweden. The choice of a particular country depends on the importance of the product and which market is relevant. Products with core functionality will be submitted in more countries and the selection of markets is normally done based on the size of the market and where the competitors operate.

Net Insight's products and solutions have a highly innovative content, where extensive knowledge on the leading edge of technology is converted into concrete customer benefit. Therefore Net Insight considers it important to use patents to prevent technology plagiarism, to control its knowledge and know-how, and retain its technological lead. In total it owns 25 families of patents, each involving patents or patent applications in one or more countries. Also, Net Insight regularly seeks protection for its company name, brands and trademarks and is well prepared for infringement litigation both through insurances and through experience from its longstanding relationship between its own legal department and the company's legal consultants.

Typically, the time required for obtaining one patent has been estimated to be four working weeks. This cost is only internal, and has to be added to the cost of external consultants and specialised attorneys. The time is also that of a dedicated person: it should be added to the time of the engineer or researcher who wants its invention to be patented.

Having a portfolio of 25 patents, Net Insight estimates a total cost of €20,000 to €80,000 per year. Reasons to apply for patents are:

- Build up a portfolio for cross-licensing (in future)
- Protect the company from litigation (could be solved with cross-licensing agreements)
- Protect inventions and the firm against competitors that could enter the market with similar products (least relevant reason since Net Insight strongly promotes open standards)

Also, R&D engineers are motivated, through incentives, to patent their inventions.

Net Insight also has some trademarks for its products (such as Nimbra), believing that having to invest in marketing and brand recognition, it's good practice also to protect the name of its products — and the process doesn't present issues.

Regarding the organisation of IPR management, the firm employs one person dedicated to patent issues, in contact with engineers and external consultants used to



writing applications for different countries. In 2004, Net Insight sold its IP rights to a newly formed, wholly owned subsidiary (NIIP Hb) in the form of a partnership. The subsidiary invoices the parent company monthly for a license fee for the use of the IPR. This was done in order to have in future, for its patent portfolio, the possibility to sell licenses via a specialised organisation without being in conflict with the NI objective of selling products that are based on the same patents.

### 5.3.3 Impact on company results

The firm believes patents are more a necessity than a strategic option to improve business results. As patents present a relevant cost, applications to award them have been reduced in recent years: at the beginning, when first products were produced, more than 50 applications were presented, then half of them were dropped and at the end only 25 patents families were obtained. The reason to abandon some of them was the cost, which in the early stages is not too high, but then when patents have to be requested in a multitude of countries, up to six, translation and other costs can become prohibitive. Today, the strategy of the company is to focus on patents that are more important for its defensive strategy.

Even if the firm never had legal issues, being in a highly competitive sector, in direct competition with multinationals such as Alcatel-Lucent and Cisco, patents are required as an insurance for future success and protection against possible litigation. Instead, having many patented products is not necessarily a way to gain customer favour: typically, Telco operators and broadcasters look at diffuse industry standards, price and functionalities, and see patents as a possible way for producers to block the client to a de facto proprietary standard. Net Insight has to cooperate extensively with standardisation initiatives in order to guarantee that its products are interoperable and open to future developments.

*"Having many patents doesn't give us a real competitive advantage today," said Christer Bohm, CTO of the firm. "When the company started it was important to have that intellectual property protected and patents were very valuable in accessing finance. Today, in our sector, patents are not so diffused. Also, it's important that the ones we own are used also by other companies."*

Net Insight has been open to collaboration to standards development: in some cases, its own patents were recognised in the standard and paid, via a low cost licence, in case of use.

*"We never had problems in setting standards based also on our patents, it's a common procedure in our marketplace, competitors are doing the same" said Christer Bohm, CTO of the firm.*

Also, according to the firm, a big problem that should be considered is how the United States patent system is working, and the fact that in the US companies have the advantage of patenting almost everything. Also, in the US inventions are disclosed only over a long time and the marketplace has a high risk of litigation.

### 5.3.4 Lessons learned

Net Insight is a successful, high tech company, that is growing rapidly in a highly competitive and dynamic marketplace of next-generation IP TV solutions. With a core business in R&D, and an outsourced model for production, the company is investing in building up sales strength in order to expand in global markets.

Operating in a dynamic, competitive and global marketplace, Net Insight has based its production right from the beginning on patented inventions, but afterwards, has found out that for its specific business, patents are more a constraint than a real value added. Today the company is pointing out to some issues that are limiting its potential of publishing inventions, such as the cost, that in some ways enforces the firm to adopt a defensive strategy with limit exploitation of other patent uses.

Patents are today mainly used to protect know-how and the firm from attempts to start litigation (that could be very expensive for a company of this size).

With a business model focused on serving directly customers such as Telco operators and media companies, the firm has to focus on the specific needs of those large clients: typically, those companies look not for patented products (seen more as a threat of being locked into proprietary products) but more for open solutions that are accepted in the whole industry. In that respect, having patented products doesn't make Net Insight solutions a preferable choice against those of competitor.

### 5.3.5 References

Elena Vaciago, senior researcher IDC Italy, on behalf of the Sectoral e-Business Watch, conducted research for this case study. Sources and references used:

- Interview with Christer Bohm, Chief Technology Officer of Net Insight
- Net Insight annual report 2006
- Net Insight Web site: <http://www.netinsight.net>.

## 5.4 Sensitive Objects, France: IPR as the key asset

### Abstract



*Sensitive Objects S.A. was founded in October 2003 in Billancourt (near Paris), France and received funding to speed up its development by August 2004 from a venture capital firm. It is a spin-off from the Wave and Acoustic Laboratory (LOA – Laboratoire des Ondes Acoustiques) of the French Science National Research Center (CNRS), whose research works include the time reversal mirror of acoustic waves, which is the basis of Sensitive Objects' breakthrough technology. Sensitive Objects develops and sells human-machine interfaces (HMI) as part of physical objects. Sensitive Objects has filed 9 patent applications. The IPR owned is a key component of the core value of the company and a strong justification, together with the business perspectives of the technology for the venture capital received. Sensitive Objects has signed a cross license agreement with Tyco Electronics (Elo TouchSystems), a well known large industry conglomerate with its main Operations in the USA. Sensitive Objects has a subsidiary in Singapore and an office in Taiwan.*

#### Case study fact sheet

• Full name of the company:	Sensitive Objects
• Location (headquarters/main branches):	Boulogne Billancourt (near Paris), FranceIT Science Park, Singapore
• No. of employees:	With 26 employees (in Oct. 2007) – R&D and executives
• Main business activity:	Development, manufacture and sales of acoustic based human machine interface products
• Primary customers:	In all industries in which human machine interfaces are required
• Year of foundation:	2003
• Turnover in last financial year (€):	2007: less than € 1 million, plan for 2008: several million euros
• Most significant market area:	All major industry areas (Europe, Asia, US)
• Focus of the case study	Start-up company using IPR to get venture capital

### 5.4.1 Background and business model

#### Company profile

Sensitive Object stems from research works performed in a French research institute: the Wave and Acoustic Laboratory of the French National Research Center. The core technology includes algorithms either run as proprietary software on a PC (i.e: Virtual keyboard, Touch-Screen), or embedded as firmware inside dedicated DSP (Digital Signal processing) or microcontroller chips embarked in the systems (i.e.: switch, control panel). The company is a spin-off from the named research institute.

Sensitive Objects's operations are led by an experienced management team. Current funding mostly comes from Sofinnova Partners, a major European Venture Capital firm.

The company does not have internal manufacturing to-date. Product manufacturing is subcontracted to experienced partners in cost competitive areas.

## Products

The bulk of the current activity is the development of innovative human machine interface products and the research in new technology.

This novel technology is based on the propagation of acoustic waves travelling through physical bodies (i.e. a table, an enclosure of a technical device in all kind of material, like glass, metal, plastic). These sound waves travel through the body creating a unique acoustic signature relating to the location of the impact. This unique acoustic signature is detected and interpreted building input devices for i.e. computers or any other applicative system requiring such type of activation.

Sensitive objects is operating in both a B2B and B2C business model. An available B2C product is a virtual keyboard for computers that does not have any movable parts, neither physical key. The virtual keystrokes are identified by the detection of an acoustic impact propagated by sound waves. This type of keyboard is particularly suited to specific markets, i.e. medical devices or it can be used as a replacement of classical keyboards.

Typical B2B products of Sensitive objects includes Touch-Screen products to be used in POS (point of sale), POI (point of information, kiosk), industry panels, ATM (automatic teller machine) or consumer electronics systems. Touch-Screen or virtual keyboard products rely on a PC to run dedicated algorithms and Software dedicated to the acoustic Human Machine Interface technology. Other product examples are control panel products for creating virtual buttons in embedded systems. Such systems do not rely on an external PC and the electronics embedded in Sensitive objects product run the algorithms and software required for the HMI. Typical target markets for this kind of product would be vending machine, small electric or electronic appliances (i.e. in home automation systems), or consumer electronics (i.e white goods).

In its current stage of development as a company, Sensitive objects does not intent to invest in internal manufacturing facilities. The development team has the largest headcount. Over time it is expected that there will be a shift to more headcount in business development and also supply chain and manufacturing management.

## Venture capital

The company got seed money in Aug. 2004 and also in Jan. 2006. The total amount of venture money has reached 7.5 Mio €. The venture capital firm is Sofinnova Partners. It also helps with supporting access to professional outsourced services such as law firms, patent attorneys, and press agencies. With such help, Sensitive objects can leverage the economies of scale of Sofinnova Partners' network.

## Competition

Main competitors in the field of touch screen include, 3M and Elo TouchSystems, a daughter company of Tyco Electronics, a worldwide active industry conglomerate. In July 2007 Sensitive objects signed a cross license agreement with Tyco Electronics. With this, agreement, Tyco Electronics (Elo TouchSystems) acknowledges the leading edge technology of Sensitive objects.

In the field of control panel and virtual keyboard, there is no direct competition to Sensitive objects using acoustic technology at this point in time. Competition is present in the form of alternative tactile technologies such as capacitive or resistive or classical mechanical solutions (buttons).

#### 5.4.2 IPR adoption model

Sensitive objects' know-how is based on previous research done in a French research institute: the Wave and Acoustic Laboratory of the French National Research Center. The core technology includes algorithms used in firmware embedded in the systems (keyboards, control panels). The company is a spin-off from the named research institute.

The firm has chosen to protect its inventions (through patents and other IPR, as trademarks) for different reasons:

First of all, Sensitive objects believes that it is critical to the company to build and protect a strong portfolio of intellectual property in the field of Human Machine Interface. A proactive and efficient IP policy is the only way to ensure high return on R&D investments. This is why Sensitive objects is focusing on registration and filing patents in the relevant world regions to ensure their strength and validity.

The research team is committed to the development of new technologies and innovative solutions for their customers. Protection of the intellectual property is important for the health of the company, to ensure a return for investors and provide to customers security in using the products. The core technology patent is on ReverSys. It is a method for locating impact on a surface and device therefore. The name ReverSys is also protected by a trademark.

As starting and founding the company was supported with money from venture capitalists, in order to convince the venture capitalist, it was an essential requirement to prove that the technology had unique value. Typically, venture funds companies look for patents as a proof of outstanding technology from start-up companies. As of today, Sensitive objects has filed 9 patent applications. Those have not been granted yet. Two patent applications have been filed in 2007 and it is expected that two more will be filed by the end of 2007.

Normally, Sensitive objects files PCT applications (patent treaty cooperation) and is focusing its efforts on Europe, the United States of America, Canada, Japan, India, China and South-Korea.

At no point in time Sensitive objects did consider any other option than filing the patent applications. Such applications are prerequisite requirements to attract valid funds from venture capital firms and long-term financial investors. Venture capital firms assess owned IPR, the management ability to execute its strategy, growth opportunities and actual sales ramp-up in a balanced matrix. Insofar, IPR are a solid basis but not the only prerequisite for a successful start-up and good financial valuation of a technology start-up company such as Sensitive objects.

In a B2C business model, the end user will not consider the patents linked to a product as a buying criterion. However, on the B2B side, valid patents are strongly influencing buying decisions because they ensure a safe access to the supply of innovative products and/or technologies. Customers can be sure that additional competition can be excluded once a patent has been granted (in the case of exclusive licensing agreements). For the

developer of the original and protected product, it is key information that no other prior art exists that could harm the unique market position of such product and/or technologies. Insofar, the search results as part of the patent examination process play a major role in the assessment of the competitive landscape for B2B markets.

## Internal IP management

In order to manage the patent activities, Sensitive objects works with two external patent law firms. Sensitive objects does not have internal capacities to manage the legal aspect of the patent process.

Sensitive objects maintains constant and intensive contacts with the Laboratoire des Ondes Acoustiques for new innovative research and technology as well as with other acoustic laboratories in Europe. Sensitive objects founder, Dr. Ros Kiri works with the company management team as technical advisor while maintaining an active research role at the LOA. Professor Mathias Fink, founder and managing director of the LOA, is an active member of the Board of Directors of Sensitive objects.

### 5.4.3 Impact on company results

In a nutshell, one could state Sensitive objects would hardly exist as a company without its intellectual property and properly filed patent applications. Venture capital firms usually would not invest in such a spin-off of a research institute if the new technology, however innovative and attractive, is not protected by any kind of IPR. Insofar, the possibility to file patent applications comprising the intellectual property of Sensitive objects is the *conditio sine qua non* for the existence of the new founded enterprise, until actual business results based on market product introduction enhance actual company financial attractiveness.

### 5.4.4 Lessons learned

The story of Sensitive objects is quite typical for IT technology spin-offs from universities and other research institutes. A core team having discovered a new technology starts a company. The company needs access to independent funds to finance its activities during the first quarters, or rather years before products exploiting the new technology make it to market. For this purpose, the new technology needs to be protected by patent applications. These patents or other IPR form the business foundation for the new enterprise. With this intellectual capital in hand, the management of the enterprise can look out for venture capitalist funds. With no visible competitive advantage in form of intellectual property, no investor would invest any money in the newly formed enterprise due to the risk of technology scavenging hampering mid-term financial returns. Consequently, the spin-off management has to position the protection of intellectual property among the top priorities of the company. This was a “must do” statement for Sensitive objects from day one.

## 5.4.5 References

Ruediger Spies, Independent Vice President, Enterprise Applications, IDC conducted research for this case study, on behalf of the Sectoral e-Business Watch. Sources and references used:

- Interview with Marc Vasseur, Vice President Marketing and Business Development, Oct. 19 and Nov. 6, 2007, by phone.
- Company presentation of Sensitive objects normally used when presenting the company to potential investors or financial institutions.
- Sensitive objects Websites: <http://www.sensitiveobject.fr>.



## 5.5 Vierling, Germany: IPR as a defence tool

### Abstract



Vierling Group, founded in 1941 and based in Germany, with 230 employees, produces special communications and measurement products and provides as well electronic manufacturing services. The portfolio of Vierling is organized in three distinct divisions: Mobile Communications, Measurement Solutions and Production. Moreover, Vierling develops and produces stationary and mobile measurement and testing equipment in solutions for telephone, DSL, broadband and IP based services. Since recently, Vierling has daughter companies in Plaisir near Paris and in Tarrytown in North America.

Vierling relies on a mix of IPR, namely patents, trademarks, copyrights as well as trade secrets. Vierling wants to protect its intellectual property in order to keep a competitive advantage and not let other companies benefit from Vierling's investments in research and development. R&D is a major investment for Vierling with the requirement to safeguard return of investment ensuring the company's future. Vierling's view is that only innovative products and concepts, added to a short time to market, can ensure the required differentiation in the highly competitive telecommunication market.

#### Case study fact sheet

■ Full name of the company:	Vierling Group
■ Location (HQ / main branches):	Ebermannstadt, Germany
■ Main business activity:	<ul style="list-style-type: none"> <li>• development and production of measurement devices for the telecommunication industry</li> <li>• development and production of network gateways between mobile and wired line networks</li> <li>• custom development and outsourced production of electronic circuit boards up to complex systems</li> </ul>
■ Year of foundation:	1941
■ Number of employees:	230
■ Turnover in last financial year:	€ 30 million
■ Primary customers:	<p>Large and medium-sized providers of telecommunication services in Europe (measurement equipment)</p> <p>SMEs in 40 countries via distributors</p>
■ Most significant geographic market:	Germany and Europe
■ Focus of the case study	Management of a full IPR portfolio

### 5.5.1 Background and business model

Vierling Group, founded in 1941 and based in Ebermannstadt, Germany, with 230 employees, produces special communications and measurement products and provides electronic manufacturing services. Typical customers are large and medium-sized

providers of telecommunication services in Europe (as regards the production of measurement equipment): other customers are SMEs in 40 countries via distributors as the indirect channel.

The company, organized as a holding, is highly innovative (with more than 10% of revenues invested in R&D, 15% of employees work in R&D) and focuses on three distinct areas with different products and customer structures. Almost all products and activities include hardware and software development for the telecommunications market. An exception to this is the line of business of electronic manufacturing services.

## Products

Vierling Lines of Business are the following:

- **Measurement solution.** This line of business is a solution provider to large and medium-sized network providers mainly in France and Germany. Typically, very specialised and innovative measurement solutions are developed for specific customers' measurement problems in the wired and mobile network space. Many unique solutions and small series solutions have been developed. The business is concentrated on a couple of European network providers.
- **Mobile communication.** This line of business produces more for the mass market. Customers are SMEs. Sales are organised via distributors and reach customers in about 40 countries around the globe with a focus on Europe.
- **Electronic manufacturing services.** A broad spectrum of customers is served by this line of business. A couple of years back, Vierling had to decide whether to close its own manufacturing line and have the production done in Asian countries or open die facilities for third-party production. Vierling decided to keep the production line and produces now from simple electronic circuit boards to complex electronic systems in highest quality for other local (European) companies.

The following section relates mainly to the line of business measurement solutions and in part to the line of business mobile communication, as those are the most relevant divisions for the actual analysis over IPR aspects.

Vierling does its own research and product development in the telecommunications sector. The gateway products make use of the fact that telephone calls from wired lines to mobile phones cost more than from a mobile phone to another mobile phone. Employees in midsize companies often need to call their sales and service representatives when they travel. Normally, in-house employees use their normal wired line telephones to call travelling colleagues. Typically, this would be a wired-to-mobile phone call resulting in high communication costs. Instead, Vierling's gateway products switch the call to a mobile call system in-house, i.e. in an extension to the switchboard system resulting in a "mobile to mobile" call. These products are based on a combination of hardware and software only. Formally, solutions for telecommunications environments have been based on electronic hardware. But those days are gone. The software portion of the development effort and the product value has grown continuously from year to year.

In order to keep up to date with latest developments Vierling is engaged in national committees around telecommunications standards, namely:

- **AKNN:** the AKNN is a self-organising working group of the telecommunications operators and manufacturers in Germany. The purpose of the working group is to

establish technical interfaces, develop operational and organisational processes in the multi-carrier environment and find solutions for general numbering and network interconnection issues in consideration of the underlying fair trade rules. It aims at maintaining the high quality standard on the national telecommunications market, minimising costs and boosting innovations in compliance with European and worldwide standards.

- DSL-Forum: this is a consortium of approximately 200 leading industry players covering telecommunications, equipment, computing, networking and service provider companies. Established in 1994, the Forum continues its drive to develop the full potential of the digital subscriber line (DSL) technology to meet the broadband needs of the mass market. In eleven years, the DSL Forum has moved through defining the core DSL technology to establishing advanced architecture standards, and maximizing effectiveness in deployment, reach and application support.

Vierling is also engaged for joint research and development in working with research institutes and universities like the Fraunhofer Institute in Munich, University in Erlangen, Universities of Applied Sciences in Nuremberg and Cologne. In addition, Vierling is in its research and development projects supported by the Bavarian ministry of economics as well as from the Bavarian economic foundation (Bayrische Forschungsstiftung), both of them supporting high tech companies in order to compete internationally.

Vierling did not make use of any European funds for research and development directly because of the bureaucratic approach and the time and money consuming application process.

## 5.5.2 IPR adoption model

Vierling relies on a mix of IPR, namely patents, trademarks, copyrights as well as trade secrets.

- Patents: 7 active patents plus 22 filed and pending patents all patents in the field of telecommunications.
- Trademarks: 4 trademarks: Vierling, Ecotel, VTM, PiQOS.
- Copyrights: those regards Vierling's publications, marketing literature, technical reports, manuals as well as user guides and protected by copyright law.

### Reasons to apply for patents

Vierling wants to protect its intellectual property in order to keep a competitive advantage and not let other companies benefit from Vierling's investments in research and development. R&D is a major investment for Vierling with the requirement to safeguard return of investment ensuring the company's future. Vierling's view is that only innovative products and concepts, added to a short time to market, can ensure the required differentiation in the highly competitive telecommunication market.

Patents have been used also, in a couple of cases, for safeguarding joint developments, when a customer has asked for a specific type of a tailor made product (i.e. measurement solution). The solution development has been discussed with the customer in a workshop. Next, Vierling's R&D department has developed a new solution "with one hand

on the computer keyboard and the other on the knobs of the oscillograph". Typically this takes a couple of weeks or even month. Sometimes, part of the development is paid by the customer. But in most cases Vierling does an upfront investment. At the end of the pilot phase the result (or only the concept) is demonstrated to the customer. In order not let the customer take the results and have it cheaply produced somewhere in Asia, and in order to benefit from the made investments in R&D, Vierling files a patent application before the final disclosure to the customer or the public. This way IPR are protected.

Vierling decides on a case by case basis what kind of IPR to use (German patents, European patents and International applications (PCT)). German patents are the majority due to much higher costs for regional (EP) or international patent (PCT) applications. Once Vierling was involved in a potential patent infringement case (regarding its own patents) but normally sees little chance to detect infringements of its IPR by others, due to upfront costs, risks and the inability to find infringing products.

## Internal IP management

Vierling has no dedicated internal resources to manage IPR. There is no dedicated internal patent attorney. The relationship to a patent law firm is managed in addition to the daily business responsibilities of the development management. The current requirements are seen as manageable together with patent law firms. The fading need for translations of European patent applications is welcome by Vierling. In order to protect Vierling's IP better it should become easier to protect computer implemented inventions.

Vierling does active competitive monitoring. Especially in the case of new developments Vierling does patent searches either to evaluate the chance for an own patent or the requirement to respect someone else's IPR. These search activities as well as patent filing and proceeding are done with patent law firms. Normally, Vierling relies on a local patent attorney but for more complex issues like international filings Vierling works also with larger remote patent law firms.

Vierling did also actively support the EU Directive for computer implemented inventions in 2004 and 2005. The Directive (that sought to endorse the practice of the EPO to grant patents for "Computer Implemented Inventions" (CII), with the effect of forcing national countries to accept those CII) was rejected by the European Parliament. Vierling was in support of the Directive because its development efforts and investments goes into software in combination with specific hardware components. The shift is clearly to the software side and there is a need to protect these solutions in the same way as traditional hardware.

### 5.5.3 Impact on company results

The firm cannot determine the direct effect of IP protection on the company's revenue or market success. The value of a single patent is extremely difficult to measure - if not impossible - unless a patent infringement happens. Currently, IPR are not licensed out so that there is no direct revenue stream linked to the IPR. Moreover, Vierling has neither licensed its know-how nor entered into any cross license agreements.

However, Vierling is using its IPR in marketing and sales activities proving Vierling's innovative potential, technological competence and future orientation. Having no patents at all would not be an alternative because Vierling's inventions could easily be copied in

foreign countries and imported to Vierling's markets.

Vierling observes that for large enterprises patents and other IPR are used as trading good and "currency", but Vierling's view is that midsize companies cannot play in this league regarding its own IPR. The effort involved and the volume of IPR required as well as the overhead dealing with large international cooperation is seen as too large.

The average cost for the protection of Vierling's intellectual property is about 40,000 € annually. Although this is a non-negligible amount for the company size and revenue of Vierling, the company is willing to invest this amount in order to be protected and not be vulnerable to competitive attacks.

#### 5.5.4 Lessons learned

Vierling is using IPR not actively as a direct competitive weapon. IPR is more used in form of passive protection mechanism of its know-how. Costs related for maintaining IPR are felt as pretty high for companies with a couple of € 10 millions in revenue. This is mainly the case for international patent applications (PCT).

However, without patents Vierling would not be able to keep its know-how from co-developments with customers in their own hand. The risk of loosing it to off-shore production companies would just be too big.

Vierling will not make significant changes to their current strategy due to resource constraints.

#### 5.5.5 References

Research for this case study was conducted by Ruediger Spies, Independent Vice President, Enterprise Applications, IDC, on behalf of the Sectoral e-Business Watch. Sources and references used:

- Interview with Georg Herrmann, Director Business Line MS, 28 September 2007
- Vierling Web site: [www.vierling.de](http://www.vierling.de), October 2007
- AKNN Web site: [www.aknn.de](http://www.aknn.de), October 2007
- DSL-Forum Web site: [www.dslforum.org](http://www.dslforum.org), October 2007

## 5.6 Comsys, Israel: choosing the country where to register patents

### Abstract



Founded in 1998 in Herzelia (Israel), with 90 employees as of October 2007, Comsys develops integrated digital baseband solutions for Mobile WiMax, UMTS, EGPRS (EDGE), GPRS and GSM networks. Comsys' offerings range from system IP for multimode 3G cellular terminals to a fully mobile WiMax baseband processor (802.16e) offered to silicon and handset manufacturers. Comsys' evolution to 4G includes an OFDM/A baseband processor with a flexible architecture and low power consumption, designed to support both TDD/FDD mobile WiMax versions, and future 3GPP-LTE.

A large part of the staff is devoted to R&D activities, confirming the high focus of the company on innovation and IP production: Comsys has an IP-based and fabless business model. Comsys registered a portfolio of 30 patents in the field of mobile and cellular technologies, and is using these IPR to protect its technology. Also, IPR serves as part of due diligence processes in front of potential investors and interested acquiring companies. The value of patents is a factor in determining the value of the company, and is an inherent part of its assets. Companies such as Texas Instruments, Quanta Computers and Datang Microelectronics choose Comsys to benefit from excellent performance, accelerated time-to-market and reduced silicon costs.

#### Case study fact sheet

■ Full name of the company:	Comsys Communication & Signal Processing Ltd.
■ Location (HQ / main branches):	Herzelia, Israel
■ Main business activity:	Integrated digital baseband solutions for mobile technologies production of electronic circuit boards up to complex systems
■ Year of foundation:	1998
■ Number of employees:	90 as of October 2007
■ Turnover in last financial year:	€ 8 million
■ Primary customers:	Industry-leading semiconductors, handset and base station equipment manufacturers
■ Most significant geographic market:	US, Asia/Pacific
■ Focus of the case study	IP as the main source of revenues in a business model without production

### 5.6.1 Background and business model

Comsys develops integrated digital baseband solutions for GSM/EDGE, UMTS and Mobile WiMax networks. Enabling numerous platforms, Comsys solutions are the choice of industry-leading chip, handset and base station equipment manufacturers. A private Israeli company, it is also supported by leading venture capital funds such as Pitango, Genesis Partners, Microdent and Koor Corporate.

Comsys' industry-leading baseband solutions are designed for efficient integration into



any type of cellular handset, chip, or base station device. As the technology partner of Texas Instruments (TI), Comsys adds EGPRS functionality to TI's TCS family of wireless chipset solutions. Other industry leaders, such as CCww, Sasken and CEVA, rely on Comsys' IP to create reference designs, complete reference platforms, and integrated mobile terminal IP solutions.

Comsys' 4G vision is of a personalised mobile high-way, enabled by multimode handsets. Comsys pioneering focus on mobile data solutions led to an advanced baseband processors design incorporating a flexible architecture with power saving features, multimode capabilities and low resource requirements. Designed with GSM/EDGE, UMTS and Mobile WiMax in mind, Comsys solutions far outperform other options that bring together multiple individual building blocks.

The vast majority (over 90%) of Comsys revenues are derived by EGGware, the IP solution package for advanced baseband processors.

Comsys manufactures its innovative developments in outsourcing model in the Far East.

### 5.6.2 IPR adoption model

Being an R&D based company, IPR have been one of the very first foundations of the company when it started. Comsys registered a portfolio of 30 patents in the field of mobile and cellular technologies; none of its patents include an essential patent (main technology breakthrough that without it the technology cannot work). The company has the potential to register additional patents but costs are a restraint at this moment in time.

### Business model and IPR

A large part of the staff is devoted to R&D activities, confirming the high focus of the company on innovation and IP production: Comsys has an IP-based and fabless<sup>47</sup> business model.

The business model for the GSM/GPRS/EDGE involves the design and license of IP rather than the manufacturing and selling of semiconductors. In the case of the GSM/GPRS/EDGE, Comsys licenses its IP to a network of "partners" that includes some of the world's leading semiconductor and systems companies. These partners use Comsys' IP designs to create and manufacture microprocessors and systems, paying Comsys a license fee for the original IP and a royalty on every chip or wafer produced.

The new product line of Mobile WiMax is different as Comsys decided to develop the IP and manufacture the chips in a foundry and then sell it as a whole to system vendors. IPR wise, the new product line of the company in the field of mobile WiMax is less problematic than the old product lines of GSM/GPRS/EDGE technologies. The IP of this standard is gathered by 400 companies and includes 2,000 patents: Qualcomm has essential patents in those fields, that helped the firm create a monopoly on IP and enabled Qualcomm to charge a lot of money to license its technology. This has caused

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<sup>47</sup> In the semiconductor industry, a fabless company concentrates its research and development resources on the end market without investing capital resources to stay current in semiconductor process technology. In other words, they are fab-less, and do not own a fab or fabrication facility - instead they rely on pure-play semiconductor foundries to manufacture their semiconductor chips on their behalf.



many problems for Qualcomm in several countries, including the US, where it is charged with limiting the competition in GSM/GPRS/EDGE technologies.

Comsys uses IPR for a defensive strategy, which can turn to be offensive if needed. The meaning is that IPR serve as a means to protect the company's assets, even if the firm is not actively pursuing other players in the field in order to sue them for patent violations.

In synthesis, Comsys uses IPR for the following goals:

- Protecting its technology.
- IPR serve as part of due diligence processes for potential investors and acquiring companies. The value of the IPR is a factor in determining the value of the company, as it is an inherent part of its assets.
- In case of litigations, Comsys will be able to use its portfolio of patents to counter attack competitors.

## Internal IP management

The Chief Technology Officer of Comsys manages IPR issues, both in the R&D stage and the procedural process of registering a patent. Comsys also uses external lawyers in the US and Israel in order to maximise the use of its intellectual property.

Comsys registers its patents as default in the US and Israel. Some of the patents are registered in the Asia region and a minority in Europe. There is no clear strategy regarding Europe: Comsys acts on a case-by-case basis, according to the density of similar developments in regions. For example, France and Scandinavia have a high density of communication vendors, so Comsys registered several patents in those countries.

Comsys does not register all its patents in Europe mainly because of cost issues. There is no mechanism that grants patents in the entire EU at a reasonable price. Today the situation is that in order to register a patent in the US (with a population of 250 million) cost is almost the same as in Belgium (with about 6 million people) and there is a need to pay for patent registration in each country separately. That makes Europe a not very cost effective region for patent registration.

Comsys has never taken part in European research programmes as they are seen to be too lengthy and time-consuming. Comsys participated in several MAGNET projects in Israel. MAGNET is a research programme deployed by the Ministry of Trade, which gathers several companies for one project, with one unified IPR. According to the company, that never succeeded because there are too many companies on the same space and no one wants to unveil its IP with competitors. Moreover, there is no protection guarantee in such programmes.

### 5.6.3 Impact on company results

Licensing its technology, based on its IP development, is the "cash-cow" of Comsys, and it represents the vast majority of its revenues.

Comsys considers its IPR as fundamental as it is an R&D-based company. The IP development itself is the core business of the company, and without it Comsys would not exist. Continuous IPR development is a natural consequence of the growth of the

company into new markets and with new product lines. There may be a negative effect on business results if there was no IPR in place, as in this situation the company will not be able to protect its assets nor be able to raise funds from venture capital. The cost of IPR is growing; Comsys estimates the cost of one patent registration at \$40,000–\$50,000 per country. To date Comsys has spent close to \$1 million on IPR procedures alone (which is a very high cost for a €8 millions revenues company) .

Comsys clients enjoy the benefits of the patents, as they may use their IP in their products with the certainty that the technology used indeed belongs to Comsys. The patents permit Comsys to outsource its production activity (lowering the production costs) with the guarantee that partners entering into the industrialisation chain are not using their inventions for different purposes.

#### 5.6.4 Lessons learned

Due to the firm high focus on innovation and IP production, Comsys is investing heavily in patents. Over the portfolio of 30 patents, only a minority are registered in Europe, due to high costs. In Europe the firm acts on a case-by-case basis, according to the density of similar developments in regions. As France and Scandinavia have a high density of communication vendors, so Comsys registered several patents in those countries.

In order to let more innovative firms based out of Europe to strengthen their industrial and R&D collaborative efforts with European enterprises, the EU Commission should find a way to make the cost effectiveness of IPR in Europe better for all companies, even small ICT firms.

#### 5.6.5 References

Research for this case study was conducted by Asaf Lev, Program Manager IDC Israel, on behalf of the Sectoral e-Business Watch. Sources and references used are:

- Face-to-face interview with Elkana Ben Sinay, CEO of Comsys Mobile, October 2007
- Comsys Website: [www.comsysmobile.com](http://www.comsysmobile.com) , October 2007

## 5.7 Array Technology, Denmark: exploiting licences

### Abstract



Revenues of Array Technologies, a small software firm with eight employees based in Copenhagen, Denmark, come 80% from sales of patented technology (sales or licenses) and 20% from services. As the patented technology is the core business of the small software firm, it's very important for Array Technologies to protect it.

Also when new tools over the initial technology will be developed, Array Technologies will try to patent them in order to maintain a unique portfolio of technologies on top of the initial invention.

The main problem the software firm has with the actual IP framework is that the patent should be granted in more countries in a simple way. Applying for different patents in different countries requires resources for language and professional support. At the moment Array Technologies is investing on average €10,000 per year for a single patent: adding more countries would lead to a cost of €20,000, only to maintain one patent.

#### Case study fact sheet

• Full name of the company:	Array Technology A/S
• Location (headquarters/main branches):	Copenhagen, Denmark
• No. of employees:	8
• Main business activity:	Production of proprietary software (80%) and services (20%)
• Primary customers:	Large companies in the manufacturing sector, software companies embedding Array's technology in their products
• Year of foundation:	1996
• Turnover in 2006 (€):	€1 million
• Most significant market area:	70% of revenues come from the US, 25% from Scandinavia, the rest from Europe
• Focus of the case study	IP-based business model

### 5.7.1 Background and business model

Array Technology was founded in 1996 in Copenhagen, Denmark, to develop and commercialise new software tools and services using the technology of array-based logic<sup>48</sup>. Since 1984, array-based logic has been used for logic configuration and control in many different applications. Configuration challenges are known in many business areas. They can be found in the sales configuration of products or services, in mass-

<sup>48</sup> Array Based Logic (ABL) is an approach to logical reasoning that has been investigated at the Technical University of Denmark. The goal of ABL is to build a model of a physical system which, once built, can be repeatedly used to deduce the values of output variables based on values of input variables.

customisation manufacturing as well as in disciplines which involve design, verification and simulation of logic models.

The first version of Array Configuration was released in 1998: since its introduction, Array's patented technology has been used in a broad range of business applications both in Europe and in North America. By solving core constraint problems and removing complexity from application design, Array Technology (AT) has made life easier for both developers and end users. The patented constraint engine precompiles model data into an extremely compact format using array-based mathematical principles. Product descriptions, created by domain specialists in the Array Studio platform, are accessed through the RunTime API ensuring that developers can interact with the product data using only a few generic method calls.

The staff at AT (8 persons) have been involved in the development from the very beginning and have many years of experience in developing software solutions for customers in the fields of product configuration and embedded control. Today, 30% of total operating costs are devoted to R&D activities.

The company has continued to increase its turnover (in 2006 revenues totalled €1 million approximately), even throughout the recent period of slow global economic growth, thanks to strong value-added reseller and OEM partnerships. 70% of revenues come from the US, 25% from Norwegian countries and the rest from Europe. With revenues that are approaching €1 million, the firm is growing and expects to double its revenues in a three years time.

### 5.7.2 IPR adoption model

The initial research in array-based logic which led to the AT patented software technology was carried out in a joint research project between the Danish company Bang & Olufsen and the Technical University of Denmark. So AT was at the beginning a spin-off of Bang & Olufsen: a very clear distinction was made about the ownership of IPR, which from the beginning were owned by AT. Today all the IPR and patents of the AT technology is 100% owned by AT: Bang & Olufsen owns a very different technology on the same mathematical foundation, which was developed at the Technical University of Denmark. This aspect, which is essential in order to guarantee the success of the start-up, is quite easy to achieve in Denmark. Close cooperation of AT with the University is ongoing.

At first the technology was patented as a European patent (in 1998), then the patent was also granted in the United States and in three European countries (France, Germany, United Kingdom). At the moment AT owns only one patent family but more applications are expected to be filed in the future. The firm has never had any litigation with other companies regarding the patent, and doesn't have IP insurance, nor is thinking of having any.

Regarding the management of intellectual property, it is the responsibility of the CEO of the company; a patent attorney is also used in Denmark.

AT is pretty comfortable with the actual IPR framework, and has never had problems or has needed to take action against possible violations of its patent. Also, it has to be noted that AT operates in a very specific niche market, and there is not much competition around its core technology. The company has never participated in European research projects and regarding open source, it is not interested in making its software code available to customers. Perhaps this will happen in the future but not for the core

technology, only for other tools written on top of it. The reason is that the open source model lets a company gain important visibility over a large community of developers, but AT doesn't really need to do this at the moment.

Other means used by the firm to protect its IP are:

- Registered trademarks, for protecting its products brands and the associated marketing effort (more will be provided in the future, as the software portfolio grows).
- Secrecy, that is considered an important internal measure to protect know-how.

### 5.7.3 Impact on company results

AT's revenues come 80% from sales of the patented technology (licences) and 20% from services. As the patented technology is the core business of the small software firm, it's very important for AT to protect it, as explained below. Also when new software tools over the initial technology will be developed, AT will try to patent them in order to maintain a unique portfolio of technologies on top of the initial invention.

The patents is relevant for the firm business model for the following reasons:

1. **Protect from duplication.** The first reason to apply for a patent in the case of AT was the need to protect the value of the software invention. Being a new, state-of-the-art configuration technology, the patent serves to protect the invention from duplication when licensed.

*"Since we are licensing the core technology," explained Gert L. Moeller, CEO and founder of the company, "we have to be open about the scope and limits of the functionality of the technology and explain how it works. Therefore, it is very important to ensure good patent protection of the basic methods of the technology."*

2. **Technology incorporated in other software products.** Also, being used by other software vendors, which embed it in their products, it has to be strongly protected.
3. **Large clients are asking access to the technology, strong protection is necessary.** As direct customers are implementing it in large sales and marketing departments, the protection serves also in this case.

Instead, the patent didn't serve to access venture capital, when the firm started to operate independently, as the company was able to grow organically.

The main issue encountered is that one European patent would be very important, in order to reduce the cost of translation of the patent in many languages.

*"A pan-European patent should be granted," said Moeller. "Applying for different patents in different countries requires many expenses for language and professional support. In particular we have found that the translation of the patent in Japanese is very costly, around €15,000."*

The patent should be granted in more countries in a simple way. At the moment AT is investing €10,000 a year for one patent: adding more countries will lead to a cost of €20,000, only to maintain one patent.

#### 5.7.4 Lessons learned

As the patented technology is the core business of the small software firm, it's very important for Array Technologies to protect it. Also when new tools over the initial technology will be developed, Array Technologies will try to patent them in order to maintain a unique portfolio of technologies on top of the initial invention. The main problem the software firm has with the actual IP framework is that the patent should be granted in more countries in a simple way.

#### 5.7.5 References

Research for this case study was conducted by Elena Vaciago, senior researcher IDC EMEA, on behalf of the Sectoral e-Business Watch. Sources and references used:

- Interview with Gert L. Moeller, CEO and founder of the company
- Company Website: <http://www.arraytechnology.com/pageSolution.asp>

## 5.8 DxO LABS, France: an IP-based business model

### Abstract



DxO Labs is a French software firm with 100 employees that develops and licenses Intellectual Property (software IP and silicon IP<sup>49</sup> for embedded architectures) serving the entire digital imaging chain: licensing of optics and silicon architectures for embedded still and video image processing; image quality evaluation and measurement tools and methodologies and image quality enhancement software for consumers. Approximately 90 of the 100 employees are devoted to R&D activities, confirming the high focus of the company on Innovation and IP production: DxO has an IP-based business model that is becoming more common in the electronic components market following the example of the British ARM. DxO has around 20 patent families (when one patent application results in several patents in many different countries, all of the patents and applications associated with the original patent application is called the patent family), obtained mainly in Europe, North America, China, Japan, Korea and India. DxO develops strong collaboration with a network of leading academic research centres and key individuals in applied mathematics. Actually, use of IPR is defensive and internal (patents used to protect and sell its products), intended to build the value of the firm around its knowledge and inventions. The firm, expecting to have a larger portfolio of patents, foresees new sources of revenues from a different use of patents, but to achieve this result, the cost to obtain and maintain patents should be lower.

### Case study fact sheet

• Full name of the company:	DxO Labs
• Location (headquarters/main branches):	Headquarter in Boulogne-Billancourt, near Paris, France and offices in California (USA), Tokyo (Japan) and Seoul (Korea)
• No. of employees:	100
• Main business activity:	Licensing of optics and silicon architectures for still and video image processing
• Primary customers:	Consumer electronics manufacturers; Imaging components suppliers; demanding photographers
• Year of foundation:	2003
• Turnover in last financial year (€):	not available*
• Most significant market area:	Europe, USA, Japan, China
• Focus of the case study	IP based business model

\* The company is owned by founders and VC funds and no information is provided about financial results or costs.

<sup>49</sup> Silicon IP are silicon-proven Intellectual Property blocks, as analogue, digital and wireless/radio building blocks and platforms for use in ASICs (application-specific integrated circuit). As semiconductor processes continue to shrink, the complexity of ASICs continues to grow and markets demand ever-shorter design cycles, ASIC developers must employ re-usable components as Silicon IP from dedicated libraries.



### 5.8.1 Background and business model

DxO Labs S.A. (“DxO”) was created in 2003 as a spin-off of Vision IQ (one of the main companies in the field of computer vision). Financed by leading European and Japanese venture capital funds, the company employs today around 100 people. DxO has its headquarter in Boulogne-Billancourt, near Paris, France and offices in California (USA), Tokyo (Japan) and Seoul (Korea).

DxO offers products and solutions ensuring high results in digital imaging. DxO Labs develops and licenses Intellectual Property (software IP and silicon IP for embedded architectures) serving the entire digital imaging chain: licensing of optics and silicon architectures for embedded still and video image processing; image quality evaluation and measurement tools and methodologies; image quality enhancement software for consumers.

Its optics and silicon architectures for embedded still and video image processing, protected by international patents, enable the design of digital camera modules delivering the high image quality while meeting industry requirements for reduced size and cost. The firm provides also services to its customers in order to facilitate the integration of its products.

DxO technology is used in

- Mobile Imaging (cameraphone, camera module, sensor and processor ) and
- digital cameras.

DxO customers are typically large companies that produce digital cameras or camera phones (consumer electronics manufacturers), or manufacturers of electronic components for these markets (as ST Microelectronics and MagnaChip).

Another market is that of professional photographers, as well as photography journalists and imaging experts, that are buying directly DxO software for high quality image processing DxO Optics Pro. In that case, the firm is selling (from the web site or via resellers) its proprietary software that comprises also patents.

Large part of the staff (approx 90%) is devoted to R&D activities, confirming the high focus of the company on Innovation and IP production: DxO has in fact an IP-based business model that is becoming more common in the electronic components market following the example of the British ARM. The ARM business model involves the production and license of IP rather than the manufacturing and selling of physical semiconductor chips. ARM licenses its IP to a network of 'production partners', or better said customers, which includes most of the world's leading semiconductor and systems companies. These partners utilize ARM's IP designs to create and manufacture microprocessors, peripherals and system on-chip designs, paying ARM a license fee for the original IP and a royalty on every chip or wafer produced. DxO, as well, sells its IP that is in fact an algorithm that can be integrated in digital camera components.

### 5.8.2 IPR adoption model

DxO has around 20 patent families (when one patent application results in several patents in many different countries, all of the patents and applications associated with the

original patent application is called the patent family), obtained in many different countries, mainly in Europe, North America, China, Japan, Korea and India.

DxO has developed strong collaborations with a network of leading academic research centers and key individuals in applied mathematics. DxO, when collaborating with public researchers, is particularly interested to make sure that IP will be owned by the firm.

According to DxO, reasons to apply for patents are:

- Defensive strategy. Patents are a way to protect the technology that could be copied by competitors or customers (as large manufacturers of digital cameras)
- Put the company in a stronger position: increase value, reputation, and possibly sell the products at a higher price.

Another measure to protect the internally developed know-how is secrecy: this informal IPR can be applied in a simple way and without the effort required for patents.

Main issues encountered with the actual patenting system are:

- The high cost for patenting: not only to award and maintain a patent, but especially for the official translation in other languages. This cost is said to depend on the size of the application, technologies covered, and, most of all, the country chosen.
- A single European patent would be recommended, not only the centralized process for European Patents but also a unique patent for all EU.

DxO has participated to a standardization initiative on image quality (sponsored by I3A - the non-profit International Imaging Industry Association - one of the largest imaging industry groups worldwide). The standard was not based on its patented technology, but DxO participated anyway, believing the initiative was useful to raise awareness in the industry about new technologies aimed at improving image quality.

Internal management of IPR is organized in the following way:

- A legal attorney is responsible of the contractual frameworks and protection of IP generated by DxO.
- Researchers are involved in the development of patentable inventions: is part of their daily job;
- External patent attorneys are required as well, as they are mandatory to file patents for example to the EPO ("They know how to talk with the EPO –has said B. Liege, Chief Operating Officer of DxO– it would be very difficult to organized it differently")
- An IP Committee has been created and organized, involving marketing and R&D directors to monitor all these activities, and also to try to focus IP protection tasks on R&D and business efforts.

### 5.8.3 Impact on company results

IP production is the core business of the firm, that, as happens in the software market, depends completely for its results on sales of IP. In order to protect its IP, the firm has chosen to invest in all available IP protection methods.

IP protection, via patents, copyright and trademarks is strategic for DxO, and in order to be efficient, the firm has dedicated efforts to the best management of IPR. Actually, use of IPR is defensive and internal (patents used to protect and sell its products), intended to

build the value of the firm around its knowledge and inventions. With the expected growth of its portfolio of patents and new sources of revenues from a different use of patents the firm can hope to enter in process of licensing businesses and/or cross-licensing. At the moment, the company chooses to apply for patents only for inventions that can be immediately applied and sold. Also, DxO applies for patents only in fields where it can detect eventual infringements.

Having dealt with patents from the beginning, DxO has developed internal experience and skills on how to apply appropriately, and believes this is a competitive advantage over other small firms in the market and new entrants.

#### 5.8.4 Lessons learned

According to an innovative, R&D focused young firm, IPR are vital both for protection of the developed IP and to increase the value of the firm operating in global markets.

Having a broad patent portfolio, the firm has been particularly careful in the definition of an internal IP management structure: this was done, as the patent portfolio in growing, to be prepared, with the right skills and structure, for a complete exploitation of the strategic value of patents, and also to set up an IPR management compliant with best practices, that is achieved monitoring of all the internal activities done to obtain patents, and trying to streamline IP protection tasks according to R&D most important outputs, also trying to apply for patents only for inventions that can be immediately applied and sold.

The high cost of patenting is seen as a constraint: the firm has to apply for patents only for inventions that can be immediately applied and sold.

#### 5.8.5 References

Elena Vaciago, senior researcher IDC EMEA, on behalf of the Sectoral e-Business Watch, conducted research for this case study. Sources and references used:

- Interview with B. Liege, Chief Operating Officer DxO and X. Pican, Legal Director DxO, July 2007
- DxO Labs Website: <http://www.dxo.com>.

## 5.9 Fluendo, Spain: choosing open source and copyright

### Abstract



*Fluendo is a Spanish small software company, founded in 2004 in Barcelona and specialised in delivering software products and, where necessary, related consulting services, on Unix and Linux multimedia platforms.*

*Fluendo supports the development of the GStreamer multimedia framework, which is emerging as the standard media open source framework on Unix and Linux platforms. The firm is both developing an open source solid multimedia framework for software developers and producing, over this framework, proprietary products that are used by end users, both developers and consumers.*

*Business results of the software firm depend on the business model chosen: having started as an open source company, revenues depended in 2006 a quote of 90% from services and the resulting 10% from software licences, but in 2007, as proprietary software licences started to be sold only this year, revenues will come 10% from services and 90% from software licences.*

#### Case study fact sheet

• Full name of the company:	Fluendo S.L.
• Location (headquarters/main branches):	Barcelona, Spain
• No. of employees:	10
• Main business activity:	Software development (both open source and proprietary)
• Primary customers:	Large public organisations, movie studios and multimedia producers, software companies, end users
• Year of foundation:	2004
• Turnover in last financial year (€):	€ 800,000 (2006); the same is expected for 2007
• Most significant market area:	20% from Spain 80% from other EU and US
• Focus of the case study	IPR role and management in company with an open source-based business model

### 5.9.1 Background and business model

Fluendo is a Spain-based small software company specialised in delivering products and consulting services on Unix and Linux multimedia platforms.

Fluendo supports the development of the GStreamer multimedia framework (which is emerging as the standard media open source framework on Unix and Linux platforms): the software house staff includes some of the core GStreamer developers in that open source community, resulting in a unique advantage for delivering first class solutions to partners and customers.

The firm is both developing an open source solid multimedia framework for software developers and producing, over this framework, proprietary products that are used by end

users, both developers and consumers. Fluendo is also delivering consulting services to its corporate customers, having developed in that way a mixed open source-proprietary software- associated services business model.

Typical customers are:

- large public organisations (the French parliament, universities and public bodies),
- movie studios and multimedia producers (Dreamworks),
- software companies and individual developers,
- end users, consumers.

The proprietary software produced by the company comprises a wide range of codecs<sup>50</sup> for the GNU/Linux and Solaris desktop and server systems. The codecs plug directly into the GStreamer multimedia framework available on all the major GNU/Linux and Solaris systems. Users of GNU/Linux operating systems (that are growing rapidly with the diffusion of the open Linux platform) have previously lacked solutions which enabled them to license and use popular media formats such as Windows Media, MPEG-2 and MPEG-4 in accordance with the laws of their country. Through Fluendo's agreements with Microsoft and MPEG LA such a solution is now available.

By closely integrating with the GStreamer multimedia framework, Fluendo's new plugins enable support for these widely used codecs in popular GNU/Linux and Solaris applications such as Totem Video Player, Rhythmbox music player, Banshee Music player, Elisa Media Center and the Jokosher sound editor. The close cooperation between Fluendo and the Totem media player project means that the plugins automatically enable support for media enabled Web sites (such as cnn.com) which use Windows Media formats and streaming protocols.

Other products Fluendo is selling are multimedia tools, such as DVD players, always offering multimedia capabilities to Linux and Unix users.

Business results (revenues for 2006 totalled €800K and this year it will be about the same) depends on the business model chosen: having started as an open source company, in 2006 it depended 90% on services and 10% on licenses, but this year, as the proprietary software licences started to be sold in 2007 (and will probably number 20,000 before the end of the year), revenues will be made up of 10% from services and 90% from software licences.

## 5.9.2 IPR adoption model

The company, which has been investing heavily in R&D for the first two years of its life (from 2004 to 2006) to implement the open source GStreamer multimedia framework, as this is an "open source" project, was not allowed to protect with patents any software developed. In the free software ecosystem, there is no space for patents: the only way to operate is to use copyright and comply to the rules set up with a specific OS licence. The company is not particularly interested in looking to see if others are infringing its products'

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<sup>50</sup> A codec is a device or program capable of performing a Compression/Decompression algorithm. In multimedia applications, different video codecs (as Mpeg, Windows Media Video and many more others), installed on a personal computer or other devices, enable storing and using videos in digital forms.

copyright or to challenge violations: whereas on one hand it would be too hard to pinpoint violations, on the other hand the firms believes that some activities of this type are unavoidable: there will always be someone not wishing to pay for copyrights, but this contributes to the diffusion of Fluendo products.

Fluendo has produced proprietary software that is based in some cases on other companies' patents (as an example, Windows Media is a standard that has been patented by Microsoft). Fluendo requested the licence from Microsoft to write the codec that lets Linux users see Windows Media format videos, but having the permission was not an easy job: in order to get it, Fluendo had to intensively negotiate. This proprietary software is protected only via the copyright, as Fluendo is in general not favourable to patenting its software. Reasons are:

- As open source software is generally incompatible with patents, no one in the open source community would use or develop it.
- The company could eventually try to patent its proprietary software, but would have too weak a position in the marketplace to enforce its patents: in case of litigation, Fluendo wouldn't have enough patents to counterbalance those of other companies (typically large international corporations) and expenses for enforcement would be too high.

Other problems that the current IPR framework presents are:

- Complexity of the process.
- Use of patents too much addressed to start litigations with possible infringements.

### 5.9.3 Impact on company results

Having chosen a mixed business model, with the development of both open source and proprietary software, copyright is seen as an important tool to protect its business. This happens also because, in the digital era, as with many other small software companies, Fluendo is selling its products through its website, to both consumers and large businesses with Linux or Unix computers.

Copyrights have to be managed carefully especially for the open source software: Fluendo has invested in legal services for adopting a correct use of software licences. The GPL license (General Public Licence<sup>51</sup>), is in fact a very invasive licence, not compatible with others, are there is a risk of conflicts that need to be avoided.

The actual copyright framework is seen as effective for its business model, and Fluendo depends heavily on it as revenues come from the sale of software licenses.

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<sup>51</sup> The GNU GPL is the most popular and well-known example of the type of strong copyleft license that requires derived works to be available under the same copyleft. Under this philosophy, the GPL is said to grant the recipients of a computer program the rights of the free software definition and uses copyleft to ensure the freedoms are preserved, even when the work is changed or added to.

#### 5.9.4 Lessons learned

Fluendo's experience is particularly insightful for the business model the firm has chosen, that is a mix of the open source development plus services and proprietary software development. In order to provide its customers with a complete platform for multimedia applications, Fluendo had also to incorporate in its multimedia framework the licence from Microsoft — in order to write the codec that permits Linux users see different video formats (such as Windows Media). This move has provided the software firm with a unique offering, that is very valuable in the open source and Linux marketplace. The issues were how to solve some legal controversies, also having to manage carefully the co-existence of different licences, open source and proprietary.

The lesson learned is that, regarding the current framework, there is the possibility of producing innovative and open solutions, with new business models open to many possible scenarios.

Even so, a small company in order to produce software interoperable and compatible with other producers' software frameworks, has to address difficulties that, without proper legal help, could be overwhelming. In this case, patents are considered by the firm more as a risk than a competitive weapon, and the size of the enterprise could be seen as a disadvantage against larger competitors that have the means of negotiating for licences. It is true that recently European antitrust bodies have been very active in prosecuting software firms that are not open enough to interoperability (as in the case of Microsoft), but the antitrust intervention is possible only for major cases, not in all contexts.

#### 5.9.5 References

Elena Vaciago, senior researcher IDC EMEA, on behalf of the Sectoral e-Business Watch, conducted research for this case study. Sources and references used:

- Interview with Julien Moutte, president and founder Fluendo, September 2007
- Website: <http://www.fluendo.com>, September 2007.



## 5.10 iMatix, Belgium: protecting custom software without patents

### Abstract



*iMatix was founded in 1998 in Brussels, Belgium, to research and develop new technologies and innovative products for the internet. Today the company has ten employees. iMatix produces systems for some of the world's largest companies, and free software products for the internet community. It is an active participant in standards and industry workgroups. Together with the JPMorgan bank it wrote the original Advanced Message Queuing Protocol (AMQP) specifications and was a founding member of the AMQP Working Group with the aim of delivering AMQP as an industry standard. iMatix is a corporate patron of the FSF (Free Software Foundation) along with such firms as MySQL, Google and Cisco.*

*Regarding the use of intellectual property rights, iMatix has never used the patent system, but uses trademarks, trade secrets, copyrights and internet domain names heavily. iMatix believes that copyrights, trademarks and trade secrets are the best forms of ownership for the IT sector compared with software patents. Also, these forms of protection let competition be open and foster market growth compared with monopolies, which are sometimes based on patented inventions. Open standards are also seen as the best basis for innovation and competition, compared with closed and licensed standards.*

#### Case study fact sheet

• Full name of the company:	iMatix Corporation
• Location (headquarters/main branches):	Brussels, Belgium
• No. of employees:	10
• Main business activity:	Software development (open source software, proprietary software, customised software, software-related services for businesses)
• Primary customers:	Large firms in the finance sector
• Year of foundation:	1998
• Turnover in last financial year (€):	€500K
• Most significant market area:	US, UK
• Focus of the case study	IPR role and management in a company with an open source strategy

### 5.10.1 Background and business model

iMatix was founded in 1998 in Brussels, Belgium, to research and develop new technologies and innovative products for the internet. Today the company has ten employees and presents a mixed business model, with development of open source software, proprietary software and customised software. It also provides software-related

services to its clients, which are mainly large firms in the finance sector.

The company is very innovative (with more than 25% of revenues invested in R&D) and focusing on different activities concerning software development, with a wide range of initiatives, from open source projects to the production of proprietary software products.

In the following are described iMatix lines of business:

- Development of an open and interoperable messaging standard. An open source project that has led to the production of the OpenAMQ server (used by the JPMorganChase bank to migrate its investment bank trading system off a legacy middleware).
- Open source code and related services. Together with the open source software (a free software licensed under the Free Software Foundation's GPL), the company had developed an offering of consulting and training services. As an example, the Xitami Web server (a technology recognised for the internal multithreading engine, developed by iMatix, that lets the Web server run on slower machines) is downloadable for free, but a commercial version of Xitami is also available, with a support fee charge of about £100 per annum.
- Custom software development. Specialised in Web technologies, iMatix also produces custom software for some customers.
- Proprietary software development. New developments are also intended to bring packaged software products to the market.

iMatix has been involved for many years in the cooperative work of developing standards and protocols for middleware environments: together with JPMorgan, Cisco Systems and other ICT vendors iMatix formed the AMQP (Advanced Message Queuing Protocol) Working Group, with the objective of creating a new specification for defining and developing a messaging infrastructure that is technology agnostic, standards-based, open and interoperable. The resulting specification is an open standard, intended to enable the development of highly stable, efficient, flexible messaging-dependent applications. Regarding European research projects, iMatix believes that the setting up of processes is too bureaucratic and time-consuming, inhibiting the firm from participating in research projects with a consortium of enterprises.

Actually, revenues originate mainly from sales of services (consulting, custom development) and licences for support, in equal percentages. After a period of low growth after the dot-com boom years, iMatix is now experiencing a moderate revenue growth.

Regarding the organisational model, iMatix is highly virtualised. It uses Internet connections from locations in Belgium (where the 10 employees are based) to other sites from where independent developers are participating to iMatix projects, in Slovakia, New Zealand, Australia and Poland. Most of these virtual teams consist of two to five people and are tightly focused on key projects, typically of large dimensions and for a restricted number of customers. Internet-based communications are used extensively (i.e. chat, Wikis, mailing lists, Voice over IP), both internally and for communications with clients. This is done in order to exploit high-level competencies where they reside and also to access lower-waged IT professionals in emerging markets.

According to iMatix, the sector in which it operates is now seeing strong competition and lower prices: this is leading the firm to develop a more distributed and flexible organisation in order to find highly skilled professionals in lower-waged countries (such as Poland, Bulgaria and Slovakia). In Poland the firm is investing in start-ups where

independent teams can work from remote sites on joint projects. At the moment iMatix is mainly concerned with the development of applications in specific areas such as finance and human resources.

## 5.10.2 IPR adoption model

### Overview

Regarding the use of intellectual property rights, iMatix uses extensively trademarks (2 in 2006, expected to become 3 in 2007), trade secrets, copyrights (for 150,000 files in 2006, expected to become 200,000 in 2007) and internet domain names (200 already registered). As stated by iMatix, reasons for adopting these IPR are:

1. Copyrights protect investments in R&D and product development.
2. Trademarks protect investment in reputation.
3. Internet domain names enable marketing via the Web.
4. Trade secrets protect confidential designs.

### Copyrights

According to the company, copyright is free, automatic, proportional and very effective for all domains it covers, even for open source software. The software firm has never been involved in litigation for its copyrights: if a company wants to change the iMatix open source software, it needs only buy the license. Copyrights are an essential tool to protect the software produced and do not present difficulties in managing them nor require special competencies (the management of a typical small software house has the essential culture to deal with these rights).

### Trademarks and domain names

The company sees internet domain names as a cheap form of trademarks: iMatix has registered approximately 200 different domain names for its products. Trademarks are registered only in the US, as mostly of the competition is coming from this country. Secrets and confidentiality agreements are also used heavily, in an easy and effective way.

### Patents and litigation risks

Instead, the patent system is largely unusable for iMatix. For software firms, the patent system presents many issues:

1. iMatix considers the patent system as being too expensive, slow and inappropriate for software.
2. The time taken to acquire patents is too long (five to seven years, when it should be immediate).
3. The cost for a patent is too high (€10K–20K; it should be under €250); instead, for other IPR, costs are: copyright: free, trademarks: approx. €2,000; domain

name: €12.

4. The lifespan is too long (20 years; it should be three to four years).
5. Litigation risk is too high (there should be near-zero litigation risk). Holding useful patents would make the firm a target for hostile litigation, from other companies developing proprietary software and holding patents in similar fields.
6. Instead of guaranteeing continued or increased innovation, the patent system is seen to expand in the area of software patents, where it can be counterproductive.

As a result, iMatix' business is negatively affected when the company is unable to determine accurately whether its products and services are "legal" in other member states, so that iMatix is exposed to a significant and unmanageable risk if it decides to export. Software patents make this risk very high and there is no insurance available for software patent infringement. Also, in nine years of operation, iMatix has only once had to cancel a developed product line (in the mobile application space) because of a software patent claim on a small part of that product. It has never had any business conflicts over copyright, nor over trademarks or domain names.

*"Before the introduction of bad patents, the patent system was of low importance to us,"* said Pieter Hintjens, CEO of iMatix Corporation, author of numerous software tools published by the company, and president of the Foundation for a Free Information Infrastructure (FFII), a not-for-profit association registered in twenty European countries, dedicated to establish a favourable environment for the development of open source software, based on copyright, free competition, open standards. FFII strongly opposed, with success, the software patent directive from 2003 to 2005.

*"We did not file patents since we operated in a domain that was adequately protected by copyrights. Furthermore, the EPO has told us on several occasions that software could not be patented, so we assumed this was 'off the radar'. However, since we started getting phone calls and threats from patent-owning firms, on the basis of pure software patents, we have been forced to move the patent issue to become a top priority<sup>52</sup>".*

The software firm would like to publish some of its innovations, especially in the field of blueprints and software architectures (in order to receive a fast feedback from the marketplace and strengthen cooperative research relationships with third parties), but this would require fast processes or registration and patent protection, with an immediate effect and a shorter duration than the one provided by the actual system.

At the moment, with the IT industry finding more productive ways of innovating via a completely open framework, as in the case of open source software (that is a powerful and very efficient way of realising solutions than can be easily modified or adjusted to fulfil customers needs), there are doubts that patenting an innovation in the software field is still a way to stimulate innovation and investments in R&D.

Being involved in open standard implementation processes, iMatix believes that the dependency on patented inventions should be avoided at all in a standardisation process. In its experience, standards based on patented inventions do not create new markets, except to those who hold the patents.

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<sup>52</sup> iMatix Corporation answers the Commission, 13/3/2006  
[http://consultation.ffii.org/iMatix\\_Answers](http://consultation.ffii.org/iMatix_Answers).

### 5.10.3 Impact on company results

iMatix believes that copyrights, trademarks and trade secrets are the best forms of ownership for the IT sector, as compared to software patents, which may stifle innovation. They also consider open standards as the best basis for innovation and competition compared to closed and licensed standards.

Regarding copyrights, iMatix owned in 2006 approximately 150,000 copyrighted files, and this is expected to increase to 200,000 in two to three years. Its business model depends primarily on these licenses. Also, the firm was using two trademarks in 2006, and expects to have at least three in two to three years. The only cost for this form of protection was estimated to be €1,000–€2,000 for the trademarks.

The actual patent framework, that let companies patent their software inventions in other countries, and in some cases also in Europe (if we consider that in recent years also the EPO has started granting patents for Computer Implemented Inventions (CII)), is negatively affecting iMatix business models. The software firm, at least in one case, had to cancel a developed product line (in the mobile application space) because of a existing software patent claim on a small part of that product.

### 5.10.4 Lessons learned

Being a small software firm, involved in open source and standardisation initiatives, iMatix has a very bad perception of the actual patent system, seeing it as largely unusable, being too expensive, slow, inappropriate for software, with the time taken to acquire patent too long (five to seven years), with a cost for a patent too high (€10K–€20K), with a lifespan too long and litigation risk too high.

Thinking at the beginning that it was sufficient not to file patents (since operating in a domain that is assumed to be adequately protected by copyrights), iMatix, quite recently started to threaten patent-owning firms that could start litigation (based on their registered patents) in order to stop the development of the firms' new products, especially in the field of open source.

As regards copyrights, trademarks and trade secrets, those forms of protections are seen as valuable and well functioning.

### 5.10.5 References

Elena Vaciago, senior researcher IDC EMEA, on behalf of the Sectoral e-Business Watch, conducted research for this case study. Sources and references used:

- Interviews with Pieter Hintjens, founder of the iMatix Corporation, June 2007
- iMatix Web site: <http://www.imatix.com/>
- FFII Web site: <http://www.ffii.org/>, <http://www.esoma.org/>

## 6 Conclusions: outlook and policy implications

### 6.1 Outlook

The development of the knowledge economy is changing the scenario for the use of IPR, an essential tool for competitiveness and innovation strategies. ICT SMEs are fully involved in this scenario, as market trends and globalization force them to deal with international competition and adapt to the reorganization of world supply chains. A recent study<sup>53</sup> estimated that about 41% of European ICT SMEs are innovative and confirmed the link between innovation, research investments and business performance. The results of this study confirmed a link between innovation strategies, the extension of IPR portfolios and positive business performance. In addition, the survey unveiled a level of diffusion of formal and informal IPR among ICT SMEs higher than expected (based on traditional literature on IPR), even if a direct comparison with previous surveys is not possible. We can conclude that ICT SMEs participate to the general trend towards a greater use of IPR and this trend is likely to continue.

Nevertheless, there is a gap between the actual use of IPR and the potential benefits, which ICT SMEs might gain, if they exploited the full range of IPR tools. Only a minority of ICT SMEs (23% of IPR users in our survey) can be defined Advanced Users. Even they do not appear to be very sophisticated in their management of IP. For example, very few ICT SMEs carry out comparative evaluations of their IPR portfolio, to improve their choices and strategies.

The main problems faced by ICT SMEs in their IPR strategies fall into two broad categories:

- The first concerns problems specific to the ICT sector, which affect ICT SMEs more than their larger competitors in the same industry. The cumulative and relentless innovation process typical of the ICT industry, with short product cycles, is not well suited to the slow mechanism of formal IPR registration, particularly the patent system. Therefore ICT SMEs have problems to find the best way to protect their knowledge but also share it, in an environment characterised by growing interoperability and networking. This is one of the reasons for the approach to IP promoted by ICT SMEs adopting Open Source Software business models. Moreover, the ongoing conflict about the validity of software patents and their role in the competitive scenery divides ICT SMEs. Not all SMEs contest software patents in toto: some make use of them pragmatically, and others find software patents indispensable to protect their inventions against foreign competitors or to ask for funding. A similar conflict extends to the ICT standards arena, particularly open standards, where there is deep disagreement about the best way to deal with IPR. Some ICT SMEs (and some large players) argue that IPR stand in the way of open standards development and should not be used at all in that context. Others believe that IPR must be recognized to maintain incentives for innovation development. In any case, most ICT SMEs argue that their interests and inputs are under-represented in the ICT standard development process, an issue coming under focus in the EC policy debate, but not easy to solve. In other words, IPR problems have become an important part of competitive games in the industry, so policy has to deal with them from this perspective.

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<sup>53</sup> "Innovative ICT SMEs in Europe" by IDC EMEA for DG INFSO and Media, see references



- The second category of problems is not industry-specific, but is in common with all other high-tech SMEs. They descend from the inherent weaknesses of small enterprises: undercapitalization and lack of specialised human resources, which lead to lack of specific knowledge and poor quality IPR management practices, especially concerning maintenance and litigation. There is also a threshold effect, meaning that only medium-large ICT SMEs are able to accumulate an IPR portfolio sufficient for cross-licensing and negotiation in networking alliances, an important emerging use of IPR. The shortcomings of the European patent system (particularly long process time and translation costs) represent one of the main barriers from this point of view. However, these problems about IPR can be more or less relevant, depending on the competitive positioning, type of market addressed and business model chosen by the firm. According to literature, these barriers to IPR adoption (lack of awareness and high costs) represent a market failure. Therefore, many policy interventions are aimed at stimulating awareness and providing support services to reduce the burden of IPR adoption for SMEs. More recent research found that SMEs have few patents but exploit them more and often better than large firms. This raised doubts about the need to lower the barrier of access to patenting for SMEs, suggesting instead maintaining high quality thresholds and helping SMEs to meet them.

This study suggests that the traditional policy view is under many aspects obsolete: IPR policy is no more a relatively simple technical issue, to be solved with straightforward support to smaller firms, without no concern with industry specificities. The reality of ICT SMEs is complex and the role of IPR varies substantially, depending on the business strategies and competitive positioning. IPR policy is growing more relevant for ICT competition and innovation policy strategies. For example, poor IPR may prevent ICT SMEs from joining profitably global supply chains. There is not a simple solution fit for all, but there is a need for policy action to remove barriers and enable small, innovative players to implement the right IPR strategy to compete effectively. IPR policy should be revised, to deal with the ICT industry competitive scenario and with the cycle of adoption, implementation and maintenance of IPR by ICT SMEs.

In conclusion, there is a need for a revision of the basic assumptions of IPR policies for ICT SMEs, to take into account the new range of emerging needs, in order to articulate better incentives and support measures. This study did not include the development of specific policy recommendations, but the following sections describe the policy implications descending from these considerations based on the study results.

## 6.2 Policy implications

### 6.2.1 Improve the quality of IPR adoption and management by ICT SMEs

Improving the quality of IPR adoption and management by ICT SMEs remains a valuable policy goal.<sup>54</sup> The study survey found that about 66% of ICT SMEs in the sample have small or limited IPR portfolios, with no dedicated management and very low investments. Very few rely on external support, such as patent lawyers. The expert participants of the

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<sup>54</sup> See also the EC's "Small Business Act" in European Commission (2008d).



Paris workshop, who discussed the study results,<sup>55</sup> agreed that many of these ICT SMEs would profit from improving the quality of their IPR choices and management, and that much of the problem is related with skills and competence. It is increasingly important for entrepreneurs, inventors, researchers, ICT SMEs employees and business consultants to improve their knowledge of the IP system, in order to manage effectively their intellectual assets and integrate better their IPR strategies in their business strategies. In addition, hidden costs of enforcement and litigation are among the most important barriers against an advanced use of IPR, and firms need to learn how to anticipate and deal with them. But it is unrealistic to expect small firms to be able to invest into this knowledge individually: there is a need to promote economies of scope and scale, by encouraging the creation of shared pools of knowledge and shared services in this field for networks/clusters of ICT SMEs. In order to do so, and to address the needs of Innovative ICT SMEs:

- There is a need for streamlining and reinforcing the broad range of IPR support services for SMEs, already existing in Europe. These services include pro-active awareness raising activities, information provision services, training, customized in-depth consulting and advisory points/services, financial assistance & legal framework services (as remarked by a recent EC Pro-Inno Policy Benchmarking report). They should be encouraged to progress beyond an excessive focus on patents to promote wider IP protection strategies, taking into account the full range of formal and informal IPR, and to provide industry-specific services, particularly to ICT SMEs.
- Policy makers should consider carefully the business case for launching, and/or contributing to, specialized, value-added IPR consulting, enforcement and implementation services, possibly web-based, dedicated to specific vertical market segments. These services could be marketed similarly to marketing, design or training services, managed by recognized professional experts (including, but not only, lawyers). These services could for example allow ICT SMEs to find help to compete and cooperate in business chains with larger enterprises with greater means. ICT SMEs should be required to pay for these services, which eventually should be self-supporting. The business case, based on cost-benefits analyses, should prove their value for ICT SMEs. The services should be dedicated to specific market segments, because their value added would be based on the in-depth knowledge of technology and the specific business problems. It is advisable that these services should be linked with research networks and other technology development agencies and stakeholders but they could be independent.

There are emerging examples in Italy of web-based specialised services of this type dedicated to vertical networks of SMEs, for areas such as design, marketing consulting, and human resources training.<sup>56</sup> This shows that this approach could be feasible.

To address the needs of less innovative ICT SMEs:

- Policy initiatives and support services should promote the diffusion of practical knowledge of the IPR system and of existing alternatives to achieve competitive

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<sup>55</sup> Sectoral e-Business Watch Workshop "IPR for Competitiveness: Challenges for European ICT SMEs", Paris, June 4th, 2008, organized by IDC EMEA and Telecom Paris University

<sup>56</sup> "Reti Digitali E Nuovi Servizi Per La Competitività Delle Pmi" (Digital networks and new services for SMEs competitiveness), by Roberto Bellini, Politecnico of Milano, 2008 Report of the Digital Innovation Forum in Italy, page 119, by IDC Italia

advantages. These initiatives could be complementary to those for advanced ICT SMEs, but should still be sufficiently specialised to provide value added.

- Advanced awareness initiatives should include periodical monitoring and comparative assessments of the suitability of the different IPR tools (or alternative protection methods), their pro and cons, from the point of view of ICT SMEs business strategies. This because over time more and more types of innovations tend to become subject to some type of IPR regime, with consequences on competitiveness in the industry.

## 6.2.2 Promote greater coordination between innovation policies. ICT industry policies and IPR policies for ICT SMEs

The study results underlined the link between innovation strategies, IPR strategies and competitiveness issues for ICT SMEs. In order to respond to specific ICT SMEs needs in this area, IPR policy should not be considered only as a horizontal, general SME policy tool, but should be better integrated with innovation and ICT industry policy goals, at the EU, national and regional levels.

This corresponds to a trend of policy convergence already observed. The last five years have seen a growing convergence of the main goals of innovation and SME development policies, at the EU level within the overarching framework of the Lisbon Strategy, but also at the national and regional level (within local economic development policies)<sup>57</sup>. Innovation policies recognize that research and knowledge development are at the basis of competitiveness. Regional development policies look at technology clusters and networking as key elements to promote the growth of local high-tech SMEs. It is time that IPR policies are considered something more than a technical detail to be dealt with by technology transfer offices, and that they are better integrated with innovation and regional development policies, but also taking into account the specificity of the ICT industry scenario.

To achieve this goal, there is a problem of coordinating the institutions and actors responsible for the different policy strands. For example, institutions operating in the national innovation system should ensure that IP is adequately incorporated into the broader framework of support for entrepreneurs and SMEs and for the ICT industry. In doing so, institutions should take into consideration the main obstacles faced by entrepreneurs and SMEs, not just in seeking grant/registration of IP rights but throughout the IP management cycle, including the commercial exploitation of IP rights, the use of patent databases, the valuation of IP assets and the enforcement of IP rights.

Moreover, traditionally research and innovation policies depend on different government agencies than economic development and SMEs support policies and this again may cause a lack of focus. There is a risk of overlapping and lack of effectiveness in the policy infrastructure, which should be considered and dealt with.

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<sup>57</sup> Confirmed by the analysis in “Policies for Innovative ICT SMEs in Europe” by IDC EMEA, Deliverable 4.2 of “Study on Innovative ICT SMEs in Europe (EU 25)”, for DG Information Society, October 2007.

### 6.2.3 Improve the understanding of the emerging IP-based business models and their implications for IPR and innovation policies

This study confirmed that emerging IP-based business models have increasing relevance in the new global supply chains of the ICT industry, particularly for start-ups and new-technology based firms. These ICT SMEs deserve to be supported, because they are showing high growth and competitiveness. Our case studies presented some of their problems with the IPR system, mainly concerning the inefficiencies and high costs of the patent system.

Moreover, IPR are increasingly used in innovation networks and business alliances, and the problems and consequences of this use are not sufficiently well known and considered by the IPR system. For example, many of our case studies mentioned that there is a minimum “threshold” of IPR portfolio size, before an SME can engage in cross-licensing practices, which is beyond most of them. But cross-licensing is a very important and effective way to ensure balanced relationships in supply and innovation networks. Perhaps it is possible to find ways to enable ICT SMEs to use this practice more often.

It is advisable to analyse more in-depth the role of IPR in these business models, to understand whether there are other problems to be solved, and other implications for innovation and SMEs policies, not only concerning IPR.

### 6.2.4 Respond to ICT SMEs needs of improvement of the IPR system in Europe

According to this study, ICT SMEs ask first of all for a greater harmonization of the IPR regulatory framework between the European and national level, particularly for patents. They ask for streamlining and harmonization of bureaucratic processes, rather than a deep overhaul of the IPR regulatory framework (with the exception of critics of software patents, see following paragraphs). It is important noticing that ICT SMEs do not criticize the quality of the patents released by the EPO, so they do not ask for a lowering of the quality standards to release patents.

The adoption of a Community Patent granted by one central authority and subject to the same rules throughout the EC is ideally the best solution to reduce the present inefficiencies of the European Patent system. But it presents several problems and should be encouraged only if the costs of obtaining, maintaining and translating such Community patents should be affordable to all patent holders including SMEs.

There is also a need to solve the problem of different legislations regimes for enforcement. The proposal of a specialised European Court system for patent validity and patent infringement cases raises still many concerns by stakeholders.

Other useful measures could be the introduction of international databases in new technology, and standardized international guidelines for examination, including the mutual recognition of application and examination findings.

Patent costs appear to be too high for ICT SMEs, but a reduction of costs only for SMEs does not appear to be the best solution. The other costs related to patent protection, other than the official filing and processing fees, may be more of an obstacle. Several experts warn against lowering cost barriers, because of the risk to increase the number of trivial or unused patents.

In order to respond to ICT SMEs needs, the overall efficiency and timeliness of the European patent system should be improved, with specific attention to the burden of excessive translation costs, which should be reduced. Additional funding could be considered, not to lower the costs as such, but to fill the gap in time when ICT SMEs must anticipate costs for patents, before new revenues start to come in. Other practical measures could be to evaluate timeliness, efficiency and cost-effectiveness of any initiatives targeted to enhancing a wider and more effective use of the IP system, developing benchmarks to compare activities developed by different countries in order to identify and promote best practices.

### **6.2.5 Enhance technology transfer and knowledge sharing, also solving the problem of software patents**

From the point of view of the policy maker, the improvement of the IPR system should lead to better technology transfer and knowledge sharing, rewarding inventors but also helping to leverage inventions at the system level. This is particularly important for the ICT industry and for ICT SMEs, who need to develop their own innovations within the digital ecosystem, building on other enterprises inventions and technology advances. Previous paragraphs have suggested different ways in which ICT SMEs may be supported in improving their use of IPR for innovation.

However, real progress on this issue would need a resolution of the conflict on software patents, which is not only an ICT SMEs problem but involves also large players. As shown by the analysis of this report, the differing opinions on the software patents issue are entrenched. Any resolution favourable to both sides is likely to be complex, requiring a delicate balancing act among the interests of all competitors. Both parties in the debate have some good reasons on their side. Some maintain that in the advanced ICT industry, the patenting regime is not well suited to the short product cycles, and to the “open innovation” and “networked innovation” models. Some maintain that IP protection for inventors is needed, as witnessed by some of the ICT SMEs interviewed. In finding more flexible IP protection tools for these market areas, the EU should take into account the legitimate concerns of smaller enterprises, who fear to be sidelined from the innovation development process, because of aggressive IPR strategies by larger competitors.

Given the difficulty to achieve a suitable compromise, there is a risk that the present situation (with the EPO releasing CII patents, recognized by some and contested by others, including courts and judges in different countries) may continue indefinitely. It is important that the EC steps up its efforts to solve this problem with a generally acceptable compromise. As this study suggests, it is important to view this issue within the overall context of the competitive scenario of the ICT industry and to find ways to enhance technology transfer and knowledge transfer, defending the interests of smaller innovative players. Competition law may play a role in this effort.

### **6.2.6 Defend the role of ICT SMEs in the open standards development process**

Standardization is an integral part of the Council's and the Commission's policies to carry out “better regulation”, to increase competitiveness of enterprises and to remove barriers

to trade at international level<sup>58</sup>. The EC is strongly involved in promoting high level ICT standardization policy, respecting the interests of all stakeholders.

The issue of ICT standards development is too complex to be dealt with appropriately in this report, which provided some evidence about the opinions and practices of ICT SMEs on this matter. This study documented the increasing conflict about the best way to deal with IPR in the ICT standards development arena, particularly about open standards, which are a key EU policy goal. Many ICT SMEs advocate ensuring positive complementarities between IPR protection, particularly patenting, and standardization and interoperability, particularly open standards. Many other ICT SMEs (and some large players) argue that IPR stand in the way of open standards development and should not be used at all in that context.

Therefore it is important to underline the urgency of this issue, and its implications from the point of view of the ability of ICT SMEs to compete at best of their potential. It is important that the EC continues its activities to defend the interests of ICT SMEs in the standards development process. It is recommended that the High Level Policy group on ICT standardization, promoted by European Commission Vice-President Günter Verheugen, engage widely and take into account in particular the issues of standardization and IPR from the ICT SMEs perspective based on a practical review of the ICT SME competitive issues in the software and standardization-interoperability areas.

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<sup>58</sup> Communication from the Commission to the European Parliament and the Council on the role of European standardisation in the framework of European policies and legislation (COM(2004) 674 final).

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## Annex I: Glossary of technical terms

Term	Definition <sup>59</sup>
<b>Access</b>	The ability to retrieve information and to communicate online through the use of digital information and communication technologies.
<b>Appropriability</b>	The ways used by firms to best capture the profits from their investments in R&D
<b>ASICs</b>	Application-specific integrated circuits
<b>B2B</b>	Business to Business. Electronic transactions between companies.
<b>B2B marketplace</b>	Electronic trading platforms on the Internet where companies can sell and/or buy goods or services to/from other companies. They can be operated by a single buyer or seller or by a third party. Many marketplaces are industry-specific. Some marketplaces require registration and membership fees from companies that want to conduct trade on them.
<b>B2C</b>	Business to consumer. Electronic transactions, between companies and consumers.
<b>Bandwidth</b>	The physical characteristic of a telecommunications system that indicates the speed at which information can be transferred. In analogue systems, it is measured in cycles per second (Hertz), and in digital systems in binary bits per second. (Bit/s).
<b>Broadband</b>	High bandwidth Internet access. In <i>e-Business W@tch</i> reports, broadband is defined as the capacity to transfer data at rates of 2 Mbit/s (megabits per second) or greater.
<b>Channel</b>	In communications, a physical or logical path allowing the transmission of information; the path connecting a data source and a receiver.
<b>CIDX</b>	Chemical Industry Data Exchange (CIDX) ( <a href="http://www.cidx.org">www.cidx.org</a> )
<b>CRM</b>	Customer Relationship Management. Software systems that promise the ability to synthesize data on customers' behaviour and needs and thus to provide a universal view of the customer.
<b>Dial-up</b>	The process of establishing a temporary connection (to the Internet) via the switched telephone network.
<b>Digital signature</b>	An electronic signature that can be used to authenticate the identity of the sender of a message or the signer of a document, and to ensure that the original content of the message or document that has been sent is unchanged. Digital signature usually refers specifically to a cryptographic signature, either on a document, or on a lower-level data structure.
<b>DRM</b>	Digital rights management. DRM is a system of IT components and services, along with corresponding law, policies and business models, which strive to distribute and control intellectual property and its rights. Product authenticity, user charges, terms-of-use and expiration of rights are typical concerns of DRM.
<b>DSL</b>	Digital subscriber line. A family of technologies generically referred to as DSL, or xDSL, capable of transforming ordinary phone lines (also known as "twisted copper pairs") into high-speed digital lines, capable of supporting advanced services. ADSL (asymmetric digital subscriber line), HDSL (high data rate digital subscriber line) and VDSL (very high data rate digital subscriber line) are all variants of xDSL
<b>EAI</b>	Enterprise application integration
<b>eBMS</b>	ebXML message service specification
<b>e-Business</b>	Electronic business. The Sectoral e-Business Watch uses the term "e-business" in the broad sense, relating both to external and to company internal processes. This includes external communication and transaction functions, but also ICT supported flows of information within the company, for example, between departments and subsidiaries.
<b>ebXML</b>	Electronic business using XML. A proven framework and unified set of internationally agreed upon technical specifications and common XML semantics designed to facilitate global trade.

<sup>59</sup> Some of the definitions in this glossary are derived from or based on definitions suggested by Whatis?com, a leading online ICT encyclopaedia and learning centre. See <http://whatis.techtarget.com>.

Term	Definition <sup>59</sup>
<b>eCommerce</b>	Electronic commerce. As distinct from the broader concept of e-business, ecommerce refers to external transactions in goods and services between companies (B2B), between companies and consumers (B2C), or between companies and governments (B2G) and may therefore be seen as a subgroup or component of e-business activities.
<b>EDI</b>	Electronic Data Interchange. A way for unaffiliated companies to use networks to link their businesses by using a common technical standard for exchanging business data. While electronic mail between companies is common, electronic data interchange passes bigger bundles that replace large paper documents such as bills and contracts.
<b>EDIFACT</b>	Electronic Data Interchange For Administration Commerce and Transport. See UN/EDIFACT
<b>EDM</b>	Electronic Document Management. The management of different kinds of documents in an enterprise using computer programmes and storage devices. An EDM system allows an enterprise and its users to create a document or capture a hard copy in electronic form, store, edit, print, process, and otherwise manage documents.
<b>e-Invoicing</b>	Electronic invoicing. A business-to-business transaction in which invoices are generated, delivered (and normally paid) electronically, replacing the equivalent traditional paper-based invoicing processes.
<b>eLearning</b>	eLearning means supporting training with learning material in electronic format, for example material that is available on the intranet or the Internet. eLearning applications can be used for ICT-related training, but also for sector-specific or even company-specific training content.
<b>ERP</b>	Enterprise Resource Planning. A software system that helps to integrate and cover all major business activities within a company, including product planning, parts purchasing, inventory management, order tracking, human resources and finance.
<b>EU</b>	European Union
<b>Extranet</b>	A network using Internet protocols that allows external organisations (for example customers or suppliers) access to selected internal data. Essentially it is an Intranet which gives external users restricted access (often password protected) to information through the firewall.
<b>Firewall</b>	A firewall is a set of related programmes that protects the resources of a private network from users from other networks. The term also refers to the security policy that is used with the programmes.
<b>ICT</b>	Information and communication technology. ICT includes networks, computers, other data processing and transmitting equipment, and software. The application of ICT in business processes leads to e-business.
<b>iDOC</b>	Intermediate document
<b>Information security</b>	Measures taken to protect information systems against unauthorised use and attacks
<b>Internet</b>	The world's largest computer communication system, with an estimated 700 million users worldwide. <sup>60</sup> The Internet is a loose confederation of principally academic and research computer networks. It is not a network but rather the interconnection of thousands of separate networks using a common language.
<b>Interoperability</b>	The technical features of a group of interconnected systems (includes equipment owned and operated by the customer which is attached to the public telecommunication network) which ensure end-to-end provision of a given service in a consistent and predictable way.
<b>Intranet</b>	An internal Internet, that is an internal network running using TCP/IP, which makes information available within the company. Most Intranets are connected to the Internet, and use firewalls to prevent unauthorised access.
<b>ISDN</b>	Integrated Services Digital Network. An international telecommunications standard for transmission of voice and data over dial-up lines running at 64 Kbit/s (kilobits per second). It allows sharing of multiple devices on a single line (for example, phone, computer, fax).
<b>IT</b>	Information technology. IT includes hardware (computers, other data processing and transmitting equipment) and software.

<sup>60</sup> Cf. Global Internet Statistics by Global Reach, [www.gireach.com](http://www.gireach.com).

Term	Definition <sup>59</sup>
<b>KM</b>	Knowledge Management. ICT solutions that support enterprises in systematically gathering, organising, sharing, and analysing their knowledge in terms of resources, documents, and people skills. Knowledge management software typically involves data mining and some method of operation to push information to users.
<b>LAN</b>	Local Area Network. The most common way of connecting computers in a small area (typically inside a building or organisation) for sharing databases and communication facilities. The two most common versions are Ethernet and Token Ring. Implementation is based on coaxial cables or plain wires. Speed achieved ranges from 10 Mbps to 100 Mbps.
<b>Leased line</b>	A private communication channel leased from the common carrier. It is usually a dedicated fixed-route link (e.g. point-to-point frame relay).
<b>m-Commerce</b>	Mobile commerce. E-commerce that takes place using mobile connection devices and through data transmission via technical standards for mobile communication.
<b>Micro enterprise</b>	A company with fewer than 10 employees.
<b>Modem</b>	Modulator/Demodulator. A device that modulates outgoing digital signals from a computer or other digital device to analogue signals suitable to be transmitted through a conventional telephone line (copper twisted pair telephone). The reverse procedure takes place for incoming signals.
<b>MRO goods</b>	Maintenance, repair and operating goods. Supplies which companies need to maintain their operations, for example office supplies, in contrast to "direct production goods" which are components of the goods and services the company produces.
<b>NACE</b>	Nomenclature Générale des Activités Economiques dans les Communautés Européennes; Classification of Economic Activities in the European Community
<b>OOS</b>	Open source software refers to computer software under an open source license. An open-source license is a copyright license for software that makes the source code available and allows for modification and redistribution without having to pay the original author.
<b>PCT application</b>	The Patent Cooperation Treaty (PCT) is an international patent law treaty, concluded in 1970. It provides a unified procedure for filing patent applications to protect inventions in each of its Contracting States. A patent application filed under the PCT is called an international application or PCT application.
<b>Processes</b>	Business processes are operations that transform the state of an object or a person. This can, for example, be an order placed via the Internet. Ordering an object or a service creates a liability for the supplier to deliver, and initiates the transfer of property rights from one entity to another. The electronic handling of processes is likely to speed them up and to introduce new processes in the realisation of the same transaction.
<b>PLM</b>	Product lifecycle management. The process of managing the entire lifecycle of a product from its conception, through design and manufacture, to service and disposal. PLM software helps companies effectively and efficiently innovate, for example by managing descriptions and properties of a product starting from conception and development.
<b>Remote access</b>	The ability of a company computer network's transmission points to gain access to a computer at a different location.
<b>RFID</b>	Radio Frequency Identification. A wireless technology which is used to uniquely identify an object, animal, or person. RFID is coming into increasing use in industry as an alternative to the bar code. The advantage of RFID is that it does not require direct contact or line-of-sight scanning.
<b>SCM</b>	Supply Chain Management. Software that helps businesses to match supply and demand through integrated and collaborative planning tools.
<b>Sector</b>	Sectors of the economy with comparable business activities. These constitute the main research unit of the <i>e-Business W@tch</i> . Aggregated information at the industry level is used to document the diffusion of activities within the industries as well as the overall importance of the observed phenomena for changes in the economy as a whole. The definition of sectors follows NACE Rev.1.1 classifications.
<b>Secure server technology</b>	Secure server technology means that data exchange between computers is based on certain technical standards or protocols, for example "Secure Sockets Layer" (SSL).
<b>SME</b>	Small and medium-sized enterprises with 0-249 employees. To be classified as an SME, an enterprise has to satisfy the criteria for the number of employees and one of the two

Term	Definition <sup>59</sup>
	financial criteria, i.e. either the turnover total or the balance sheet total. In addition, it must be independent, which means less than 25% owned by one enterprise (or jointly by several enterprises) falling outside the definition of an SME or a micro-enterprise, whichever may apply. The thresholds for the turnover and the balance sheet total will be adjusted regularly, to take account of changing economic circumstances in Europe.
<b>SOAP</b>	XML based lightweight protocol for exchange of information in a decentralized, distributed environment ( <a href="http://www.w3.org/TR/2000/NOTE-SOAP-20000508/">http://www.w3.org/TR/2000/NOTE-SOAP-20000508/</a> )
<b>SSL</b>	Secure Sockets Layer. A commonly-used protocol for managing the security of a message transmission on the Internet. SSL has recently been succeeded by Transport Layer Security (TLS), which is based on SSL.
<b>Standard</b>	A standard is a technical specification approved by a recognised standardisation body for repeated or continuous application, with which compliance is not compulsory.
<b>Transaction</b>	Electronic transactions can be subdivided into several steps, each of which initiates a process. There are pre-sale (or pre-purchase) phases, sale and after-sale phases. Typically a transaction starts with information gathering, price and quality comparisons and possibly pre-sale negotiations. During the sale phase contracting and delivery are the core processes, and payment is the final stage of this phase. After-purchase transaction stages comprise customer service, the administration of credit payments and the handling of returns as well as marketing activities preparing for the next purchase.
<b>UMTS</b>	Universal Mobile Telecommunications Service. A third-generation (3G) digital standard for mobile communication, enabling packet-based transmission of voice, text and video at data rates up to 2 megabits per second (Mbps).
<b>UN/EDIFACT</b>	United Nations rules for Electronic Data Interchange for Administration, Commerce and Transport <a href="http://www.unece.org/cefact/">http://www.unece.org/cefact/</a>
<b>Value added</b>	Gross output minus intermediate inputs. It is valued at producers' prices and includes all indirect taxes, but excludes VAT and subsidies.
<b>VMI</b>	Vendor Managed Inventory
<b>VoIP</b>	Voice over Internet Protocol (IP). The use of telephony services over Internet networks, by means of digitised voice transfer technology.
<b>VPN</b>	Virtual Private Network. A way to use a public telecommunication infrastructure, such as the Internet, to provide remote offices or individual users with secure access to their organisation's network.
<b>WAN</b>	Wide Area Network. A network allowing the interconnection and intercommunication of a group of computers over a long distance.
<b>WAP</b>	Wireless Application Protocol. A communication protocol for delivering data over mobile telephone systems, allowing cellular phone sets and other mobile hand-set systems to access WWW pages and other wireless services.
<b>Website</b>	A related collection of World Wide Web files that includes a beginning file called a home page.
<b>Wi-Fi</b>	Wireless fidelity. A popular term for a high-frequency wireless local area network (W-LAN). Wi-Fi technology is rapidly gaining acceptance as an alternative or complementary infrastructure to a wired LAN.
<b>W-LAN</b>	Wireless Local Area Network. An implementation of a LAN with no physical wires, using wireless transmitters and receivers. It allows a mobile user to connect to a LAN or WAN through a wireless (radio) connection. A standard, IEEE 802.11, specifies the technologies for wireless LANs.
<b>WWW</b>	World Wide Web. The collection of pages in HTML format which reside on web-servers. Although WWW and the Internet are different, the terms are increasingly becoming interchangeably used.
<b>XML</b>	Extensible Mark-up Language. A standard to describe the contents of a page or file. XML is a way to create common information formats and share both the format and the data on the World Wide Web, intranets, and elsewhere.

## Annex II: The e-Business Survey 2007 – methodology report

### Background and scope

The Sectoral e-Business Watch collects data relating to the use of ICT and e-business in European enterprises by means of representative surveys. The e-Business Survey 2007, which was the fifth survey after those of 2002, 2003, 2005 and 2006, had a scope of 5,486 telephone interviews with decision-makers from five industry sectors in nine EU countries and the USA. Interviews were carried out from August to October 2007, using computer-aided telephone interview (CATI) technology. The overall survey was divided into four separate projects (each with a different questionnaire), which focused on different sectors and specific topics (see Exhibit A1-1). This document contains methodological notes for Project 4, which accounted for 683 of all interviews conducted.

*Exhibit A1-1: Components ("projects") of the e-Business Survey 2007*

Survey project	Focus	Sectors covered	No. of interviews
1	e-Business manufacturing in	<ul style="list-style-type: none"> <li>• Chemical, rubber and plastics</li> <li>• Steel</li> <li>• Furniture</li> </ul>	2121
2	e-Business in retail, transport & logistics	<ul style="list-style-type: none"> <li>• Retail</li> <li>• Transport &amp; logistics services</li> </ul>	2248
3	RFID adoption	<ul style="list-style-type: none"> <li>• Manufacturing sectors</li> <li>• Retail</li> <li>• Transport services</li> <li>• Hospitals</li> </ul>	434
4	Intellectual Property Rights in ICT SMEs	<ul style="list-style-type: none"> <li>• ICT manufacturing</li> <li>• ICT services</li> <li>• Software publishing</li> </ul>	683

### Questionnaire

The questionnaires for Project 4 contained about 40 questions and was structured into the following modules:

- Intellectual property protection and innovation practice: yes or no
- Intellectual property protection objectives and management
- Awareness and opinions about intellectual property protection
- Reasons for not using intellectual property protection
- Intellectual property protection in co-operative research
- Background information about the company

The survey addressed companies that used or planned to use IP protection measures as well as companies that did not use such measures. Non-users were asked to give reasons why they chose not to do so. Some questions were filtered, for example follow-up questions which were only relevant for companies depending on their answer to the entry question on whether IP protection of innovation practices were in use. No open questions were used.



The questionnaires of all e-Business Watch surveys since 2002 can be downloaded from the project website ([www.ebusiness-watch.org/about/methodology.htm](http://www.ebusiness-watch.org/about/methodology.htm)).

## Population

The population of the surveys consisted of companies from sectors, countries and size-bands which were specifically defined for each survey:

- **Firm size-bands covered:** The survey covered micro, small and medium-sized companies in the range from 3 to 249 employees.
- **Geographic scope:** The survey included eight EU countries: Austria, France, Germany, Ireland, Italy, Poland, Spain and the United Kingdom (termed the "EU-8").
- **Sectors covered:** The survey covered companies from the ICT industries, including ICT manufacturing, software publishing, IT services and telecoms (see Exhibit A1-2). For operational purposes (notably for sampling), the sectors were defined on the basis of NACE Rev. 1.1.
- **Additional filter criteria:** to qualify for the survey, in addition to the characteristics specified above, companies needed to protect or plan to protect intellectual property. If this was not the case, the company needed to have developed products, services or processes that were new to the market within the past three years. If non of these criteria applied, the interview was terminated.

*Exhibit A1-2: Sector coverage and number of interviews per sector (Survey Project 4 – IPR)*

No.	Sector name	NACE Rev. 1.1 activities covered	Size-band	No. of interviews conducted
1	Manufacturing activities	30.02, 32.1, 32.2, 32.3, 33.2,	Micro to medium sized companies (3 to 249 employees)	261
2	Software publishing	72.2		282
3	Telecommunications and IT services	64.2, 72.1, 72.3		140

## Sampling frame and method

From the universe a random sample of companies, stratified by sector and, where possible, size (number of employees in the company), was selected per country for each of the pre-defined quota cells, i.e. 'country-sector-cells'. The sample drawn (for each sector) was a random sample of companies from the respective sector population in each of the countries, with the objective of fulfilling minimum strata with respect to company size-bands per country-sector cell (see Exhibit A1-3).

*Exhibit A1-3: Strata by company-size*

Company size-bands	Target quota specified (in % of total interviews)
Large (250+ employees)	(not covered)
Medium-sized (50-249 employees)	30-35%
Small (10-49 employees)	30-35%
Micro (up to 9 employees)	30-35%

Samples were drawn locally by fieldwork organisations based on official statistical records and widely recognised business directories such as Dun & Bradstreet (used in several countries) or Heins und Partner Business Pool (see Exhibit A1-4).

The survey was carried out as an enterprise survey: data collection and reporting focused on the enterprise, defined as a business organisation (legal unit) with one or more establishments. Due to the small population of enterprises in some of the sector-country

cells, target quota could not be achieved (particularly in the larger enterprise size-bands) in each country. In these cases, interviews were shifted to the next largest size-band (from large to medium-sized, from medium-sized to small), or to other sectors.

## Fieldwork

Fieldwork was coordinated by the German branch of Ipsos GmbH ([www.ipsos.de](http://www.ipsos.de)) and conducted in cooperation with its local partner organisations (see Exhibit A1-4) on behalf of the Sectoral e-Business Watch. Pilot interviews prior to the regular fieldwork were conducted with about 10 companies in each sector in Germany, in order to test the questionnaire (structure, comprehensibility of questions, average interview length).

### Exhibit A1-4: Institutes that conducted the fieldwork

Country	Institute conducting the interviews	Sample source
Austria	IPSOS GmbH, 23879 Mölln	Dun & Bradstreet
Germany	IPSOS GmbH, 23879 Mölln	Heins and Partner Business Pool
France	IPSOS Insight Marketing, 75628 Paris	WEGENER DM, previously IDATA
Ireland	CONTINENTAL Research, London EC1V 7DY	Dun & Bradstreet
Italy	Demoskopoea S.p.A., 20123 Milano	Dun & Bradstreet
Poland	IQS and Quant Group Sp.z.o.o, 00-610 Warszawa	Hoppenstedt Bonnier Information Poland
Spain	IPSOS Spain, 28036 Madrid	Dun & Bradstreet
UK	CONTINENTAL Research, London EC1V 7DY	Dun & Bradstreet

### Exhibit A1-5: Interviews conducted per sector and country (Project 4 – IPR)

Sector	Country	DE	ES	FR	IT	PL	UK	IE	AT	Total
<b>IPR - Total</b>		<b>90</b>	<b>90</b>	<b>92</b>	<b>91</b>	<b>90</b>	<b>106</b>	<b>54</b>	<b>70</b>	<b>683</b>
Manufacturing		33	37	37	37	37	45	12	23	<b>261</b>
Software companies		38	41	36	36	30	36	31	34	<b>282</b>
Telecoms & IT services		19	12	19	18	23	25	11	13	<b>140</b>

**Non response:** In a voluntary telephone survey, in order to achieve the targeted interview totals, it is always necessary to contact more companies than just the number equal to the target. In addition to refusals, or eligible respondents being unavailable, any sample contains a proportion of "wrong" businesses (e.g., from another sector), and wrong and/or unobtainable telephone numbers. Table A1-6 shows the completion rate by country (completed interviews as percentage of contacts made) and reasons for non-completion of interviews. Higher refusal rates in some countries, sectors or size bands (especially among large businesses) inevitably raises questions about a possible refusal bias. That is, the possibility that respondents differ in their characteristics from those that refuse to participate. However, this effect cannot be avoided in any voluntary survey (be it telephone- or paper-based).

**Exhibit A1-6: Interview contact protocol, completion rates and non-response reasons**

		AT	DE	ES	FR	IT	PL	UK	IE
1	Sample (gross)	771	1245	1322	1443	921	1777	2342	674
1.1	Telephone number not valid	86	92	14	6	140	98	221	129
1.2	Not a company (e.g. private household)	6	6	42	0	7	16	7	26
1.3	Fax machine / modem	2	3	0	11	6	44	5	8
1.4	Quota completed address not used	202	338	301	669	101	521	354	0
1.5	No target person in company	44	93	87	64	108	95	90	76
1.6	Language problems	2	1	87	0	-	14	2	1
1.7	No answer on no. of employees	0	0	0	0	-	2	0	0
1.8.1	Size too small: RFID < 50 empl./ IPR < 3 empl.	2	4	10	5	13	16	16	8
1.8.2	Size too big 250+ (IPR only)	0	10	10	7	11	4	6	3
	Sum 1.1 – 1.10	345	549	505	143	401	810	714	269
2	Sample (net)	426	696	817	1300	520	967	1628	405
2.1	Nobody picks up phone	11	24	191	163	-	9	6	37
2.2	Line busy, engaged	0	2	0	15	-	0	0	0
2.3	Answering machine	0	0	0	116	-	0	59	6
2.4	Contact person refuses	123	349	0	30	76	532	695	48
2.5	Target person refuses	49	151	506	75	52	10	453	63
2.6	no appointment during fieldwork period possible	7	6	0	9	5	202	106	90
2.7	open appointment	162	57	0	155	295	54	157	93
2.8	target person is ill / cannot follow the interview	0	2	0	2	0	7	3	1
2.9	Interview abandoned	4	15	30	4	1	40	43	13
2.10	Interview error (no interview cannot be used)	0	0	0	1	-	23	0	0
	Sum 2.1 – 2.10	356	606	727	1208	429	877	1522	351
3	Successful interviews	70	90	90	92	91	90	106	54
	<b>Completion rate (= [3]/[2])</b>	<b>16.4%</b>	<b>12,9%</b>	<b>11,0%</b>	<b>7,1%</b>	<b>17,5%</b>	<b>9,3%</b>	<b>6,5%</b>	<b>13,3%</b>
	<b>Average interview time (min:sec)</b>	<b>13:45</b>	<b>13:09</b>	<b>10:53</b>	<b>13:00</b>	<b>11:17</b>	<b>13:37</b>	<b>11:57</b>	<b>12:32</b>

## Feedback from interviewers

No major problems were reported from the fieldwork with respect to interviewing (comprehensibility of the questionnaire, logical structure). The overall feedback from the survey organisations was that fieldwork ran smoothly and that the questionnaire was well understood by most respondents. The main challenge was the fulfilment of the quotas, which was difficult or impossible in some of the sectors, in particular among the larger size-bands. More specific comments from fieldwork organisations, which point to difficulties encountered in the local situation, are available in the detailed field-report from Ipsos, which can be downloaded from the e-Business Watch website at ([www.ebusiness-watch.org/about/methodology.htm](http://www.ebusiness-watch.org/about/methodology.htm)).

## Weighting schemes

Due to stratified sampling, the sample size in each size-band is not proportional to the population numbers. If proportional allocation had been used, the sample sizes in the 250+ size-band (in terms of RFID 1000+) would have been extremely small, not allowing any reasonable presentation of results. Thus, weighting is required so that results adequately reflect the structure and distribution of enterprises in the population of the respective sector or geographic area. The Sectoral e-Business Watch applies two different weighting schemes: weighting by employment and by the number of enterprises.

- Weighting by employment: Values that are reported as employment-weighted figures should be read as "enterprises comprising x% of employees" (in the respective sector or country). The reason for using employment weighting is that there are many more micro-enterprises than any other firms. If the weights did not take into account the economic importance of businesses of different sizes in some way, the results would be dominated by the percentages observed in the micro size-band.
- Weighting by the number of enterprises: Values that are reported as "x% of enterprises" show the share of firms irrespective of their size, i.e. a smaller and larger companies both count equally as one legal unit.

## The use of filter questions in interviews

In the interviews, not all questions were asked to all companies. The use of filter questions is a common method in standardised questionnaire surveys to make the interview more efficient. For example, questions on Intellectual property protection objectives were only asked to those companies that had actually confirmed using respective measures.

The results for filtered questions can be computed on the base of not only those enterprises that were actually asked the question (e.g. "in % of enterprises using IPR measures") but also on the base of "all companies". In the study report, both methods are used, depending on the indicator. The base (as specified in footnotes of tables and charts) is therefore not necessarily identical to the set of companies that were actually asked the underlying question.

## Statistical accuracy of the survey: confidence intervals

Statistics vary in their accuracy, depending on the kind of data and sources. A 'confidence interval' is a measure that helps to assess the accuracy that can be expected from data. The confidence interval is the estimated range of values on a certain level of significance. Confidence intervals for estimates of a population fraction (percentages) depend on the sample size, the probability of error, and the survey result (value of the percentage) itself. Further to this, variance of the weighting factors has negative effects on confidence intervals.

Exhibit A1-7 gives some indication about the level of accuracy that can be expected for industry totals for the EU-8 (based on all respondents) depending on the weighting scheme applied. The confidence intervals differ depending on the industry and the respective value; for aggregate values (i.e. for the total of all sectors), on average, it is about +/-5 percentage points (in both weighting schemes). Confidence intervals for specific sectors are about +/- 5-8 percentage points, depending on values and weighting.

The calculation of confidence intervals is based on the assumption of (quasi-) infinite population universes. In practice, however, in some industries and in some countries the complete population of businesses may consist of only several hundred or even a few dozen enterprises, notably within certain size-bands. In some cells, therefore, most or

even any enterprise were contacted and asked to participate in the survey. This means that it is hardly possible to achieve a higher confidence interval through representative enterprise surveys in which participation is not obligatory. This should be borne in mind when comparing the confidence intervals of e-Business Watch surveys to those commonly found in general population surveys.

**Exhibit A1-7: Confidence intervals for the IPR survey**

	Survey result	Confidence interval								
		Weighted as "% of firms"			Weighted by employment			Unweighted		
<b>All sectors (aggregate, EU-8)</b>	<b>10%</b>	<b>8.0%</b>	-	<b>12.4%</b>	<b>8.1%</b>	-	<b>12.3%</b>	<b>8.3%</b>	-	<b>12.1%</b>
Manufacturing	10%	7.0%	-	14.1%	7.1%	-	13.9%	7.3%	-	13.5%
IT services & telecoms	10%	5.9%	-	16.4%	6.4%	-	15.2%	6.5%	-	15.0%
Software	10%	7.2%	-	13.8%	7.2%	-	13.8%	7.4%	-	13.3%
<b>All sectors (aggregate, EU-8)</b>	<b>30%</b>	<b>26.8%</b>	-	<b>33.4%</b>	<b>26.9%</b>	-	<b>33.3%</b>	<b>27.2%</b>	-	<b>33.0%</b>
Manufacturing	30%	24.9%	-	35.6%	25.1%	-	35.4%	25.5%	-	34.9%
IT services & telecoms	30%	22.8%	-	38.4%	23.8%	-	37.0%	24.0%	-	36.7%
Software	30%	25.2%	-	35.2%	25.2%	-	35.3%	25.7%	-	34.7%
<b>All sectors (aggregate, EU-8)</b>	<b>50%</b>	<b>46.4%</b>	-	<b>53.6%</b>	<b>46.5%</b>	-	<b>53.5%</b>	<b>46.8%</b>	-	<b>53.2%</b>
Manufacturing	50%	44.2%	-	55.8%	44.4%	-	55.6%	44.9%	-	55.1%
IT services & telecoms	50%	41.5%	-	58.5%	42.8%	-	57.2%	43.1%	-	56.9%
Software	50%	44.6%	-	55.4%	44.5%	-	55.5%	45.1%	-	54.9%
<b>All sectors (aggregate, EU-8)</b>	<b>70%</b>	<b>66.6%</b>	-	<b>73.2%</b>	<b>66.7%</b>	-	<b>73.1%</b>	<b>67.0%</b>	-	<b>72.8%</b>
Manufacturing	70%	64.4%	-	75.1%	64.6%	-	74.9%	65.1%	-	74.5%
IT services & telecoms	70%	61.6%	-	77.2%	63.0%	-	76.2%	63.3%	-	76.0%
Software	70%	64.8%	-	74.8%	64.7%	-	74.8%	65.3%	-	74.3%
<b>All sectors (aggregate, EU-8)</b>	<b>90%</b>	<b>87.6%</b>	-	<b>92.0%</b>	<b>87.7%</b>	-	<b>91.9%</b>	<b>87.9%</b>	-	<b>91.7%</b>
Manufacturing	90%	85.9%	-	93.0%	86.1%	-	92.9%	86.5%	-	92.7%
IT services & telecoms	90%	83.6%	-	94.1%	84.8%	-	93.6%	85.0%	-	93.5%
Software	90%	86.2%	-	92.8%	86.2%	-	92.8%	86.7%	-	92.6%

confidence intervals at  $\alpha=.90$