

INTELLECTUAL ASSETS AND VALUE CREATION

SYNTHESIS REPORT



ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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Acknowledgements

This brochure has been compiled drawing on materials prepared by the OECD Directorate for Science, Technology and Industry, the Directorate for Financial and Enterprise Affairs, and the Centre for Entrepreneurship, SMEs and Local Development and in consultation with other OECD directorates. The lead authors include Douglas Lippoldt (project manager) and Desirée van Welsum, with contributions from Annabel Bismuth, Dominique Guellec, Mariarosa Lunati, Cagatay Telli, Grid Thoma, Yoshiaki Tojo and Stefano Usai. The project is being implemented under the supervision of Marcos Bonturi.

Foreword

At the 2006 Meeting of the OECD Council at Ministerial Level, Ministers noted the growing importance of intellectual assets for sustained economic growth and the need for improved measurement of these assets as an input to the process of policy formation. Building on the OECD report *Creating Value from Intellectual Assets* (2006), Ministers endorsed a follow-up study in order to deepen understanding of intellectual assets in relation to innovation and value creation.

The project has been conducted under the auspices of the Committee on Industry, Innovation and Entrepreneurship (CIIE).¹ The Directorate for Science, Technology and Industry has the lead responsibility for the project, which it is implementing in co-operation with the Directorate for Financial and Enterprise Affairs, the Centre for Entrepreneurship and external experts and in consultation with other OECD directorates.

1. The project scoping paper is available to OECD delegates via the OLIS system, document code DSTI/IND(2006)14.

Main Points

This brochure presents a synthesis of the key findings to-date from recent OECD work on intellectual assets and value creation with regard to three core issue areas:

1. Macro-level: national accounts and estimations of investment in intellectual assets

The System of National Accounts is of crucial importance for tracking economic developments. Currently, the system provides an incomplete accounting of intangible assets, though progress in recent decades has resulted in inclusion of certain types of software and R&D investment. Firm-specific intangibles – such as network capital or organisational capital – are still not captured directly. As a result, it remains difficult to assess with precision the economic contribution and evolution of intellectual assets, leaving decision makers with incomplete information about an asset category that – for OECD economies – appears to be roughly comparable in size to that of tangible assets.

A number of statistical assessments are underway that aim to improve estimates of the scale of investment in intangible assets at the national level for selected OECD countries (Finland, Japan, Netherlands, United Kingdom and United States). These estimates were developed using similar methodological approaches, but they are not strictly comparable in terms of the variables covered. The estimates underscore the large scale of this investment, amounting to between 7.5 and 11.7% of gross domestic product, depending on the country. Failure to take investment in intellectual assets into account may lead to underestimation of GDP and biased estimates of the contribution of the various components of GDP.

2. Regional level: the regional dimension of innovation, firm location and linkages

There is significant variation in the inventive performance of regions as measured by indicators for one of the key types of intellectual assets (*i.e.* patents). Inventive performance is shown to be particularly concentrated in certain regions of continental Europe, North America and Japan. The development of inventive activities in countries usually takes place in a small number of regions. Highly inventive regions tend to cluster together. This spatial dependence is found to have increased over time. Moreover, the inventive performance of regions is found to be directly influenced by the availability of human capital and R&D expenditure. Cross-country differences point to the importance of national innovation systems.

The results also indicate the importance for innovation of linkages within firms across regions. The most inventive regions tend to have relatively more multi-regional firms among their innovative firms. It is important to arrive at a better understanding of these processes, especially with a view to maximising the returns to innovation and optimising the effects and efficiency of innovation policy.

3. Firm-level: corporate reporting, value creation, SMEs

The main disclosure standards and practices fall in two broad categories: *i)* narrative statements and non-financial reporting intended to cover all types of value drivers related to organisational performance; *ii)* specific reporting about the intellectual assets. Current practices often focus on backward-looking information, providing little systematic information about the capacity of the company to generate future revenues with respect to intellectual assets. Through guidelines and reporting frameworks, some governments and industry bodies are aiming to enhance narrative reporting and to promote the disclosure by companies of, *inter alia*, material, qualitative and forward-looking information about value drivers, trends, risks and uncertainties. Still, specific reporting on intangibles remains relatively limited in practise, albeit with some variation by region and sector.

By ensuring that non-financial information is consistent and comparable over time and across companies, these initiatives may allow investors to better assess future earnings and risks associated with different investment opportunities. This should help to make financial markets more efficient by reducing information asymmetry, biased or unfounded earnings estimates, unrealistic valuations and unjustified share price volatility. Improved information about intellectual assets and company strategy also improves the ability of firms to secure funding at a lower cost of capital – notably for small listed companies suffering from limited analyst coverage – and to better allocate resources. Government can assist these efforts through identification and dissemination of information on best practices.

At the firm level, the ability to create value from intellectual assets is highly contingent on the management capabilities in individual firms and the implementation of appropriate business strategies. Work on the impact of R&D, patents, human capital and software shows that the average return on investment in intellectual assets can be large. Leading firms have increased the efficiency of their R&D processes by linking internal R&D activities more closely to their business strategy and relying on external sources to gain access to complementary knowledge and round out technology portfolios. The ability of companies to manage risks is also important, requiring systems of internal control and good information including with respect to intellectual assets.

Small firms often rely on informal approaches to management of intellectual property, a point that policy does not always take into account. There may be scope through government or business association efforts, for example, to assist with information on access to intellectual property, to simplify administrative procedures, and to deliver relevant training and capacity building.

- Particularly promising areas for further work might include analysis of:
 - Intellectual assets and new business models**, including examination of the influence of intellectual assets on the emergence of new business models.
 - Value creation and globalisation**, including exploration of the relationship between intellectual assets and organisational change.
 - Improved measurement approaches**, *e.g.* for definition of asset boundaries and determination of appropriate depreciation rates and deflators.

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Introduction

The expansion of the services sector, globalisation, deregulation and the emergence of new information and communication technologies (ICTs) have brought to the fore the issue of how knowledge is created, disseminated, retained and used to obtain economic returns. This development is associated with a structural change from traditional scale-based manufacturing to new more innovation-intensive activities. These rely heavily on intellectual assets encompassing such elements as research and development (R&D), patents, software, human resources and new organisational structures. In fact, these assets have become strategic factors for value creation by firms. They are increasingly important in enabling productivity and efficiency gains, and are a crucial part of innovation in relation to business processes and products. As such, intellectual assets are central to economies' growth and competitiveness.

These developments have transformed the value creation process, and have contributed to increasing fragmentation and globalisation of value chains. Intellectual assets are crucial for reaping the benefits offered by new technologies, for example in the implementation of organisational change and new business models (Box 1). Because of the potential transformative effects of intellectual assets, and the large contribution they make to the economy and the way economic processes are organised, measurement methods and conceptual models of investment, capital, and its return, need to be updated. This is true at both the economy-wide level and at the firm level. Intellectual assets are rarely reflected in official measures of economic performance, and most of them are not accounted for as investments in financial statements.²

Today, firms often spend as much on intellectual assets as on tangible assets, so there is an increasing need to measure their contribution to OECD economies. The current bias towards tangible assets in measuring investment may lead to inefficient policymaking, misallocation of resources by managers and increased cost of capital for investors. However, any shift toward consideration of intellectual assets as investments rather than as expenses must overcome a range of measurement and valuation problems. Although creating innovations and value through the efficient use of intellectual assets is primarily the role of company management and their boards, public policy is also important. Government has a key role to play in establishing appropriate

2. For example, buying a piece of equipment is counted as investment, but money spent on learning how to use it or to pay the patent license that enables its use is not.

macroeconomic and framework conditions conducive to development of intellectual assets and the creation of value.

The OECD's 2006 report to ministers on *Creating Value from Intellectual Assets* identified five major policy challenges in this regard: *i)* promotion of competition to support value creation and innovation, *ii)* gauging the impact of intellectual assets as sources of economic growth, *iii)* investment in human capital, *iv)* ensuring the diffusion of knowledge while retaining intellectual assets, and *v)* improved disclosure by listed companies. The present study builds on these findings, taking stock of recent developments and pushing the analysis forward across a range of policy dimensions.

Box 1. Intangible assets, ICTs, and productivity

Intellectual assets tend to achieve the greatest benefits when combined with other assets. One example is when technology enables the implementation of productivity enhancing organisational change. These effects can be very important. For example, it has been argued that the US – UK total factor productivity (TFP) differentials from 1995 onwards can be explained by a combination of unmeasured investments in intangible organisation capital and information and communication technologies (ICTs) and the complementary investments and innovations they induce (Basu *et al.*, 2003).

Improvements in workplace organisation, enabled by ICTs, have improved productivity. These include the re-organisation and streamlining of existing business processes, for example order tracking, inventory control, accounting services, and the tracking of product delivery (Atrostic and Nguyen, 2006). The expected economic impact from investments in technologies such as ICTs will also be far greater than what is predicted by just examining the capital investments because this does not take into account the widespread complementary innovations enabled by the technologies (Brynjolfsson and Hitt, 2000).

The effects of organisational changes may rival the effects of changes in the production process in terms of their impact on productivity at the firm-level. The ability to create economic value from intellectual assets is highly contingent on the management capabilities of individual firms and the implementation of appropriate business strategies (OECD, 2006), and the ability of ICTs to enable complementary organisational investments such as business process and work practices constitutes a significant component of the value of ICTs. These investments, in turn, lead to productivity gains by allowing firms to reduce costs and increase output quality, for example in the form of new products or through improvements in intangible aspects of existing products, such as convenience, customisation, timeliness, quality and variety (Brynjolfsson and Hitt, 2000).

Quantitative study of the effects of intangible investments, such as organisational changes and management practices, on growth is relatively recent and requires new frameworks and measurement practices. Given the quantitative importance of intellectual assets, their inclusion in measures of economic activity (such as GDP) is important for obtaining an accurate picture of economic growth, productivity and cyclical developments (OECD, 2006). Corrado *et al.* (2006) argue that the conventionally measured capital stock is underestimated by some 1 USD trillion and the business capital stock by up to 3.6 USD trillion.³ Adding this capital to the standard growth accounting framework changes the observed patterns and sources of US economic growth significantly. In particular, the rate of change of output per worker increases more rapidly in the presence of intangible capital, and capital deepening becomes the dominant source of labour productivity growth.

Source: van Welsum (2008).

3. An amount equivalent to around 29% of US GDP in 2005, or around 12% of US business capital stock.

The present phase of OECD work on intellectual assets and value creation has proceeded under a three-tier approach. At the macro-level, the focus is on national accounts estimations of accumulated intellectual assets and comparable growth accounting. At the regional level, the project is assessing the importance of intellectual assets for clusters and the geography of firms, as well as regional linkages. The third tier of work considers intellectual assets and their efficient management at firm level. This brochure presents a summary of the key findings to date from each tier of the project, drawing on underlying project documents.⁴ It aims to provide an integrated perspective on the topic, highlighting common themes, gaps and areas where further analysis is required.

Definitional issues

There is no commonly accepted definition of the term *intellectual assets*, reflecting the diversity of actors and disciplines involved (*e.g.* academics, accounting bodies, investors, managers, management consultants and policy makers, in economics, business administration, management theory and national accounts) and their different interests in addressing the issue of measurement and management of intellectual assets. Furthermore, there appears to be a mismatch between “theoretical” definitions and taxonomies, and the practical realities faced by businesses.

Similar terms such as “intellectual capital”, “intangibles” and “knowledge capital” are sometimes used interchangeably with “intellectual assets”, and there have been a number of attempts to identify the various constituents of intellectual assets and develop a taxonomy. The resulting proliferation of definitions, classifications and measurement techniques is indicative of the methodological and practical difficulties. Nonetheless, most definitions seem to agree that they are non-physical assets with three core characteristics: *i)* they are viewed as sources of probable future economic profits; *ii)* lack physical substance; and *iii)* to some extent, they can be retained and traded by a firm. They are generally seen to include R&D, patents, and trademarks. More recently, the scope has evolved to a broader conceptualisation that includes human resources and capabilities, organisational competencies (*e.g.* databases, technology, routines and culture) and “relational” capital (*e.g.* organisational designs and processes, and customer and supplier networks).

Definitions now also tend to include more dynamic business attributes such as knowledge-creating capabilities, rights of access to technology, the ability to use information, operating procedures and processes, management capability to execute strategy and innovativeness. The expansion in the conceptual scope of intellectual assets is pushing the definition beyond the “traditionally accepted” intellectual assets such as patents, software and trademarks, to include the associated value drivers. This blurring of definition is in part due to the fact that intellectual assets by themselves neither create value nor generate growth but need to be combined with other factors of production. Moreover, the components themselves are often deeply intertwined. For example, patents frequently are the result of R&D and are a legal device for securing the ideas emanating from human capital; the development of software represents a large portion of R&D spending, especially in services; software

4. The underlying documents are cited in the text and reference section. The full synthesis report is available to OECD delegates via the OLIS system, document code DSTI/IND(2008)6/FINAL (forthcoming).

and organisational structure are frequently the codification of human expertise and know-how; investment in training only generates value when combined with other factors such as improved business processes and the availability of the right information system (Lev and Daum, 2004).

National accounts

The System of National Accounts (SNA) provides a key instrument for monitoring of the economy. The information is of crucial importance for assessments from the perspectives of both domestic economic development and international comparisons. Decision makers across society depend on this information. Yet, the current approaches to this accounting provide an incomplete accounting of intangible assets. While there has been some progress in recent decades in enhancing the SNA to better reflect these assets, gaps remain. A substantial share of intellectual assets is still not reflected in the reporting. For example, the latest revisions have resulted in inclusion of certain types of software and R&D investment, but firm-specific intangibles – such as network capital or organisational capital – are still not captured directly. As a result, it remains difficult to assess with precision the economic contribution and evolution of intellectual assets, leaving decision makers with incomplete information about an asset category that – for OECD economies – appears to be roughly comparable in size to that of tangible assets.

Efforts are underway to better assess the measurement and policy dimensions of intellectual assets at the national level. Governments and business leaders have come to recognise the potential economic importance of such efforts. Consideration of intellectual assets is a part of the path to a more complete understanding of economic developments and enhanced policy responses for the future, including with respect to such issues as growth, resource allocation, adjustment and competitiveness. Nevertheless, the methodological challenges remain in spite of efforts to date to overcome them. In addition to the shortfall in coverage in the SNA, other national statistics and traditional corporate reporting standards do not adequately reflect the role of intellectual assets as a productive force and tend to rely on methods that favour financial or physical capital. The result is inadequate availability of reliable statistical information on intellectual assets, which may have negative consequences for economic decision making. The complexities stemming from the nature of intellectual assets, an increasingly dynamic environment and the absence of a coherent and agreed conceptual framework make research in this area extremely challenging and difficult to reconcile for practitioners and policy makers.

Different categories of intellectual assets

There are a variety of classifications of intellectual assets. One common approach is to classify the components in three broad categories: human capital, relational capital and structural capital.

- **Human capital** relates to the knowledge, skills and know-how that employees “take with them when they leave at night”. Examples are, innovation capacity, creativity, know-how, previous experience, teamwork capacity, employee flexibility, tolerance for ambiguity, motivation, satisfaction, learning capacity, loyalty, formal training, and education.

- **Relational capital** concerns the resources arising from the external relationships of the firm with customers, suppliers and R&D partners. It comprises that part of human capital and structural capital involved with the company's relations with such stakeholders. Examples are image, customer loyalty, customer satisfaction, links with suppliers, commercial power and negotiating capacity with financial entities.
- **Structural capital** refers to the knowledge that stays with the firm "after the staff leaves at night". It comprises organisational routines, procedures, systems, cultures and databases. Examples are organisational flexibility, a documentation service, the existence of a knowledge centre, the general use of information technologies and organisational learning capacities.

Unfortunately, a classification of intellectual assets is more easily described than conceptually framed and implemented for SNA purposes. Whereas such a descriptive framework may be useful from a point of view of a firm manager, it is inadequate for a national accountant. As a result, the distinction between different types of intellectual capital forms is a topic of ongoing debate extending from a mere classification issue to much deeper understanding of economic systems, how they work and the way that economic activities are meaningfully presented in the accounting statements.

The current System of National Accounts and knowledge assets

Though the 1993 revision of the SNA introduced an important change by recognising certain categories of intellectual assets such as software, literary and musical compositions, entertainment originals or recordings and mineral exploration, the scope of intellectual assets covered by that revision under the definition of intangibles remains relatively narrow (Schreyer, 2007). For example, a sizable share of R&D remains outside the scope of the current definition of assets and therefore expenditures on them are treated as intermediate consumption or final consumption depending on the sector. A further revision to the SNA is set to be released in 2008. Under this revision, R&D capitalisation will be integrated into the revised SNA.⁵

Several countries (Australia, US and Canada) have indicated their intention to include R&D Gross Fixed Capital Formation in their core accounts. The EU has decided that member countries should compile R&D satellite accounts until they feel the estimates are good enough to go in the core. Several OECD countries are also in the process of enhancing their statistical systems to include coverage of different forms of intellectual assets including human capital. Nevertheless, for now, and for some time to come, coverage of intellectual assets in SNA will remain incomplete, facing a number of challenges out of both institutional and conceptual concerns.

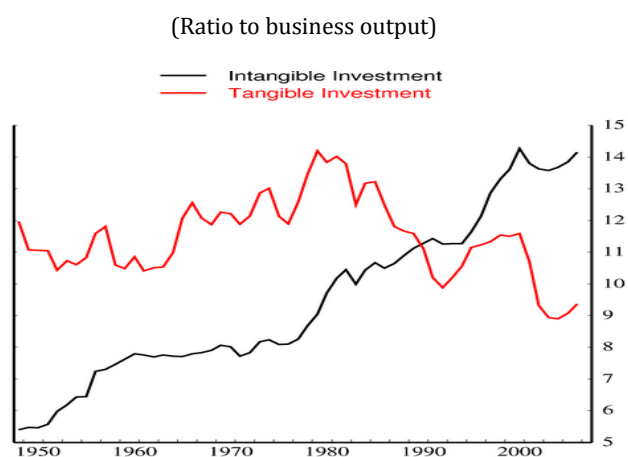
5. The 1993 SNA Rev. 1 chapters 6 (production account) and 10 (capital account) are near finalisation, and are of particular interest for capturing intellectual assets as they include such issues as R&D, patented entities, originals and copies, and databases.

Going forward, a combined approach of encouraging new front line research and guidelines and consolidating the already existing efforts and stock of knowledge may contribute to the progressive revision of SNA. International co-ordination in this context is vital and will maximise the efficiency of the revision process.

Intellectual assets in macroeconomic statistics

The increasing importance of intellectual assets for value creation is reflected in corporate expenditure, whereby investment in intangible assets appears to be approaching levels comparable to investment in tangibles. A number of statistical assessments are underway that aim to improve estimates of the scale of investment in intangible assets at the national level for selected OECD countries. Those presented in Table 1 consider estimates of total annual investment in intellectual assets for five Member countries (Finland, Japan, Netherlands, United Kingdom and United States). These estimates were developed using similar methodological approaches, but they are not strictly comparable in terms of the variables covered. The estimates underscore the large scale of this investment and amount to between 7.5% and 11.7% of gross domestic product, depending on the country. Among the analytical initiatives aiming to improve measurement of intangible assets, Corrado *et al.* (2005, 2006) estimated the annual investment in intellectual assets by US businesses in the late 1990s highlighting the growing importance of investment in intangibles (Figure 1).⁶

Figure 1. Business investment in the US, tangible and intangible investment



Source: Corrado *et al.* (2005, 2006)

6. The methodology employed by Corrado *et al.* (2005, 2006) groups intellectual asset investments into three major categories: *i*) computerised information (software, computerised databases), *ii*) innovative property (scientific R&D, non-scientific R&D, design); and *iii*) economic competencies (brand equity, firm-specific human capital and organisational capital).

Table 1. Intellectual asset investment in five OECD countries, by asset category

(Percentage of GDP)

	CHS (2005, 06) US 1998- 2000	GH (2006) UK 2004	FHMS (2007) Japan 2000- 2002	RBT (2007) Netherland 2004	JAA (2007) Finland 2005
Computerised information	1.7	1.7	2.0	1.2	1.0
Innovative Property	4.6	3.4	3.7	2.4	4.0
Scientific R&D	2.0	1.1	2.1	1.5	2.7
Mineral exploration	0.2	0.0	0.0	0.0	0.0
Copyright and license costs	0.8	0.2	0.9	0.1	0.1
Other product development, design and research	1.6	2.0	0.7 ¹	0.7	1.1
Economic competencies	5.4	5.0	2.5	3.6	4.1
Brand equity	1.5	0.9	1.0	1.6	1.7
Firm-specific human capital	1.3	2.5	0.3 ²	0.8	1.2
Organisational structure	2.7	1.6	1.2 ³	1.2	1.1
Total intangible assets investment	11.7	10.1	8.3 ⁴	7.5	9.1

1. Product development in financial services only.

2. Direct firm expenses only.

3. Purchased organisational structure is not included.

4. Not strictly comparable with the figures for the other countries due to incomplete coverage of some asset classes.

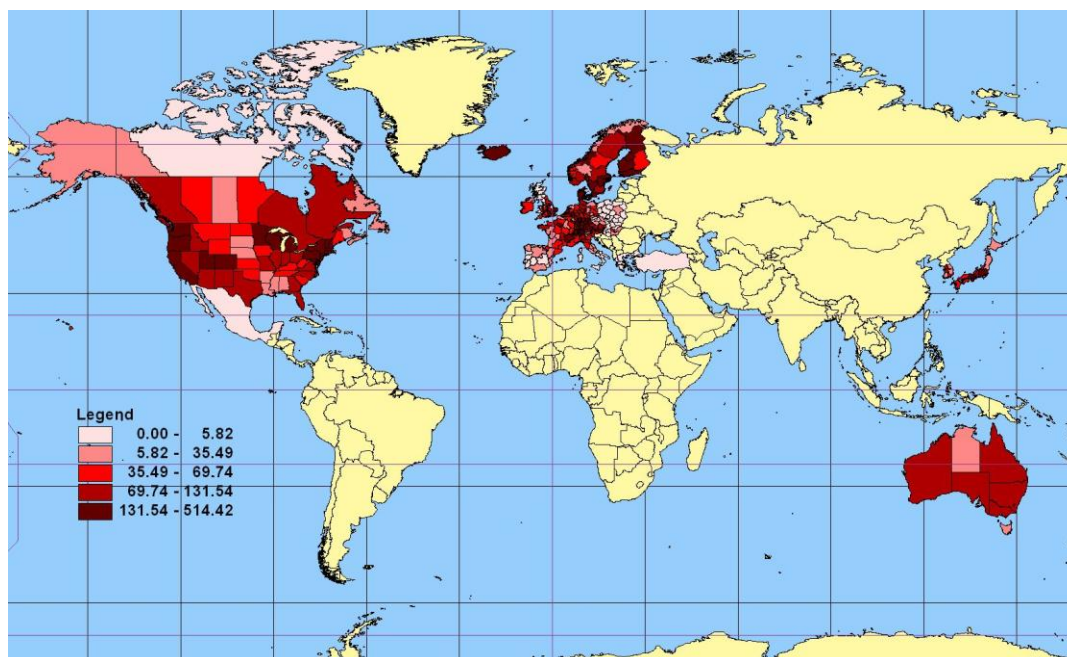
Sources: Corrado *et al.* (2005, 2006), Giorgio-Marrano and Haskel (2006, 2007), Fukao *et al.* (2007), van Rooijen *et al.* (2008), and Jalva *et al.* (2007).

The regional dimension of innovation

Intellectual assets are also an important consideration for clusters and the geography of firms, as well as regional linkages. Analysis shows that there are important differences in the inventive performance of regions in OECD economies, as measured by indicators for one of the key types of intellectual assets (*i.e.* patents). Inventive performance is shown to be particularly concentrated in certain regions of continental Europe, North America and Japan (Figure 2). The development of inventive activities in countries usually takes place in a small number of regions. There are linkages both between geographical areas and between firms as a result of the flow and transfer of intellectual assets and knowledge spill-overs. Geography matters for the spatial distribution of intellectual assets and innovation activities in particular, as knowledge flows and specific skills often require proximity to be fully exploited.

Figure 2. PCT applications, OECD countries, 2002-2004

(per million population)



Source: Usai *et al.* (2008), based on the OECD Regional Database.

Preliminary results from work pioneering a new OECD regional database (Usai *et al.*, 2008) indicate that the regional distribution of innovation is skewed, especially in Europe. They confirm that highly inventive regions tend to cluster together. This spatial dependence is found to have increased over time. There are linkages both between geographical areas and between firms as a result of the flow and transfer of intellectual assets and knowledge spill-overs. Moreover, the geography of innovation is influenced by factors such as regional and local governance, infrastructure and factor endowments (*e.g.* skilled labour), alongside national factors such as macroeconomic conditions and policy frameworks, specifically on competition, R&D, and intellectual property right (IPR) protection. Cross-country differences point to the importance of national innovation systems. The results also indicate the importance for innovation of linkages within firms across regions. At the same time, the most inventive regions tend to have relatively more multi-regional firms among their innovative firms. It is important to arrive at a better understanding of these processes, in order to maximise the returns to innovation and optimising the effects and efficiency of innovation policy.

There are various types of “economies of agglomeration”, related notably to the use of common resources by innovative actors. For instance, agglomerations benefit from positive “local externalities” such as lower communication, transportation costs and knowledge spillovers. The local availability of skilled labour, of competitive firms and the presence of high quality publicly funded research (universities, public laboratories) have also been found to matter. There can, however, also be certain costs associated with geographical agglomeration of activities such as congestion.

Knowledge spill-overs and regional linkages

Given the importance of knowledge spill-overs for innovation and the diffusion and transmission of intellectual assets in theory, it is important to attempt to measure the extent of knowledge spill-overs, as well as their rate of decay with distance, in practice. This is a difficult task, especially in light of numerous measurement challenges, not only for capturing information on intellectual assets, but also innovative activity itself. The approach taken in Usai *et al.* (2008) uses patents as an indicator of innovative output, employing counts of Patent Cooperation Treaty (PCT) applications.^{7,8} The data used come from the OECD Regional Database of statistics on socio-economic indicators in some 2 014 regions across the 30 OECD member economies. The level of detail chosen for the analysis is the so-called Territorial Level 2 (TL2), where possible, and country level elsewhere.⁹ The regional distribution of PCT applications in the 30 OECD economies is shown in Figure 2. The greatest regional coverage can be found in the US (each of the 51 states).

Usai *et al.* (2008) examine two time periods, 1998-2000 and 2002-2004. Growth in PCT applications was greatest in Japan and Korea, which are still modest utilisers of this type of application. Most countries that experienced low PCT values in the first period saw a significant increase in PCT values in the second period (Mexico, Poland, Turkey, and Slovak Republic). Countries with strong performances in the first period saw slower growth in the second period (Finland, Norway, Sweden, and Luxembourg). Most European regions showed significant PCT applications growth in both time periods.

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7. Patent measures are often used as an indicator of inventive performance. However, they have drawbacks as indicators of invention. Looking at the number of patents granted does not provide an estimation of the quality or impact of the underlying innovation, nor does it necessarily reflect the impacts of patenting on the diffusion of knowledge. Moreover, the increasing importance of open innovation may affect the usefulness of patents as an indicator of innovative activity. Not all inventions will get patented, and not all patents will result in commercial innovations. Furthermore, the relationship of patents to the overall volume of innovation is not necessarily linear. Some innovators may opt not to employ intellectual property (IP) protection or may choose to rely on other forms of IP protection instead of patents (*e.g.* copyrights or trade secrecy).
 8. Use of the PCT applications database distinguishes this report from most of the literature on this topic, in that the other analyses tend to use the databases from the European Patent Office (EPO), US Patent Office (USPTO) and the Japan Patent Office (JPO). Those databases reflect a home bias effect; this is negligible in the PCT database, making it very suitable for cross-country analyses.
 9. TL2 data are available for 23 of the 30 OECD member economies. Country level analysis has to be used for the remaining countries: Denmark, Iceland, Ireland, Luxembourg, Mexico, New Zealand, and Turkey.

The inventive performance of a region can be related to the share of skilled workers; the concentration of skilled workers in a region should enable externalities to materialise since direct communication enables flows of information and tacit knowledge. The density of economic exchanges and contacts is assumed to act as a catalyst for agglomeration effects.¹⁰ Innovation systems have been found to matter for innovation performance at the aggregate level (*e.g.* Jaumotte and Pain, 2005) and regional innovation institutions and strategies are likely similarly important in stimulating and diffusing innovation. Finally, with knowledge spill-overs, innovation generated in one region may spill-over and help knowledge formation in other regions, especially nearby ones. Indeed, the production of knowledge in a region may depend not only on its own research efforts, but also on the knowledge stock available in the whole economy and on its ability to exploit it. Many factors, including those external to the region, can have an impact on technological activity, such as trade and investment flows and common markets for skilled labour and final goods.

Intellectual assets: firm location and linkages

Linkages between firms, and between firms and universities have an impact on the degree and patterns of innovation on regions and on the intensity and patterns of cross-regional technological links, and the role of intra-firm and inter-firm relationships in inter-regional co-operation are analysed in new work by Thoma (2008). Preliminary results indicate that most of the linkages between regions are intra-firm and that the most innovative regions tend to have relatively more multi-regional firms among their innovative firms.

There is large literature arguing the benefits of geographical proximity among different innovators, mainly based on the importance of local production means and localised technological spillovers for innovation and growth (see Thoma, 2008, and the references therein). However, the mechanisms of generation, diffusion and absorption of these benefits are quite heterogeneous. The process also evolves over time, especially with technological developments, in particular in ICTs. These can enable a broader and faster exchange of codified knowledge and ideas. Tacit knowledge, however, tends to rely on proximity, practice and learning-by-doing. By locating close to each other, people can access information, monitor other people's behaviour, and foster communication among individuals, thereby reducing the complexity and uncertainty of the innovation process.

A second stream of literature describes the firm as the natural mechanism to foster, select and co-ordinate R&D projects and activities (Nelson and Winter, 1982; Dosi *et al.*, 1988). Firms rely on specific competencies, learning processes, and communication systems that reduce the cost of co-ordinating different individuals and parts of the organisation (Nelson, 1995). Firms' distinctive capabilities for spin-off companies are thought to lie in the parental origins of the firm, and require transferring the human capital employed by the companies (Klepper and Sleeper, 2002). The effectiveness of a firm's learning processes, the capabilities to co-

10. For example, Audretsch and Stephan (1996) argue that, all else being equal, the same R&D efforts may result in higher levels of innovative activity in urban areas than in rural areas because of agglomeration economies.

ordinate and integrate internal activities, and the ability to modify strategies and competencies when the environment conditions are important factors in explaining firms' competitive advantage (Teece *et al.*, 1997). Thus, the geographical distribution of innovation activities at the regional level is intrinsically related to the geographical dispersion/concentration of inventive production process at the level of the organisation that has generated it.

The new study by Thoma (2008) classifies business organisations according to the geographical scope of their inventive activity or the number of distinct locations where the inventors are located. The "size" of the innovator, defined by number of the inventions produced by a firm, is also important. The geographical space unit used is Territory Level 3 (TL3, hereafter). The database employed in his analysis consists of 422 893 patent applications, whose inventors are located in 2 060 distinct TL3 regions. More than 65% of the regions are European, about 20% and 10% in the US and Canada, respectively. There are only 14 TL3 zones in Australia and 10 in Korea. The Japanese regions correspond to the 47 prefectures.

Regions differ substantially in terms of inventive performance as a large number of the most productive inventors are localised in only a small share of the regions (10% of the regions account for more than two-thirds of the patents). These top 10% regions are labelled "Top Knowledge Regions" and the analysis for the overall sample is compared to the performance of these regions. The US accounts for some 25% of the Top Knowledge Regions, producing around 40% of the overall patents. The Top Knowledge Regions in Europe generated the same amount of patenting but across twice as many regions as in the US.

The geographical scope of the inventive activities

Most PCT applicants are mono-regional (64%) or bi-regional (29%), but most patents are from multi-regional firms (60% from applicants present in more than three regions; 17% in more than 20 regions). The largest applicants tend to be present in more regions than other applicants. Applicants with greater inventive geographical scope also tend to be more inventive. Relatively more multiregional applicants are found in Japan and the United States than in Australia, Canada, the EU, and Korea. There are also differences by technical fields; applicants in the chemicals and pharmaceutical technologies fields are active in relatively more regions and they are more inventive. This finding would be consistent with studies that have concluded that the inventive process in chemicals and pharmaceuticals is characterised by a more general and abstract knowledge (Arora and Gambardella, 1994). Such codifiable knowledge¹¹ enables the geographical separation and division of labour in the inventive process in these industries. Electrical-electronics and instruments technologies follow after chemical and pharmaceuticals. Top knowledge regions have a higher percentage of both multiregional applicants (47% versus 36% in total) and serial applicants.

11. This is in contrast to so-called tacit knowledge, which tends to require physical proximity to be transmitted.

Multinational firms are characterised by a greater geographical scope of their inventive activities, and they tend to be located in the Top Knowledge Regions. This suggests that the innovative performance of a region both in terms of total inventions produced and innovativeness of its firms is strongly related to the region's degree of openness and collaboration with other regions, nationally and internationally.

What types of firms open new technical fields?

The opening of new fields is detected with the first patent filed, world-wide, in a given technical class (technical classes are quite narrowly defined as there are more than 70 000 classes overall in the international classification). Occasional inventors open 49% of new fields (whereas they represent 45% of all patents), monoregional firms (most of them occasional inventors) open 31% of new fields (19% of all patents). Hence, although larger, multiregional and multinational firms open the majority of new fields, smaller and monoregional firms contribute more than their overall weight in patenting, indicating their comparative advantage for such, more radical, inventions, which can be related to entrepreneurship.

Research co-operation within regions

Small and medium size enterprises (SMEs), in particular, may strive to adopt collaborative approaches to invention when they do not hold sufficient internal competences and resources to develop an invention autonomously. Thoma (2008) looks at copatenting to examine the extent of R&D collaboration among firms. In general, copatenting is not a common form of collaborative R&D collaboration. Only 0.2% of patents were found to have been filed by more than one applicant. When copatenting does occur it is done almost always in collaboration with multiregional firms (98.5%) and with multinational firms (87%). Monoregional firms, occasional innovators, and firms from smaller countries tend to use copatenting relatively more than multiregional firms and serial innovators. Copatenting tends to be done with regional partners, and monoregional firms are more likely to co-operate with partners of the same region than multiregional firms.

Research co-operation between regions

Cross-regional co-inventions are inventions with inventors located in at least two different regions. They represent two geographically distinct sources of knowledge being pooled together and resulting in a new invention. It is therefore an important type of cross-regional linkages. Overall, about 56% of patents reflect cross-regional co-inventions. The practice of cross-regional co-invention is more widespread among persistent and serial inventors than among occasional ones, and among EU and US firms. A very small share of cross-regional co-inventions are done as inter-firm co-operation, about 0.2%, while the rest is organised within firms. Hence, most cross-regional co-inventions are in fact organised within firms, essentially large ones, both multiregional and multinational.

Patenting by non-business organisations

Non-business organisations (NBOs) include notably universities and government research organisations. In the US, patenting by NBOs increased rapidly and substantially after the introduction of the Bayh-Dole Act in 1981 – followed by similar legislation in other countries. This Act made it possible to retain ownership rights over patentable inventions generated from publicly funded research projects. The increase in such patenting has been more substantial in the US and Canada than in Europe, although some studies have pointed to systematic institutional differences in the patenting of inventions from public laboratories that favour the assignment of patents to a public organisation in the US and to a business partner in collaboration with academic inventors in Europe (Lissoni *et al.*, 2007). As a result, results making reference to cross-country comparisons need to be interpreted with care.

High-growth and innovative SMEs

The situation of SMEs merits special attention with respect to reporting and management of intellectual assets. To the extent that intellectual asset reporting guidelines cover all organisations, they can have beneficial effects for small innovative companies. Enhanced approaches to reporting can raise awareness – among businesses and policymakers – of the potential for small firms to develop and exploit intellectual assets. For example, young and innovative firms can usefully employ their intellectual property as collateral in obtaining finance in cases when they cannot rely only on their tangible assets and do not yet have reputation or brands or other intellectual assets for use in raising capital. Moreover, there is room for enhancement of policies in support for small and medium-sized enterprises with respect to intellectual assets and value creation. Small firms often rely on informal approaches to management of intellectual property, a point that policy does not always take into account. There is scope for improved awareness of this among policy makers and in the larger business community. Such awareness may lead to enhancement of communication and support strategies for small firms, for example in the targeting of government or business association efforts to provide access to intellectual property, to simplify administrative procedures and to deliver training and capacity building.

High-growth firms,¹² and SMEs in particular, account for a significant share of jobs created and are key players in economic growth. High-growth SMEs can be found throughout the economy, including older firms in traditional sectors as well as younger, technology-based ones in emerging and high-tech sectors. There are at least two important aspects of the relationship between innovation and rates of SME growth: the extent to which innovation promotes fast growth, and the relative importance of innovation versus other potential sources of high growth. The two aspects are related and are often driven by obtaining and exploiting intellectual assets. Having intellectual assets is important, but results also depend on the use

12. The OECD defines a highgrowth firm as being characterised by annualised growth in employment or turnover of more than 20% a year over three years for enterprises with a starting employment of 10 or more employees. Gazelles are a sub category added to capture growth within younger enterprises, *i.e.* those established for less than 5 years. One drawback of this definition is that it does not take sectoral differences into account.

that is made of them. It is not straightforward to establish the link between the use of intellectual assets, innovation and high-growth in SMEs empirically.

An OECD study of high-growth manufacturing SMEs (OECD, 2002b) highlights five aspects of firm development with a particular impact on growth: *i)* innovation, *ii)* market and technology links, *iii)* organisation and managerial structure, *iv)* teamwork, and *v)* networking. Overall, the findings point to the importance of the link between innovation and response to customer demands. High-growth SMEs tend to be very market-oriented and respond to market changes with product innovations, often also closely related to process innovations. They tend to aim for improved product quality and customer satisfaction rather than reduced costs. This is an example of how firms can create value from their intellectual assets.

Most high-growth firms relied on networking and public-private relationships to develop innovative products and processes, and only few had their own R&D department. The organisation and management of high-growth companies was found to generally take on a hybrid structure, as in partnerships, where decisions and strategy directions are arrived at by general agreement. The innovation process tended to be well organised and in line with the firm's overall strategy. Delegation of tasks, use of teamwork and knowledge are other key aspects of high-growth firms. Profit sharing was often used to motivate staff. Training was important, especially when faced with difficulties in recruiting skilled staff. Networking with customers, other firms, suppliers, distributors and others such as competitors and public or private research institutions, was also found to be very important for high-growth firms.

Three factors have been identified as particularly important for the relationship between innovation and high enterprise growth, reflecting the importance of different types of intellectual assets: *i)* business practices, *ii)* knowledge acquisition and the increasing importance of obtaining and exploiting intangible assets, and *iii)* how the owners and managers of these enterprises handle transition points in their business life-cycle.

Business practices and the use of intangible assets

Business practices such as leadership, planning practices, customer and supplier focus have an impact on firm performance. Capital investment choices, R&D practices, market research and a range of employee practices are also important, as are innovation in capabilities and resources within the firm. External characteristics such as industry structure further contribute. Intangible resources inside firms and the use of existing knowledge adapted to changing circumstances have been found to matter for developing firms' capabilities and competitive advantage (Campbell-Hunt *et al.*, 2000). Distribution networks are important for the firm's ability to internationalise its operations (Chetty and Campbell-Hunt, 2003). Internationalisation can then further contribute to a firm's performance through increased competitive pressures, access to new markets, and access to foreign knowledge and technologies, in turn an important driver of innovation.

The use and acquisition of knowledge

The nature of comparative advantage is increasingly shifting to the efficient and productive use of intangible assets such as knowledge, skills, and intellectual property. The impact of knowledge spill-overs, from sources both external and internal to the firm, on SME performance and firm growth have been examined empirically, though only on some small and selected samples. Geographical proximity is not necessarily a pre-requisite for innovation (Davenport, 2005), especially when the firms internationalised (*e.g.* because they lacked domestic markets or networks). In innovative high-growth firms, “organisational proximity” was found to be more important than physical proximity. Other studies have found that the learning environment is important for small firms, especially when building on past experience (Dalley and Hamilton, 2005), and that learning often is a continuous process of adaptation to changing circumstances (Simpson *et al.*, 2000). The ability to learn is fundamental to the ability to innovate, and the capacity to develop flexible and adaptable learning processes, especially in times of pressure, was found to have helped firms to grow and innovate even after the crisis period was over.

The business life cycle and key transitions

Managing transitions in a firm’s life-cycle, for example in response to changes in regulation, is very important for innovative and high-growth SMEs. High growth often requires changes in entrepreneurial behaviour over the course of a firm’s life cycle, for example with staff changes (number of employees, types of skills), or changing processes and procedures. Knowledge transfer is also especially important in times of change and transition. A firm’s leadership role can play an important part in how it responds to high growth and whether it retains its competitive advantage, especially since staying competitive requires continuous efforts. From a strategic management perspective, innovation and high growth have been found to be closely related to the manner in which firms deploy innovation during key transitional phases in their growth patterns. For example, one way for a firm to manage sudden high-growth is to concentrate on a product niche to preserve the firm’s competitive advantage (Corbett and Campbell-Hunt, 2002). It has also been suggested that entrepreneurs in high growth firms who share the running of the business with a team, in so-called ‘distributed entrepreneurship’, are more likely to achieve significant growth. These findings highlight that the manner firms use intellectual assets is crucial to their potential to create value from them.

Finally, management capabilities are an important factor in firm innovation and growth, and have been identified as a potential problem area for SMEs. For example, a study for the UK finds that innovative SMEs there may be more constrained by management skills than by financial concerns (Hughes, 2000). This could point to an area for further assessment in terms of its policy implications; a lack of management skills is often named as a factor in cases where SMEs have failed either as a firm, or in bringing new ideas to the market. Many SMEs have a wealth of technological ideas but not the management skills to implement them and see the process through to successful innovation. This highlights the idea that the use that is made of a firm’s intellectual assets is crucial to the firm’s potential to create value from them, be it through new and/or improved products (with product and process innovations) or lower costs.

The management of intellectual property by SMEs

As intellectual assets and the ability to create value from them increases, so does the ability to reap the economic gains from the assets. In certain cases, this can be achieved through the use of intellectual property rights. Innovative and young SMEs can usefully employ IP as collateral in obtaining finance in cases when they cannot rely only on their tangible assets and do not yet have reputation or brands or other intellectual assets for use in raising capital. However, a study on SMEs in the UK and Finland found that many SMEs see IPRs as irrelevant and rely more on informal practices (Kuusito and Paallysaho, 2007). SMEs reported relying on a wide range of informal IP protection practices including secrecy, publishing, enhancing the commitment of the personnel, division of duties, circulation of duties, documentation, fast innovation cycle and technical protection. Informal ways of protecting IP are less costly, easier to control and use and they may be embedded in the routine working practices of the firm. However, for many SMEs improved informal IP management and protections skills can also be a ‘first step’ on the ladder towards an effective IP strategy that includes the utilisation of formal IPR protection.

These findings raise a number of policy issues. It would be useful to achieve a balanced policy approach that recognises the importance to SMEs of both informal and formal ways to manage and protect IP. This requires improved awareness of informal IP protection and management strategies among policy makers and in business communities. Informal IP management and protection involve a wide variety of different types of business process activities carried out by SMEs. Such a wide interface creates opportunities to integrate IP strategy related issues more effectively into the SME policies. Linking IP related support services to the life-cycle of the innovation and business processes could be an effective way to communicate these issues to the SMEs, as would be providing access to IP knowledge, simplification of administrative procedures, adequate fees, training and capacity building. The suggestions are reflected in the responses from a recent OECD policy questionnaire (Box 2).

Box 2. SME policy questionnaire

The OECD Working Party on SMEs and Entrepreneurship (WPSMEE) is collecting comparative information on government programmes via a policy questionnaire covering WPSMEE members and observers¹³ and targeting policies that aim to foster enterprise growth and innovation, in particular with respect to SMEs. The questionnaire addresses main policy objectives, including those that aim to: *i*) foster the growth or high-growth of SMEs, *ii*) promote skill development in enterprises, *iii*) develop intellectual assets (IAs) management capabilities in enterprises, including intellectual property rights (IPRs), *iv*) support business R&D in enterprises, *v*) stimulate enterprise in innovation, *vi*) facilitate enterprise collaboration with other partners and open innovation, and *vii*) improve access to financing for high-growth SMEs and innovative enterprises (by debt financing, equity financing and financing for niche groups, *e.g.* creative industries). Preliminary results show that this policy area receives much attention and substantial efforts from many governments. Many governments seem to react to a reported lack of awareness among SMEs of the importance of intellectual assets management and the resulting lack of resources allocated for this activity.

13. The observers include Brazil, Israel, Romania and Thailand.

Corporate reporting

Recent OECD work on corporate reporting highlights developments in guidelines and frameworks concerning intellectual assets (Bismuth, 2006 and 2007) While there are a variety of such reporting initiatives, the main disclosure standards and practices can be categorised broadly in two categories: *i)* narrative statements and non-financial reporting intended to cover all types of value drivers related to organisational performance and *ii)* specific reporting about the intellectual assets. In many cases, current management and corporate reporting practices are focused on backward-looking information and provide little systematic information about the capacity of the company to generate future revenues with respect to intellectual assets. Under the various reporting initiatives, governments and industry bodies have moved to enhance narrative reporting and promote the disclosure by companies of, *inter alia*, material, qualitative and forward-looking information about value drivers, trends, risks and uncertainties.

Despite the diffusion of these initiatives, specific reporting on intangibles remains relatively limited in practise, albeit with some variation by region and sector. Still, there are indications that successful implementation of enhanced reporting on intellectual assets can yield a number of benefits in terms of efficiency and value creation. The provision of sufficient and appropriate information about intellectual assets can improve decision-making by investors and help discipline management and boards with positive economic consequences. By ensuring that the non-financial information is consistent and comparable over time and across companies, these initiatives may allow investors to better assess future earnings and the risks associated with different investment opportunities. This should contribute to making financial markets more efficient by reducing information asymmetry, biased or unfounded earnings estimates, unrealistic valuations and unjustified share price volatility. Improved information about intellectual assets and company strategy also improves the ability of firms to secure funding at a lower cost of capital – notably for small listed companies that suffer from a lack of coverage by analysts – and to better allocate resources.

One important policy implication is the potential for government to assist in the efforts to promote identification and dissemination of best practices in reporting. (In this regard, it should be noted that the types and importance of intellectual assets vary across industries and some specificity is needed.) Dissemination of knowledge about the potential benefits could also encourage more companies to improve their disclosure practices as well as their internal management systems. Better information on intellectual assets in the national accounts and corporate reporting would also facilitate the design, monitoring and implementation of more efficient public policies, for example with respect to investment in intellectual assets to generate economic value.

Understanding how companies use intellectual assets, in particular to innovate and to create value, and how intellectual assets fit into wider firm strategies and risks, is crucial. Current accounting standards are not suitable for the reporting of intellectual assets, but additional non-financial disclosure has been found to enhance market efficiency. The issues at hand are analysed in Bismuth (2006, 2007) and include questions such as what should be disclosed and how; what kind of information should be produced by the firm; and how this information can improve

the management and operation of companies, including their risk management. Public policy and private initiatives can play a role by raising awareness about the concept of intellectual assets, its importance and existing best practices for intellectual assets reporting.

Competition is forcing many companies to accumulate intellectual assets and to seek to use them effectively to create value by introducing product and process innovations that improve product quality and sales or reduce production costs. This ongoing process has important implications for management, the design of information and control systems, oversight by the board and transparency with respect to shareholders and other stakeholders. However, many companies are finding it difficult to adjust to these changes. Board members and some executive managers express dissatisfaction with the information they are receiving about the effective use of intellectual assets (*i.e.* value creation) and many investors have expressed the same sentiment.

One way to disclose more information about a company's intellectual assets and strategies for value creation is through narrative reporting. Where firms disclose more about their assets and value drivers they are rewarded by improved market valuations, another form of value creation for the firm. This effect is especially pronounced for companies that have limited pools of available capital (referred to as "small-caps" hereafter) and that suffer from a lack of coverage by analysts¹⁴ and sector or branch publications. The existence of special segments of stock markets might also improve the relationship between investors and the companies and thereby underpin valuations, innovation and growth.

Guidelines and frameworks for reporting intellectual assets

Guidelines and frameworks to aid narrative reporting have been issued that promote the disclosure of, *inter alia*, material, qualitative and forward-looking information about the company's value drivers, trends, risks and uncertainties. To date, three waves of proposed frameworks to encourage companies to report developments related to their intellectual assets can be distinguished. The first wave of reporting frameworks evolved around a scorecard format that provides a mechanism for companies to report a greater variety of information about the various components of their intellectual capital. Among them, the most famous are the Skandia Navigator (Skandia, 1994), the Balanced Scorecard (Kaplan and Norton, 1992) and the Intangible Assets Monitor (Sveiby, 1997). The second wave is characterised by the attempt to link intellectual capital more explicitly with innovation and the value creation process through frameworks such as the Value Chain Scoreboard (Lev, 2001). The third wave relates to a more narrative-based format for intellectual capital statements and has emerged in Denmark. In 1997, a pilot group of Danish Companies issued Intellectual Capital Reports according to a guideline proposed by the Danish authorities. Taking the lead from the MERITUM and the PRISM projects at the European Union level, other firms have decided to make additional disclosures going beyond listing requirements, especially in Germany and in Spain.

14. The degree of analyst coverage is important as it not only has an impact on a company's valuation, liquidity and growth, but also affects the efficient operation of financial markets.

A number of leading companies have also reported intellectual capital going beyond their reporting requirements (Ordonez de Pablos, 2005). European companies have pioneered the intellectual capital measurement and reporting field, but the trend has now extended to Japan where guidelines for disclosure of intellectual assets have been issued. In the United States, some leading firms have also moved to expand narrative reporting on these issues. In addition, there is interest in having standardised information directly linked to a revenue or income stream, as illustrated by practices in certain industries (*e.g.* pharmaceuticals) that use a number of intellectual asset-oriented indicators.

Aims and expected benefits from reporting intellectual assets

The main anticipated benefits from introducing non-financial reporting frameworks include improved capital market efficiency, a lower cost of capital, a lower bid/ask spread and reduced stock price volatility. However, whereas the general non-financial reporting frameworks mainly concern listed companies and are usually mandatory and shareholder oriented, making them essentially a reporting tool for the company, the reporting guidelines on intellectual assets cover all organisations, with a special focus on small innovative companies. They intend to promote a voluntary application of the guidelines, and are not necessarily shareholder focused so they tend to be considered as a management tool.

The main aims of the non-financial information assembled by the intellectual capital reports are to: *i)* make intellectual assets and their value drivers more visible; *ii)* ensure stakeholders that the specific risks arising from the intellectual assets are properly managed; and *iii)* report intellectual asset-specific key performance indicators that portray the performance of the company in terms of how it has managed its intellectual assets. Some companies use this narrative reporting to discuss their intellectual assets and corporate strategy with respect to innovation. In particular, the adoption of Intellectual Asset reporting should contribute to mitigating the difficulties encountered by research-intensive SMEs to find financing for their research and innovation projects.

The main challenges for non-financial reporting frameworks in identifying and understanding competitiveness and value drivers are: *i)* to assist companies in the process of producing and disclosing timely, relevant and comparable reports that allow providers of capital to make more informed estimates of the future benefits and risks associated with their investment opportunities; *ii)* not to overlap with existing voluntary reporting and provide consistency with all existing reports; *iii)* not to overload information disclosure and to ensure the materiality of information released; and *iv)* not to increase preparation costs for companies listed in multiple jurisdictions.

Even though reporting guidelines on intellectual assets are potentially applicable to all companies, in practice most companies that have reported their intellectual assets in this form turn out to be non-listed SMEs. Major benefits reported by non-listed companies that have produced intellectual assets reports relate to internal management and communication with stakeholders. Additional benefits of intellectual capital reports can include improved customer acquisition and retention, enhanced employee motivation and an awareness of organisational strategy and the objectives of the company, improved employee recruitment and retention, and

increased competitiveness of the company coming from a better identification of the value creation drivers, an enhanced efficiency of resource allocation and better project management. Intellectual assets reports may also serve to enhance the reputation of a company.

The role of financial markets

The pressure from investors for improved disclosure is at an early stage in many markets but could become a driving force in pushing companies to reconsider calls for an increased disclosure of forward-looking information about their intellectual assets and value creation strategies. The main objective for analysts and investors is to establish a link between key intellectual assets, company performance and share price.

Even in the absence of formal disclosure of intellectual assets reporting, there is evidence that markets take into account company features such as the expected value of new innovations, R&D initiatives, technological breakthroughs and the quality of management. Capital markets use other channels of information, such as the information provided by analysts and specialised sector publications (Darby *et al.*, 1999). For example, large investors discuss directly with management the innovation strategy and intellectual asset base of the company, although this way of obtaining information about intellectual assets and business strategies implies additional costs, which, in turn, delays the dissemination of their assessments in the financial markets as they will seek an economic return on their private knowledge (Holland, 2002).

Financial markets reward companies for increased disclosure, especially in the case of small listed companies. In particular, the negative association of increased corporate transparency and reduced stock price volatility is stronger for smaller companies (Barnett, 2003), and the importance of presenting good quality information increases significantly as the level of analyst coverage declines. Reduced stock price volatility, in turn, contributes to reducing the company's cost of capital. Company managers can encourage analyst coverage by explaining how business processes function and how value is created (Das *et al.*, 2006). Market pressures also encourage more companies to improve their reporting practices but companies differ widely in this respect. Some companies are already coping with the non-financial reporting of intellectual assets, but not in any systematic way, and with great differences across companies, sectors and countries.

Intellectual assets, risk management and internal control

Although most existing guidelines focus on reporting issues, investors and managers are increasingly oriented to internal control and risk management issues. Intellectual assets reporting frameworks aim to report how an organisation is seeking to create value. As a result, the main benefits of intellectual assets reports have been found to be improved management of intellectual assets, enhanced resource allocation decisions at company level and better risk management. However, intellectual asset-intensive companies face heightened risks as innovation cycles are variable and entail substantial investments. The identification, assessment and management of such risks require a strong internal control system.

Management is not always able to deliver the information on the company's value drivers needed by investors and boards, and the information on key non-financial drivers of success either not available or of poor quality. Additional information is needed on intangibles such as how well the company is satisfying customers, delivering high quality products and services, operating with efficient processes, and developing new products and services. Reporting frameworks will need to address the issues of internal control and risk management and encourage companies to set up internal information systems in order to provide managers and boards with the quantitative measures they need for efficient resource allocation. Increasing the efficiency of resource allocation is a major challenge as research has shown that, for example, an increase in R&D expenditures is not necessarily linked with more and successful innovation.

Difficulties arise from the interrelated nature of intellectual assets: intellectual assets are not always separately identifiable but tend to be complementary and can overlap significantly. Knowing more precisely which combination of intellectual assets favours innovation and value creation contributes to improved allocation of scarce resource and strategy formulation, and hence increases a company's competitiveness and growth. By managing and reporting their intellectual assets, the experience seems to be that managers obtain new insights into the value and performance of the organisation's knowledge intensive resources. The increasing emphasis on risk management and internal control taken by current approaches to corporate governance is thus moving in the same direction as moves to improve the management and disclosure of intellectual assets.

Venture capital

Start-ups and small innovative companies, both typically highly intellectual assets-intensive, need creative and diverse ways of financing, and this incurs reporting obligations. Firms with a high share of intangibles and in high-tech sectors are more likely to be financed through venture capital because they are more difficult for external investors to evaluate and they also look for extra-financial input. Venture capital reduces asymmetric information problems, which tend to be higher for small innovative firms and firms whose assets are difficult to evaluate (such as those whose main asset is a new product yet to be launched on the market or those with a large share of intangible assets in their "balance sheet").

Venture capital (VC) addresses the funding needs of entrepreneurial companies in a number of companies that generally do not have the size, assets, or operating histories necessary to obtain capital from more traditional sources, such as public markets and banks. Hands-on venture capitalists play roles over and above those of traditional financial intermediaries, which find it more difficult to value assets as collateral. The venture capitalists' contributions in financially oriented areas (monitoring financial performance, regular budget reporting and giving financial advice) are obviously high, but their involvement also covers a wide range of non-financial areas. These include strategic advice, networking opportunities, providing focus and support and enhancing company credibility, their relative importance depending on the VC-backed company's development stage. VC is particularly suited to finance and nurture innovative companies at an early-stage of development (Hellman and Puri, 2002). For these companies, the expertise of the VC firm, its

knowledge of markets and of the entrepreneurial process, and its network of contacts are most useful to help realise their growth potential.

As VCs are often industry specialised and entrepreneurs may lack management skills, VC strategic advice is a highly valuable input to many venture-backed companies, especially during developing stages. VC firms rely on their industry-specific human capital as their most valuable intellectual asset to identify good investment opportunities and to manage these investments (Gompers *et al.*, 2005). However, access to information, including on firms' intellectual assets, is crucial for VCs ability to enhance the value creation process. For example, Board representation not only provides the VC with the rights to control corporate decisions, but it can also be used to ensure access to the company's trade secrets and therefore knowledge of its intellectual assets.

How do firms create value from intellectual assets?

At the firm level, the ability to create value from intellectual assets is highly contingent on the management capabilities in individual firms and the implementation of appropriate business strategies. There are essentially three ways in which value can be created at the firm level: by increasing the consumer surplus, the producer surplus, or the stock market valuation of the firm. Work on the impact of R&D, patents, human capital and software shows that the average return on investment in intellectual assets can be large. Leading firms have increased the efficiency of their R&D processes by linking internal R&D activities more closely to their business strategy and relying on external sources to gain access to complementary knowledge and round out technology portfolios. Such techniques are particularly important in competitive industries where innovative products rapidly become commodities through follow-on innovation and imitation. The ability of companies to manage risks is also important, requiring systems of internal control and good information including with respect to intellectual assets.

Good management is key to creating value from intellectual assets

The ability to create value from intellectual assets is contingent on the management capabilities of individual firms and the implementation of appropriate business strategies. Leading firms have increased the efficiency of their R&D processes by linking internal R&D activities more closely to their business strategy and relying on external sources to gain access to complementary knowledge and round out technology portfolios (OECD, 2002a). The likelihood of success also appears to increase when management ensures that, before R&D projects are initiated, there is clear customer demand for the new products or services and a profitable way to bring them to market (Jaruzelski *et al.*, 2005). In the area of intellectual property, a number of firms have achieved considerable revenue growth through the adoption and active implementation of intellectual asset management procedures. These aim to realise value from patented inventions through licensing and sale, to transfer low-value patents to venture capital enterprises and to link patents better with innovation through incorporation into improved products and services (OECD, 2005). Such techniques are particularly important in competitive industries where

innovative products rapidly become commodities through follow-on innovation and imitation.

At the microeconomic level, work on the impact of R&D, patents, human capital and software shows not only that the average returns to investments in intellectual assets can be large, but also that the value of many intellectual assets is highly skewed. For example, a small number of patents can account for the bulk of the value of firms' patent portfolios (Harhoff *et al.*, 1999). Many R&D projects do not result in a successful new product or service, but the returns from successful projects can more than compensate. The role of management is to direct investment to areas of higher expected returns and develop processes that ensure that those returns are realised. There is now significant empirical work to support the view that effective use of intellectual assets and technologies depends on the quality of management. However, management practices, including management of human capital and technology, setting targets and reporting on performance, have been shown to vary widely both within and between countries and within industries (Bloom and van Reenen, 2005).

Knowledge management

Sound corporate management of intellectual assets is needed in addition to measurement, accounting and reporting of intellectual assets in order for a firm to create value of its intellectual assets. This is sometimes referred to as knowledge management. KPMG Consulting (2001) describes the knowledge management as “a collective phrase for a group of processes and practices used by organisations to increase their value by improving the effectiveness of the generation and application of intellectual capital.”

Marr and Stratovic (2004) found that many companies that stated wanting to use knowledge management initiatives in order to create economic value from their intellectual assets did not have a clear idea of the exact expected benefits and required changes within corporate systems. The study argues that knowledge management is conceptually linked to organisational culture and processes thus the overall target for companies should be to manage cultural and organisational means instead of knowledge. It then provides an organisation system model in which systemic variables of knowledge management are identified and depicted on a visual diagram (Jeans, 1998). Other conceptual frameworks of knowledge management include that developed by the Cranfield School of Management is in the form of a knowledge process wheel, the Balance Scorecard (Kaplan and Norton, 1992), and the Intangible Asset Monitor, and Intellectual Capital Accounting, each of which implicitly deals with multifaceted feedback mechanisms in the corporate environment.

Creating value ... and retaining it

As the importance of intellectual assets as a source of value creation increases, so does the importance of the ability to retain them. Changes in IPR policies over the past decades have often shifted the balance between right owners and users of innovations towards owners: more subject matter is protected, the term of protection has increased and higher damages are awarded by courts to IPR holders. At the same time, the innovation process itself is becoming more open; ideas and knowledge for innovation are now drawn from many, often global, sources, and linkages and co-operation are of growing importance for successful innovation. There is a need to further explore the trade-offs between open and controlled access to intellectual assets and their effects on business innovation and economic performance, especially in industries where innovative products become commodities rapidly through follow-on innovation and imitation.

Creating and retaining value - Policy challenges

Although creating innovations and value through the efficient use of intellectual assets is primarily the role of company management and their boards, public policy is nevertheless important. Better information on intellectual assets in the national accounts and corporate balance sheets would facilitate the implementation of more efficient public policies. Likewise both public policy and corporate strategy making would benefit from a better recognition of the impact of investing in intellectual assets to generate economic value.

As intellectual assets contribute a larger share of economic value, policy makers will be confronted with a growing need to balance the benefits of gaining control over them against the benefits of mobility and open access. As the nature of innovation becomes more collaborative, within and across firms, and as the pace of innovation accelerates, policies need to strike a proper balance between private and public goals. There is need for further exploring the trade-offs between open and controlled access to intellectual assets and their effects on business innovation and economic performance, especially in an environment that is quickly changing because of technical developments, especially with the Internet and high speed broadband communications networks.

Ensuring that the non-financial information about firms' intellectual assets is consistent, comparable over time and across companies, would allow investors to better assess future earnings and the risks associated with different investment opportunities and should contribute to making financial markets more efficient. Improved information about intellectual assets and company strategy also improves the ability of firms to secure funding at a lower cost of capital. Policies should take into account the diverse nature of intellectual assets, which further varies by firm and by industry. To date, best practices have not been widely disseminated and governments could play a role in helping to diffuse those pioneered by high-performance firms. Highlighting the potential benefits of disclosure may also encourage more companies to improve their disclosure practices as well as their internal management systems.

Next steps and future work

Intellectual assets are increasingly important in the modern knowledge economy. Effective development and deployment of intellectual assets can fuel value creation both in terms of expansion of the stock of wealth and in the generation of current value through new or improved products and processes. However, these assets are not yet well measured and the value creation mechanism is not yet well understood. Failure to correctly assess intellectual assets can lead to misallocation of resources and other inappropriate decisions by managers, policy makers and others. Filling these knowledge gaps in potential future work will entail working toward increased standardisation in the terminology, development of statistical indicators and expanded analytical work, at the national, regional and firm levels. Particularly promising areas for follow on work might include such topics as the following:

- **Intellectual assets and new business models.** Intellectual assets are increasingly important for innovation, and in particular non-technological innovation and other new forms of innovation. An extension of the current analysis could examine the impact of intellectual assets on the emergence of new business models.
- **Value creation and globalisation.** Intellectual assets play a pivotal role in the increasing fragmentation of global value chains and in the globalisation of business services. An extension of the current analysis could explore the relationship between intellectual assets and organisational change, with particular regard to value creation in the globalising world economy.
- **Improving measurement.** Efforts to compile data series on intellectual assets and to assess returns to the related investments reveal the measurement challenges such as definition of asset boundaries and determination of appropriate depreciation rates and deflators. If comparability is to be achieved, conventions will need to be developed.

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