CHAPTER 1
INTELLECTUAL PROPERTY RIGHTS AND INNOVATION IN SOUTH AFRICA: A FRAMEWORK

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1. INTRODUCTION

There is an elaborate and long-established system of IPRs in South Africa dating back to 1916, when comprehensive national legislation was passed, much earlier than most industrializing countries. However, despite this long history, while particular aspects of the IP regime in South Africa have received attention, there are virtually no studies or assessments that characterize and assess the overall IP regime.[1] An even wider gap is the absence of any study of the broader impact of the IP regime on innovation and economic performance. While innovation in South African firms and publicly funded research organizations (PROs) has received some, albeit limited attention, only a very few of these studies pay any attention to the impact of the IPR regime, and then only peripherally.[2]

This publication represents the first attempt to assess innovation in South Africa and in particular how it is impacted on and affected by the IP regime. Through a series of studies, this publication attempts to shed some light on these issues and to suggest further areas for research.

Studies of this kind should always be situated within a broader framework. Four issues are of particular relevance here. The first is the broad characterization of the overall IP regime and its likely impact on innovation and diffusion. The second is South Africa's innovation performance overall and its determinants and constraints. The third is the relationship of South Africa's innovation performance to the prevailing IP regime. The fourth is the policy context – government perspective on innovation and the proposed policy changes specifically in regard to intellectual property.

It is the broader context and these specific issues that are addressed in this chapter.

2. SOUTH AFRICA'S INTELLECTUAL PROPERTY REGIME

South Africa's IP system is, in many respects, very advanced. Legislative provision is particularly strong. There is an elaborate array of legislation, which has its origins in the Patents, Designs, Trade Marks and Copyright Act No. 9 of 1916. This was compendium legislation dealing with each of the major categories of intellectual property. Subsequently, separate statutes were enacted for each category. The South African Patents Act was initially closely based on British law and, much more recently, the European Patent

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Convention. Accordingly, when South Africa joined the World Trade Organization (WTO) and thereby adhered to the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement), only minor changes were required in the legislation (Wolson, 2005:43). The scope of patent legislation is wide. Section 25 of the South African Patent Act 57 of 1978 specifies that: "A patent may…be granted for any new invention which involves an inventive step and which is capable of being used or applied in trade or industry or agriculture". (SA Chapter 5. Section 25 (1):18).[3] The courts function effectively and strongly to enforce the rights of patent holders. South Africa is a member of most of the international treaties on IP law. In terms of international patent protection, South Africa is a member of the Paris Convention for the Protection of Industrial Property, the Patent Cooperation Treaty (PCT), the Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure and the TRIPS Agreement. In terms of copyright and related rights, South Africa was a signatory to the Berne Convention for the Protection of Literary and Artistic Works in 1928 and to the WIPO Copyright Treaty (WCT) and the WIPO Performances and Phonograms Treaty (WPPT) in December, 1997.

South Africa's patent regime is ranked highly among developing countries in terms of strength. Lesser (2001) constructed an IPR score for a number of countries based on three criteria: TRIPS and compliance with the International Union for the Protection of New Varieties of Plants (UPOV); PCT applications and prices and a corruption index, with the strongest weighting to the first criterion (Lesser, 2001:11). Out of a total of 44 developing and industrializing countries, for the year 1998, South Africa scored highest (Lesser, 2001:12). In 2005, South Africa scored 4.25 on the Ginarte Park index – higher than many countries at comparable stages of development (e.g. Brazil and Chile) and comparable with a number of industrialized countries (Park, 2008:762-763).[4] A recent report that utilized the Ginarte Park index on the strength of patent protection, but in addition also assessed the extent of copyright and trademark protection to construct an overall IP score, gave South Africa seven out of a possible 10 – 22nd highest out of 115 countries (Property Rights Alliance, 2008:26).[5]

The Companies and Intellectual Property Registration Office (CIPRO) administers South Africa's IPR regime. CIPRO was formed in 2002 by a merger of two former directorates of the Department of Trade and Industry (DTI), the South African Companies Registration Office and the South African Patents and Trade Marks Office. CIPRO is the registrar of patents, designs and trademarks and custodian of the registers of existing rights.

In respect of patents, individuals are able to file provisional patent applications, but full applications can only be undertaken by a patent attorney. The fees charged are – 60 rand (US$8) for a provisional patent application; 590 rand (US$79) for a full patent application and annual renewal fees of 130 rand (US$17). The registration of a trademark is 590 rand (US$79) and a new copyright application in respect of films and videos made for commercial use is 510 rand (US$68) (CIPRO, 2008).[6] This scale of fees is very low by international standards.

However, CIPRO is a non-examining registration office. The substantive novelty and the inventive merit of the application are not subjected to verification. Apart from registration, CIPRO offers simple searches. WIPO's International Patent Classification System (IPC) is followed only to a limited extent – to the level of subclasses, but not to the level of groups and sub-groups (Teljeur, 2003:52). Hardcopy registers are available for scrutiny but there is, as yet, no complete electronic system available at CIPRO. There are proprietary systems such as the Electronics Patent Journal (EPJ). Searches can therefore be performed on a contract basis, but only at considerable cost. It is not possible to get an accurate picture of the current backlog, but it is substantial. As an indication, local patent attorneys report that while registering a provisional patent is quick and effective, there are substantial delays in other areas. For example, obtaining a file to undertake a patent search may take up to a year and trademark registrations currently take two to three years (telephonic interviews. February 15, 2008). Since CIPRO does not currently have a fully electronic database, hardcopy searches add substantially to the time required.

Thus, while South African innovators have cheap and easy access to local registration, there are also some considerable drawbacks. What are the implications for local innovators? The absence of search and examination before a patent is granted results in the absence of any guarantee that the patent is valid. Possession of a patent granted in South Africa, will be of no substantive value to any South African innovator wishing to commercialize a product abroad. Similarly, local innovators who wish to commercialize a product or a process in South Africa, and who are at risk of infringing another innovator's patent, do not have a secure patent right. Patents are only confirmed, in effect, after being granted, generally by the courts and by patent holders who, on challenge, have to prove the validity of the patent. The South African legal system is expensive and this imposes a considerable obstacle, particularly for smaller and less capitalized firms.

The absence of a local patent examination system, and the subsequent ease of securing a patent, is also said to result in companies filing a large number of patents locally. This could serve to discourage innovators.[7] In addition, the absence of an examination system may well result in the granting of patents with a very broad scope. Again, this is likely to discourage new innovators. High costs of search, consequent on the non-existence of a freely available searchable electronic database, combined with long delays, create further disincentives to innovation. Finally, the absence of an examination procedure, combined with the difficulty of searching patent databases, results in local innovators having little incentive to search the patent register. The public good character of local patenting, via the diffusion of technological information contained in patent documents and its potential impact on access to new knowledge, is accordingly limited. Thus the diffusion of new knowledge to local innovators is significantly impeded.

However, despite these considerable disadvantages to local innovators, it is not at all clear that CIPRO should function as an examination office. Legal certainty requires that the search and examination undertaken is of a high quality. This is an expensive process entailing large numbers of qualified examiners as well as access to sophisticated technological information in specialized fields. South Africa is a severely skill-constrained so-

ciety.[8] In addition, it has many competing and urgent demands combined with very limited government resources.

There are a number of alternative potential solutions to this problem (for a listing of the potential possibilities, see WIPO, 2008:54-55). For example, it may be possible to contract some other country's IP office to conduct the examination. It may also be possible to engage the services of the local universities and science councils in conducting search processes – but they too are severely skill-constrained. These and other potential solutions need further examination. The issue concerning search and examination is how to maximize the quality of the patents granted with the limited resources allocated to the patent office. One possible answer is to engage in more international cooperation – intergovernmental regional cooperation has reduced administrative burdens and improved cost-effective operations as well as fostering trade and investment within the region (WIPO, 2008:55).

There is considerable debate as to the impact of IPRs on foreign investment (Maskus, 2000). While stronger IPRs are likely to have a positive impact on foreign investment, it is evident that they are not the sole or possibly even a major determinant of FDI. Certainly, South Africa has attracted far less FDI than other countries whose IPR system appears to offer potential foreign investors weaker protection.

There are no studies, as yet, of the impact of the current IPR system on FDI inflows or on technology transfer to South Africa – a fertile area for further research. South African lawyers report that the larger and more innovative transnational corporations for whom they act are filing ever more patents locally and that they regard South Africa as a country with fair levels of protection (telephonic interviews, February 18, 2007). It appears though that many of the global corporations engage routinely in patenting locally as a matter of course, and it is not clear if this has any impact upon their investment decisions. Some sectors and activities will be more sensitive to IP protection than others.[9] Accordingly, such studies would need to distinguish between different types of foreign investment.

With respect to trademarks, South Africa has offered strong protection, including for well-known global brands. Thus, to cite one example that has received considerable publicity, the courts upheld the McDonald's trademark against a local trading firm, even though McDonald's had not been trading in South Africa for several years. The Appellate Division overruled the decision of a lower court that had accepted the argument that the company had not proved that it was a well-known trademark in South Africa.[10] The Appellate Division ruling assuaged concerns that South Africa could not be relied upon to fulfill its obligations under Article 6bis of the Paris Convention by not protecting well-known international trademarks.

With respect to plant breeder's rights, South Africa joined UPOV in 1977. Local courts have functioned effectively to uphold plant breeder's rights.[11] While there is no direct evidence, this is likely to be a positive factor in encouraging foreign owners of plant varieties to supply propagating material to South Africa.

In respect of enforcement, South Africa has adhered to the practices required under international obligations. There is a Counterfeit Goods Act which lays down strong penalties for illegal activities. There also is a specialist police unit engaged in enforcing the Act. This unit works closely with business. However, in general, policing is not always effective in South Africa and, while there is no data, it would seem likely that policing in this area may be similarly limited in efficacy.

South Africa has made very little use of mechanisms to limit the rights of patent holders in the interests of broader public interest – compulsory licensing or parallel importation, for example. In 2001, 39 large pharmaceutical companies withdrew from a legal attempt to stop the government promulgating legislation that it had passed in 1997. The legislation aimed at lowering the cost of drugs including Section 15C on the importation of drugs. Following the withdrawal, the South African government gave assurances to the industry that it would only utilize Section 15C to import brand-name drugs, which are on the market in other countries at a lower price than in South Africa. The government also reiterated its commitment to honor international obligations, in particular the TRIPS Agreement.

Overall, therefore, the IP system in South Africa can be considered generally as favorable to foreign investors who are concerned with the protection of their intellectual property. But, to reiterate, FDI into South Africa has not been strong generally. Furthermore, there is no evidence of significant investment from foreign firms in areas where IP protection will be of particular concern – IT and pharmaceuticals, for example. This is certainly an area that merits much further research.

Likely future changes in South Africa's IP system are considered later (Section 4).

3. SOUTH AFRICA'S INNOVATION PERFORMANCE

3.1. Inputs

In 2004, South Africa's Gross Expenditure on R&D (GERD) was 0.87 per cent of GDP. This is comparable with many industrialized countries and significantly higher than many of the middle-income countries with the same level of GDP *per capita*.[12] While there are problems interpreting the data, GERD has been growing steadily. Between 1993 and 2004, it almost doubled, and the GERD/GDP ratio increased from 0.60 per cent to 0.87 per cent (DST, 2007b:9-11).

A significant feature is the share of GERD performed by business enterprises in South Africa – at 56.3 per cent in 2004, this is comparable with a number of industrialized countries and significantly higher than most comparable middle-income countries (OECD, 2007:5; 45). Business expenditures on R&D are heavily focused in four areas – engineering sciences (32 per cent), information, computer and communication (20 per cent), medical and health sciences (15 per cent) and applied sciences and technologies (13 per cent) (OECD, 2007:49).

In 2004/5, there were almost 30,000 full-time equivalent personnel engaged in R&D. At 2.7 researchers per 1,000 employees, this is low relative to industrialized countries, but also relative to a number of countries with a comparable GDP *per capita*. Although South Africa devotes comparatively large resources to R&D, this is not reflected in a greater number of researchers employed. The reason is that South African research workers command significantly higher salaries than in comparable countries. Moreover, while the number of full-time equivalent (FTE) researchers has increased, this has been slow – rising by only seven per cent in the period 1992-2004.

Growing commitment of resources has been accompanied by extensive policy experimentation. Grounded in the overall concept of the National System of Innovation (NSI), policy design has drawn extensively from international experience and thinking. It has included policies to improve governance of the innovation system; the more effective functioning of key performers of S&T, especially the science councils; new mechanisms for funding R&D and innovation; and the development of new organizational arrangements and programs to support R&D and to undertake R&D directly.

While there is clearly considerable room for improvement, extensive institutional reform and ongoing evaluation have enhanced efficiency of organizations as well as increased inter-organizational cooperation. In the main, the institutions undertaking financing and supporting innovation function effectively (Kaplan, 2008).

3.2. Outputs

More resources combined with an effective and improving institutional structure and innovative and directed policy changes might have been expected to yield significant results. However, the high-level output performance indicators for the S&T system are disappointing.

3.2.1 Publications

In terms of publications, there has been a slight increase in the number of South Africa's scientific publications (listed by the Institute for Scientific Information) since 1994. In relative terms, South Africa's global share has declined significantly from a peak of 0.7 per cent in 1987 to 0.48 per cent in 2003. In contrast, other comparable countries, such as Brazil, India, and the Republic of Korea, starting from a lower base, have overtaken South Africa as their share of world publications has climbed steadily (NACI, 2003:60; Pouris, 2003:425-6).

3.2.2 Patents

The situation with regard to South African patents registered abroad is broadly similar to publications. Since the end of apartheid and the election of a democratic government in 1994, there has been a slight increase in patents. However, no clear trend is evident. Indeed, the number of South African patents registered in the US has remained stagnant throughout the period 1994-2007.

Table 1. Patents of South African Origin Granted by the USPTO, 1994-2007

	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07
Utility Patents	101	123	111	101	115	110	111	120	113	112	100	87	109	82
All Patents	109	127	116	114	132	127	125	137	123	131	115	108	127	116

Source: USPTO, 2006(a); USPTO, 2006(b).
Data for 2007 supplied by the USPTO, January 18, 2008.

South Africa's relative position in terms of patents has declined. Its share in all foreign patents registered in the USPTO has consistently declined from 0.28 per cent in 1992 to 0.13 per cent in 2007. For utility patents, South Africa's share declined from 0.3 per cent in 1992 to 0.11 per cent in 2007. A recent study of the patenting activity at the USPTO by the five most innovative South African universities concludes that their performance is well below that of other countries (Lubango and Pouris, 2007:7).

In terms of South African patent applications filed through the PCT, the trend is less well-defined. The PCT only became operative in South Africa in March 1999. Since that date, there has been no clear trend and considerable fluctuation. However, the figure was lower in 2007 than in 2001. Moreover, as with the USPTO, South Africa's share in PCT patent filings has declined consistently – from 0.42 per cent in 1999 and 2000 to 0.26 per cent in 2007.

Table 2. Patents Applications of South African Origin Filed through the PCT, 1994-2007

	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07
SA Patents	30	42	72	84	114	317	387	419	384	357	411	358	422	360

Source: WIPO Statistics Database.

Table 3 shows the number of patent applications made at the local Companies and Intellectual Property Office (CIPRO). The number of patents remained constant throughout the period 1994 -1998 and then declined by a third. Numbers picked up again in 2001, but have been slowly declining since. The drop in 1999 may largely be attributed to South Africa becoming a part of the PCT system in March 1999 as many international companies would have channeled their applications to South Africa via the PCT system, with a time-lag until such applications entered the national phase in South Africa. Overall, local patenting at about 270 patents per million population is low and, at least since 2001, showing a slowly declining trend.

Table 3. Patent Applications at CIPRO, South Africa, 1994-2005

	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05
Total Patent	10,414	11,050	10,956	11,734	11,953	7,838	7,793	10,553	10,408	9,955	10,396	10,044

Note: Data are for provisional and complete patent applications. For 1994-1997 from Teljeur; data for 1998-2005 from Innovation Fund, 2007.

Source: Teljeur, 2003:55; Innovation Fund, 2007:36.

A recent study concluded that "…at least 50% of the patent applications filed at CIPRO in this period (2000 – 2002) were filed by foreign nationals, with the biggest contributors being USA and German nationals". (Innovation Fund, 2007:28). From the table below, a clear and consistent trend is evident for the period 2001-2006: (1) the overall number of patents has been stagnant; (2) the number and the share of resident patent applications has been declining; (3) *pari passu* the number and particularly the share of non-resident patent applications has risen significantly.

Table 4. Number and Share of South African Resident and Non-Resident Patent Applications (Filed and Granted) at CIPRO, 2000-2002 and 2004-2006

	2000	2001	2002	2004	2005	2006
Total	7,793	10,553	10,408	10,420	10,456	10,787
Resident	5,204	4,985	4,721	4,587	4,328	4,058
Non-resident	2,589[13]	5,568	5,687	5,843	6,128	6,729
Non-resident percentage of total	33	53	55	56	59	62

Source: Data for 2000-2002 from Innovation Fund, 2007:28. Data for 2004–2006 supplied by CIPRO.

A detailed breakdown of patents filed in South Africa by country reveals that every country increased the number of its patents, between 2004 and 2006. However, patenting by South Africans declined in the same period by almost 12 per cent.

Table 5. Patents Filed in South Africa, by Country of Origin, 2004-2006

Date	ZA	US	GB	FR	DE	NL	CH	JP	Others
2004	4,587	1,953	506	275	716	223	387	268	1,517
2005	4,328	2,112	529	284	782	193	373	313	1,443
2006	4,048	2,269	555	429	858	270	434	277	1,666

Source: Data supplied by CIPRO.

3.2.3 Royalty Receipts and Payments[14]

The technology balance of payments (TBP) registers a country's commercial transactions related to international technology and transfer of know-how. It consists of payments made or received for the use of patents, licenses, know-how, trademarks, designs and technical services. These receipts and payments are generally registered as royalties paid abroad and royalties received from abroad.

In South Africa, consistent data for royalties received is only available from 2000. Analysis of the data regarding royalties from 2000 shows that in the period 2000-2007, royalties received from abroad increased by 58 per cent – a compound annual rate of 6.8 per cent per annum. In the same period, royalties paid abroad increased by 360 per cent – a compound annual growth rate of 20.1 per cent per annum.

Moreover, royalty payments greatly exceeded royalty income. In 2000, royalty payments were some 10 times royalty income. In 2007, royalty payments were 30 times royalty income.

The widening adverse technological balance of payments and, even more significantly, the relatively slow growth of royalty receipts from a very low base, are a further index of South Africa's weak overall innovation performance.[15]

3.2.4 Share of Global Trade

A country's performance in global trade in industries where innovation is central to economic success is an important output indicator, particularly in respect of business sector R&D. In the period 1992-2005, South Africa's exports of high technology products grew at 9.5 per cent per annum. While at first sight, this appears impressive, it is lower than the global average (11 per cent), and well below that for developing countries (21 per cent). As a result, as with scientific publications and patents, South Africa's share of global high technology exports has declined. This cannot be attributed to the country's dependence on commodity exports. Brazil's share of global high technology exports increased and the share of high technology exports in total country exports has risen significantly. South Africa's export performance was similar to that of Argentina. The share of high technology products in South Africa's total exports is much lower than that of Brazil and marginally lower than Argentina.

Table 6. Share of Global High-Technology Exports, 1992-2005 and Share of High Technology Exports in Country Exports, 1992-2002: South Africa, Brazil and Argentina

Share of Global High-Technology Exports	1992	2005
South Africa	0.07	0.07
Brazil	0.29	0.49
Argentina	0.05	0.03

Share of High-Technology Exports in Country Exports	1992	2002
South Africa	1.63	2.51
Brazil	3.9	10.5
Argentina	2.1	2.6

Source: COMTRADE, TIPS and own calculations

3.2.5 Composite Indicators

There are a number of composite indicators that measure the ability to generate, adopt and utilize new knowledge. The Knowledge Economy Index (KEI) compiled by the World Bank, probably the most widely used, is based on the average of the normalized performance of a country or region in four areas – economic incentives, institutional regime, education and human resources, the innovation system and ICT. In terms of the KEI, South Africa has declined since 1995. In contrast other commodity-based exporters,

such as Brazil, have seen a rise in the index as has the upper middle-income country group. Overall, South Africa is currently ranked 50 out of 140 countries – a decline of nine places since 1995. South Africa's performance on the KEI is again similar to that of Argentina.

Table 7. Knowledge Economy Index (KEI): South Africa in Comparative Perspective, 1995-Latest Year

	1995	Latest Year
South Africa	6.08	5.64
Brazil	5.14	5.50
Argentina	6.41	5.49
Upper middle income	6.38	6.50
World	6.41	5.93

Source: World Bank, 2007:7, available at *http://info.wordbank.org/etools/kam2/KAM_page7.asp* (accessed September 7, 2007).

3.3. Constraints on Performance

In summary, the resources committed to R&D in South Africa are commensurate with other countries at similar stages of development and have been increasing significantly. Moreover, business accounts for a very significant and rising share of expenditure on R&D. However, the number of personnel engaged in research is lower than for many comparable countries and has risen only slowly. This reflects the high cost of skills engaged in research, which in turn is a consequence of the limited supply of the skills needed.

While each of the system level output indicators has its limitations, all of them – publication counts; patents (local, US and PCT); royalty receipts and payments; shares of global trade and composite KEIs – tell essentially the same story; despite the injection of more resources and the introduction of a raft of new policies derived from international experience that have significantly improved the policy environment at the aggregate level, South Africa's innovation performance is largely stagnant if not declining slightly, particularly seen in a comparative perspective.

At the same time, South Africa has a number of highly innovative firms situated in different sectors and embracing a wide range of activities. In addition, there are also organizations in the public sector that are strong innovators. Many firms and public sector organizations have been able to profitably exploit this expertise in innovation in global markets.

South Africa is host to many innovative firms. A range of government policies and programs provides support for innovation; public funding is significant and growing and there is a local supply of engineering and scientific skills. There is an emerging consen-

sus that the key factor that acts as a constraint on innovation and the emergence of more innovative firms is a severe shortage of skills (Blankley and Kahn, 2005; Kahn, 2006; Breitenbach, 2007; NACI, 2006). The recent Review of South Africa's Innovation Policy by the OECD confirmed this consensus. The OECD identified a looming crisis in two areas. The first is a large and growing "engineering gap". "A very large gap appears to be opening up between the supply of design, engineering and related managerial and technical capabilities and demand for such resources being generated by the increased rate of investment across the economy." (OECD, 2007:7). The second is the very limited supply of university graduates capable of undertaking research. Unless this is addressed, the entire innovation system will be constrained (OECD, 2007:7). The OECD assessed human resource development as "…perhaps the issue that will be central to all other aspects of the development of the STI system over the next decade". (OECD, 2007:87)

4. THE SIGNIFICANCE OF IP TO INNOVATION

As noted earlier, there is a dearth of studies attempting to assess the specific impact of the IP regime on innovation in South Africa. There are two major criteria by which we might measure the impact of the IP regime on domestic innovation. The first would be to assess the extent to which local innovators, particularly innovating firms, make use of patents, both to protect their own intellectual property and as a source of information. The second would be to assess the impact of intellectual property in encouraging the emergence of specialist suppliers of technology – firms that are able to earn returns from their intellectual property, notably patents (Arora *et al*., 2007:27).[16]

With regard to the first, the Innovation Survey of 2005 provides an overall picture of the usage of IPRs on the part of innovative firms. Between 2002 and 2004, 11 per cent of innovative firms registered a trademark while 5 per cent claimed a copyright and 4 per cent registered an industrial design; 3.1 per cent of innovative firms secured a patent in South Africa while 2.5 per cent applied for a patent outside South Africa. About 1.7 per cent of innovating firms granted IPRs originating from their own innovation activities to third parties (DST, 2007:28-29). As outlined above, the indications are that patenting activity – particularly international patenting – has been in decline among South African firms. Other research performers, publicly funded science councils and universities, also make little use of patents: "analysis of the patent patterns for South African institutions shows very low levels of patenting by publicly funded institutions." (NACI, 2006:36)

The percentage of South African innovative firms applying for a patent abroad (2.5 per cent) is lower than for any of the EU 27 Member States plus Norway, except for Cyprus (data supplied by William Blankley, February 8, 2008).

The system level data suggest that only 21 per cent of innovating firms in South Africa make use of patents as sources of information – and only 8 per cent of innovating firms

regard patents as important (5 per cent) or very important (3 per cent). Apart from the innovation centers (which have a very limited presence in South Africa), patents rank lowest as sources of information for innovating firms in South Africa.

Table 8. Innovative Firms' Usage of External Information Sources

External Sources	Source not used	Used but little	Used and important importance	Used and very important
Competitors	32	18	41	9
Exhibitions	35	18	40	7
Suppliers	36	21	29	14
Professional literature	38	17	38	7
Buyers	43	20	27	10
New personnel	57	14	23	5
Consultants	58	17	16	8
Electronic info.	61	18	16	5
Group	65	10	10	14
Sector institutes	74	14	9	4
Universities	75	12	11	2
Research labs	78	13	6	3
Patents	79	13	5	3
Innovation Centers	86	9	4	1

Source: Innovation Survey, 2001 quoted in OECD, 2007:53

In a recent study of 20 innovative high technology firms in South Africa, the absence of an examining patent office was listed as a constraint on innovation (Breitenbach *et al.*, 2006:11). Lodging a patent with CIPRO and obtaining a South African patent is straightforward and inexpensive. However, most innovators are looking to global markets and CIPRO does not undertake any search for prior art. As a result, obtaining a local patent provides no indication of whether this patent could succeed in any other dispensation. As a consequence, innovative firms which are considering attempting to exploit global markets will have little incentive to secure a local patent. They accordingly undertake a time-consuming and difficult process of engaging local patent lawyers who then instruct patent lawyers abroad to file.

With regard to a second major criterion by which we might measure the impact of the IP regime, there is no systematic data on the extent and growth of specialist technology suppliers in South Africa. However, there are a number of examples of such firms, notably in the mineral and other resource-based industries. A number of these specialist firms have spun off from the large mining houses themselves, exploiting and further developing technology that was first established within the firm. One example is Lodox Systems. The company was spun off from De Beers, the diamond mining company. It is engaged in advanced full-body radiography equipment, initially for the mines, but now principally for healthcare applications. It has had considerable success in developed coun-

try markets and its Scannex product is now installed on five continents. Another example is Merisol, a joint venture between the large South African chemical firm, Sasol, and the US firm Merichem. Established in 1997, this firm supplies high quality phenolic products to the chemical industry. The company holds numerous patents. Gradchem Solutions was established in 1999 by engineers previously employed by Sasol. It provides innovative solutions to the fine chemical industry through innovation – including plant design and novel equipment. There are many other examples (Breitenbach *et al.*, 2007).

The development of specialist technology suppliers seems to have accelerated as South Africa has liberalized in terms both of trade and investment. Faced with global competition, South African firms have faced increasing pressures to specialize in their areas of core competence and to out-source other activities to specialized technology suppliers. In particular, there has been a significant growth of local engineering service firms, especially geared to supporting resource-intensive activities, but also more widely (OECD, 2007:96; Segal and Malherbe, 2000). A comprehensive mapping of such specialty suppliers and the precise factors underpinning their growth require investigation. Moreover, the role that intellectual property has played in the emergence and development of these firms is unknown. They are all fertile areas for future research.

5. GOVERNMENT POLICY ON INNOVATION AND INTELLECTUAL PROPERTY – CURRENT DEVELOPMENTS

South Africa's National Research and Development Strategy (NRDS), published in 2002, provides the framework for South Africa's policy. The NRDS highlights South Africa's low levels of patenting and the importance of intellectual property to wealth creation and foreign investment. Noting South Africa's weak performance in patenting, the NRDS identifies the lack of a policy framework for intellectual property as one of six key weaknesses that need to be addressed in order to improve system performance (DST, 2002:21). The NRDS is especially concerned about the lack of a policy framework in regard to intellectual property that arises from public funds allocated to research (Kaplan, 2004:283).

Indeed, while expressing concerns about the IP framework in general, the NRDS confined its analysis and concrete recommendations to considerations of publicly funded research. There was no examination of the totality of the wider IP system, or of its economic and social impacts. Nor has such an investigation been undertaken following the NRDS. The impact of the IP system as a whole has never been examined nationally. Curiously, this neglect is matched by the lack of any consideration of this issue by any international agency reporting on South Africa's innovation system. The OECD has recently completed a full-scale review of South Africa's innovation policy (OECD, 2007). In contrast with the NRDS, intellectual property is not identified by the OECD as one of the weaknesses in the innovation system. Accordingly, the OECD makes no proposals with respect to it – indeed the report is completely silent on the whole issue.

As a consequence, there has never been a discussion or consideration of the economic role of the IP system *in toto* in South Africa or of the objectives sought. While there is a general perception that an overhaul of this system may be required and that this will need to be based on clear principles and objectives (NACI, 2006:80), it does not appear that such an exercise is on the agenda in the short term. While there have been recent changes to the IP regime, these have been largely to accommodate international requirements and have been amendments to the legislative framework and the Patents Act.

South Africa is a signatory to the 1992 Convention on Biological Diversity (CBD) and in 2004 introduced the South African Biodiversity Act (BA) to comply with its international obligations under the Convention. In terms of the BA, any patent sought in South Africa will be required to state whether the invention is derived from any indigenous biological or genetic resource. In this event, provision must be made to ensure compensation for the person or community providing access to the indigenous biological resource. Where the invention is based on or derived from traditional knowledge and where the indigenous community is the owner of this knowledge, such indigenous communities must be adequately compensated. The Patents Act has similarly been amended to ensure disclosure of any biological resources utilized with all patent applications.

Another recent amendment to the Patents Act allows third parties, during the term of the patent, to make use of patented inventions for non-commercial R&D purposes. This allows users to enter the market immediately upon expiry of the patent (Wolson, 2005:21).

Two further changes to the IP regime are to be effected in the short term.

The first relates to intellectual property arising from public funds allocated to research. The approach that was taken by the NRDS to this issue was to list the general attributes that such a policy framework should possess. Thus, it should be based on best global practice and create a context for benefit sharing. It should also be legislated (DST, 2002:68-69). This approach led to the formulation of a new Bill entitled Intellectual Property Rights (IPR) From Publicly Financed Research. This has been widely discussed and is due to be debated shortly in Parliament . The other concrete measure proposed by the NRDS was: "A dedicated fund to finance the securing of intellectual property rights resulting from publicly financed research and development." (DST, 2002:69) An Innovation Fund Commercialization Office has subsequently been established to provide financial support for intellectual property resulting from publicly funded research.

In addition to legislation relating to intellectual property arising from publicly funded R&D, Parliament is expected in 2008 to debate a Bill in respect of traditional knowledge, which will be protected *sui generis* within the framework of existing legislation. Accordingly, there will be amendments to existing acts – the Copyright Act, the Trade Mark Act and the Patents Act. These amendments will require inter alia that recognition of TK will have to be accompanied by a clear benefit-sharing arrangement with an indigenous community.

6. CONCLUSION

South Africa's innovation system is at a critical stage. System performance has not been strong, particularly relative to the increases in resources committed. There has been considerable policy experimentation and innovation in many areas, but with regard to intellectual property, policy changes have been piecemeal and largely reactive to changing circumstances, particularly international obligations. There is a need for a comprehensive review of the IP regime. Such a review should rest on a consideration of the role that it has played and could play in enhancing innovation, investment (particularly FDI) and growth.

This, in turn, requires considerable research on the economic impact of intellectual property – an area that has attracted very little attention in the past. The purpose of this publication is to provide some initial research, but also to initiate and stimulate further research. Such research has the potential to enhance understanding, and also make an invaluable contribution to ensuring that future policy changes in South Africa rest on firm empirical foundations.

Notes

1 Teljeur, 2003 is a valuable exception, but it is of limited scope. The Department of Trade and Industry has indicated its plans to address this issue by embarking on a project that would analyze the impact of intellectual property on education, health, research, innovation and development, franchising, information sharing, telecommunications and ICTs, technology transfer, consumer protection and access to knowledge in South Africa.

2 The following are excluded as not being considered as an invention – "(a) a discovery; (b) a scientific theory; (c) a mathematical method; (d) a literary, dramatic, musical or artistic work or any other aesthetic creation; (e) a scheme, rule or method for performing a mental act, playing a game or doing business; (f) a program for a computer or (g) the presentation of information." (SA Chapter 5. Section 25 (2):18.)

3 The mean for all countries was 3.34 with a standard deviation of 0.89 (Park, 2008:763).

4 It is understood that such indexes can only be indicative and must be taken with caution, as they only reflect certain aspects of the IP system and may not be a good reflection of actual IP protection (and enforcement) in any given country.

5 Conversions at 7.50 rand to US$1.

6 Teljeur cites "anecdotal evidence" of companies registering large numbers of patents which would not pass the international criteria and as result, "…some companies have diverted R&D funds away from an area in which superfluous patents exist, even though the company can contest the validity of the patent". (Teljeur, 2003:54).

7 Enterprise managers identified the skills constraint as the most serious obstacle to their operations and growth. Clarke *et al*. (2007: xvii).

8 Javorcik, 2002.

9 On May 1, 1995 a new Trade Marks Act, No 194 of 1993, was promulgated in South Africa and Section 35 thereof made provision for the protection of well-known foreign trademarks.

11 A recent well-publicized case concerned the local propagation of a variety of sweet pepper – peppadew. The Appeal Court upheld the plant breeder's rights of the developer. The Sunday Times, 'Peppadew court victory protects breeder rights'. Business Times, February 16, 2007:6.

12 "…the proportion of GERD performed by business enterprises in South Africa is broadly similar to, or a little higher than, in (sic) several other countries, with much higher GERD/GDP ratios like Spain, New Zealand, Norway, Netherlands and Canada. It is also 1.6 to 2.0 times higher than the levels in countries with lower GERD/GDP ratios, including some with higher levels of GDP *per capita* like Portugal or Greece." (OECD, 2007:92)

13 As explained above, the low number of non-resident patent applications for the year 2000 is likely due to South Africa becoming a member of the PCT in March 1999.

14 This section is based on data supplied by the South African Reserve Bank. Royalty payments and income are not currently published by the Bank. It therefore gave permission to the author to outline the data trends, but not to publish the actual data.

15 The rapid increase in the import of foreign technology may partly be the result of strong IP protection. In addition, increased inflows of technology will impact on productivity. These are issues that merit further research.

16 A third might be the impact of intellectual property on the access of South African companies to international markets for technology and the extent to which this enhances productivity and local innovation.

17 The Department of Science and Technology announced on January 14, 2009, that the Intellectual Property Rights Bill had been signed into law.

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