FACTORS AFFECTING THE USE OF INTELLECTUAL PROPERTY (IP) PROTECTION BY SMALL AND MEDIUM ENTERPRISES (SMES) IN AUSTRALIA

A Report for the Commonwealth Department of Industry, Tourism and Resources

VOLUME I
(EXECUTIVE SUMMARY & FINDINGS)

Intellectual Property Research Institute of Australia (IPRIA)

April 2005

THE UNIVERSITY OF MELBOURNE

AUTHORS

Paul Jensen, Owen Morgan, Kimberlee Weatherall, Elizabeth Webster (**VOLUME I**)
R. Mitch Casselman, Joshua Gans, Elly Gay, Paul Jensen, Elizabeth Webster (**VOLUME II**)

ACKNOWLEDGEMENTS

We thank Danny Samson for his invaluable assistance in developing a model for the case studies. We would also like to thank Rod Crawford from IP Australia for his help with the data used for this study. Gharad Bryan provided excellent research assistance. We thank Vibeke Pedersen and Ben Methakullawat for administrative support. We would like to acknowledge the significant contributions made by Emma Caine and Katerina Gaita in the final editing of the report. All views expressed are solely those of the authors and do not necessarily represent those of the above individuals and organisations. Responsibility for all errors lies with the authors.

TABLE OF CONTENTS

Index of Tables 6

Index of Figures 7

Index of Graphs in Executive Summary 8

Definitions 9

1. Executive Summary 10

1.1 This Study 10

1.2 IP Application Rates for SMEs 10
1.2.1 IP applications 10
1.2.2 Patent grants and renewals 12

1.3 Factors inhibiting Patenting and other forms of IP Protection 13
1.3.1 Ranking the factors 13
1.3.2 Is IP part of the business strategy of SMEs? 14

1.4 Relationship between Exports and IP Protection 15

1.5 Effectiveness of IP Protection in meeting the needs of SMEs 16

1.6 Summary of Key Findings 16

2. Background 19

2.1 Objectives 19

2.2 Background 19

3. Method of inquiry 22

3.1 Literature review 22

3.2 Analysis of the IP Australia data base 22

3.3 Consultations 23

3.4 Design of the survey instrument 25

3.5 Case studies 25

4. Results 27

4.1 Application Rates for IP Protection by SMEs 27

4.1.1 Profile of SMEs in Australia 27
4.1.2 Invention and Innovation Potential 29
4.1.3 SME use of IP protection 29
4.1.4 SME patenting by technology and industry 33
4.1.5 SME patenting grant and renewal rates 38

4.2 Factors inhibiting Patenting and other forms of IP protection 40
4.2.1 What factors are most important in inhibiting use of the IP System by SMEs? 40
4.2.2 Cost 41
4.2.3 Perceived Insufficiency of Benefits 44
4.2.4 Ignorance/Lack of Information 46

4.3 IP Protection and Export Performance of SMEs 51
4.3.1 The relationship between export intention and use of the IP system 51
4.3.2 Overseas enforcement of IP rights 52
4.3.3 Other issues relating to international IP 53

4.4 IP Protection and Enforcement Systems and the Needs of SMEs 55

5. Conclusions 58

5.1 IP Application Rates for SMEs 58

5.2 Factors inhibiting Patenting and other forms of IP protection 58

5.3 Relationship between Exports and IP Protection 59

5.4 Effectiveness of IP Protection in meeting the needs of SMEs 59

Factors Affecting the Use of Intellectual Property (IP) Protection by Small Medium Enterprises (SMEs) in AUSTRALIA: Volume II 71

1. The Use of Intellectual Property Protection by SMEs: A Survey of the Academic Literature* 74

1.1 General Studies of SME Innovation 74

1.2 The Value of IP Protection 75
1.2.1 Commercialisation Choices 76
1.2.2 Solving Disclosure Problems 77

1.3 The Costs of IP Enforcement 78
1.3.1 Liquidity constraints 79
1.3.2 Preliminary injunctions 79
1.3.3 Reputation effects 80
1.3.4 Trade secrets 81
1.3.5 Displacement of small enterprises 81
1.3.6 New Technology Areas 81
1.3.7 The likelihood of a litigious ‘event’ 82

1.4 Conclusion 82

2. Patenting by technology and industry, Large and Small and Medium Enterprises 84

3. Estimating the number of SME IP applicants 87

4. Industry and Government Consultations 90

5. Survey Design and Response Rates 93

6. Case Studies 99

7. References 136

INDEX OF TABLES

Table 1: Profile of SMEs, [(a)] Australia, 2001 28
Table 2: Average employment by industry, Australia, 2000-01 28
Table 3: Percentage distribution across industries, by size, Australia, 2001 29
Table 4: Annual patent[(a)] applications per enterprise by enterprise size, 1989-2002 30
Table 5: Annual trade mark applications per enterprise by enterprise size, 1989-2002 30
Table 6: Annual design applications per enterprise by enterprise size, 1989-2002 30
Table 7: Percentage of enterprises that had applied for a patent in the last 5 years by enterprise size, Europe, 1994 31
Table 8: Percentage of Norwegian enterprises that had applied for a patent in the last 3 years by enterprise size, 1997 31
Table 9: Average Australian patent[(a)], trade mark and design intensity[(b)] by enterprise size, 1989 to 2002 31
Table 10: Patenting propensity by enterprise size in manufacturing, USA 1996-2000 32
Table 11: Australian patent, trade mark and design applications per employee by enterprise size, Australia, 2000-01 33
Table 12: Percentage distribution of Australian patent applications[(a)] by OST technology class, by enterprise size, Australia, 1989-2002 35
Table 13: Percentage distribution of Australian patent applications[(a)] across industries, by enterprise size, Australia, 1989-2002 36
Table 14: Relative number of Australian patent applications[(a)] across industries as a ratio of relative number of companies within each industry, by enterprise size, Australia, 1989-2002 37
Table 15: Rates of granted patents by enterprise size, Australia 38
Table 16: Patent renewal rates by enterprise size, Australia 39
Table 17: Ratio of rates between large enterprises and SMEs, by technology area and industry, 1989 - 2002 84

INDEX OF FIGURES

Figure 1: Factors inhibiting the use of IP protection 40
Figure 2: Innovation partners' experience with imitation and copying 45
Figure 3: Importance of organisations in providing IP information 47
Figure 4: Strategic use of IP protection by SMEs 49
Figure 5: Reasons for using IP protection 51
Figure 6: Breakdown of innovation partner export involvement 52
Figure 7: Cost of IP protection in overseas markets 53
Figure 8: Effectiveness of different types of IP protection 56
Figure 9: Importance and effectiveness of IP protection by industry type 57
Figure 10: Percentage of patent applicants matching to IBISWorld and AOD, Australia, 1989-2002. 88
Figure 11: Percentage of trade mark applicants matching to IBISWorld and AOD, Australia, 1989-2002 88
Figure 12: Percentage of design applicants matching to IBISWorld and AOD, Australia, 1989-2002. 89
Figure 13: Recipients and respondents to the innovation advisors survey 94
Figure 14: Recipients and respondents to the innovation partners survey 94
Figure 15: Breakdown of innovation advisors' SME clients 95
Figure 16: Breakdown of innovation advisors' SME clients by industry 96
Figure 17: Breakdown of innovation partners by industry 97
Figure 18: Breakdown of partner organisations 97

INDEX OF GRAPHS IN EXECUTIVE SUMMARY

Graph 1: IP Applications by Enterprise Size 11
Graph 2: IP applications per employee by enterprise size, Australia, 2000-01 11
Graph 3: Rates of granted patents by enterprise size 12
Graph 4: Patent renewal rates by enterprise size 13
Graph 5: Factors inhibiting SMEs' use of IP protection 14
Graph 6: Strategic use of IP protection by SMEs 14
Graph 7: Reasons for using IP protection 15
Graph 8: Importance and effectiveness of IP protection by industry type 16

DEFINITIONS

Intellectual Property (IP)	Intellectual property refers to the creations of the mind or intellect and to the property rights which attach to these creations. There are various types of intellectual property, as follows: patents, trade marks, copyright, designs, confidential information/trade secrets, plant breeder's rights and circuit layout rights.
Innovation	For the purposes of this study, innovation is defined as the application of an invention or way of doing things that is new to the world, whether successful or not. Innovation is distinct from invention (see below).
Invention	Invention is defined as the non-obvious creation of new ideas, devices or processes.
SME	Small and Medium Enterprise. This report adopts the Australian Bureau of Statistics definition of SME: a business that employs less than 200 people and has not more than $200m in assets.

1. EXECUTIVE SUMMARY

1.1 This Study

IPRIA was asked by the Department of Industry, Tourism and Resources to determine whether or not the level of IP protection by Australian SMEs is at sub-optimal levels, to identify the reasons for this and to note areas for further attention.

The present study comprises a number of distinct components:

(1) Examination of whether the relative application rates of IP by SMEs in Australia are compared with (i) large firms in Australia; and (ii) SMEs in other industrialised nations;

(2) Identification and ranking of factors that inhibit patenting, and use of other forms of IP, by SMEs;

(3) Evaluation of the extent to which these factors inhibiting IP protection impact on the export performance of Australian SMEs by industry sector; and

(4) Assessment of the extent to which the current IP protection and enforcement system meets the needs of Australian SMEs by industry sector.

The methodology used for the study comprises the following elements:

- A comprehensive review of the academic and public policy literature;
- An analysis of the IP Australia databases;
- A number of consultations with industry and government organisations;
- Two surveys of organisations that advise and partner SMEs; and
- Ten case studies of innovation by SMEs.

The report is presented in two volumes. Volume I contains the executive summary and the findings of the study. Volume II contains the literature review and supporting data, including summaries of the case studies, and results from the industry consultations (set out in various tables and graphs).

1.2 IP Application Rates for SMEs

1.2.1 IP applications

The table below illustrates the percentage of firms making at least one application for a patent, trade mark or design in any given year. It can be seen that, compared to SMEs, a higher percentage of large firms make applications for protection under the IP system. However, this finding must be read in context. Due to their greater size and resources, large firms are typically more active generally and it is therefore to be expected that they would make more IP applications within a given period of time.

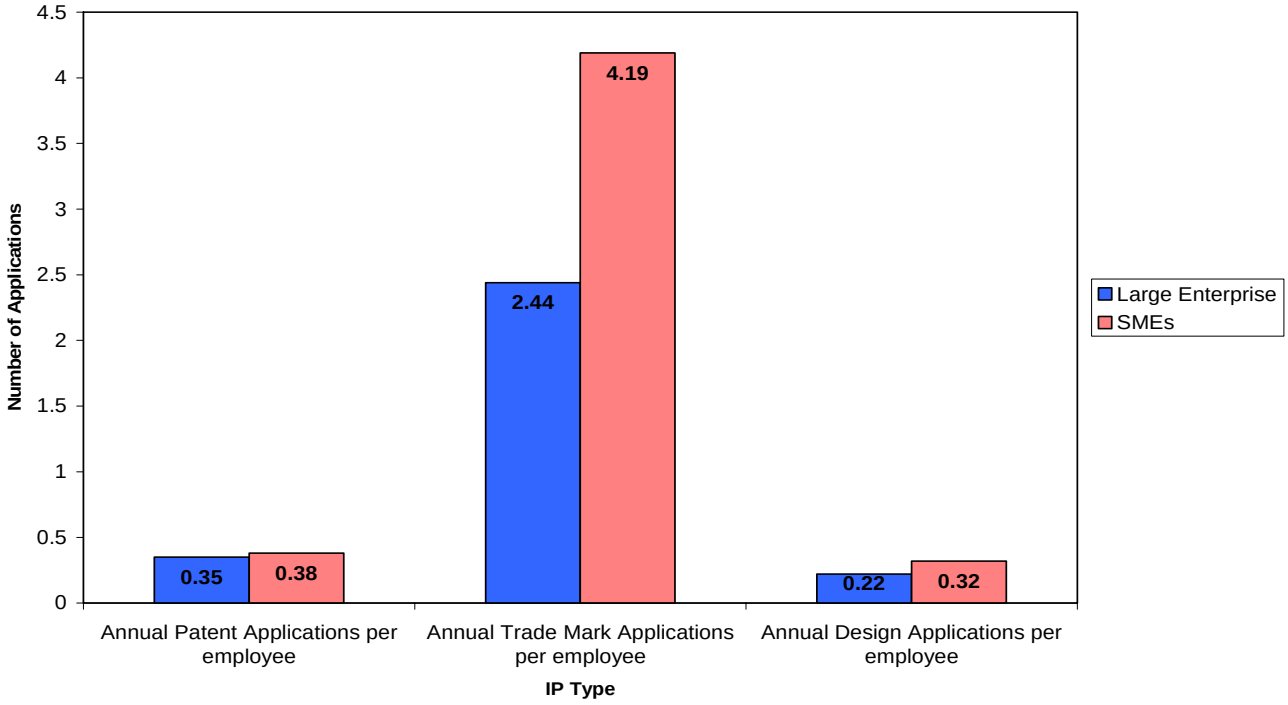
Graph 1: IP Applications by Enterprise Size

Type of IP	Approximate percentage of enterprises making at least one application in any given year	
	Large	**SME**
Patent applications	6%	2%
Trade mark applications	26%	16%
Design applications	4%	1%

A better measure of the use of the IP system is the intensity of use, i.e. the number of applications per employee. This measure takes the creative potential of an enterprise into account. The creative potential is determined by the number of employees in the enterprise. Thus it is possible to make a more precise comparison of large enterprises with SMEs.

The graph below illustrates that when the intensity of IP applications by enterprises is measured by the number of applications per employee, Australian SMEs have about the same rate of application for patents as large enterprises, a higher trade mark application rate and a slightly higher design application rate.

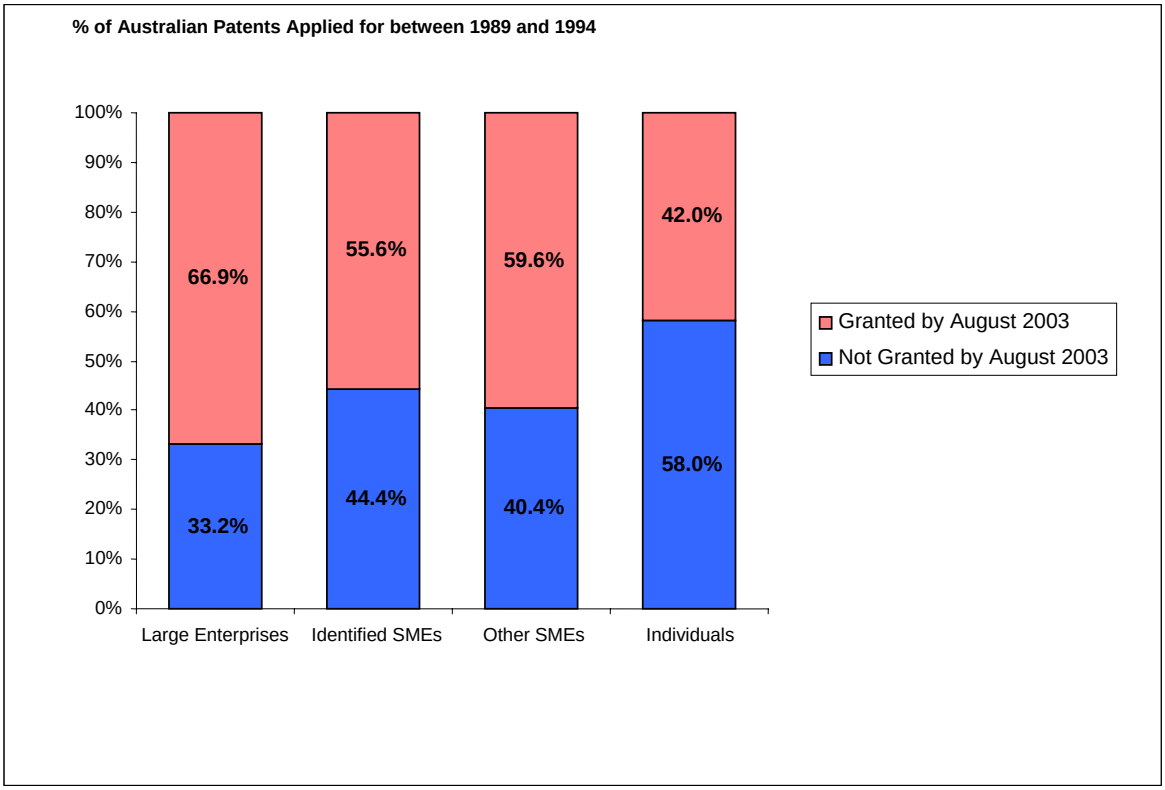
Graph 2: IP applications per employee by enterprise size, Australia, 2000-01



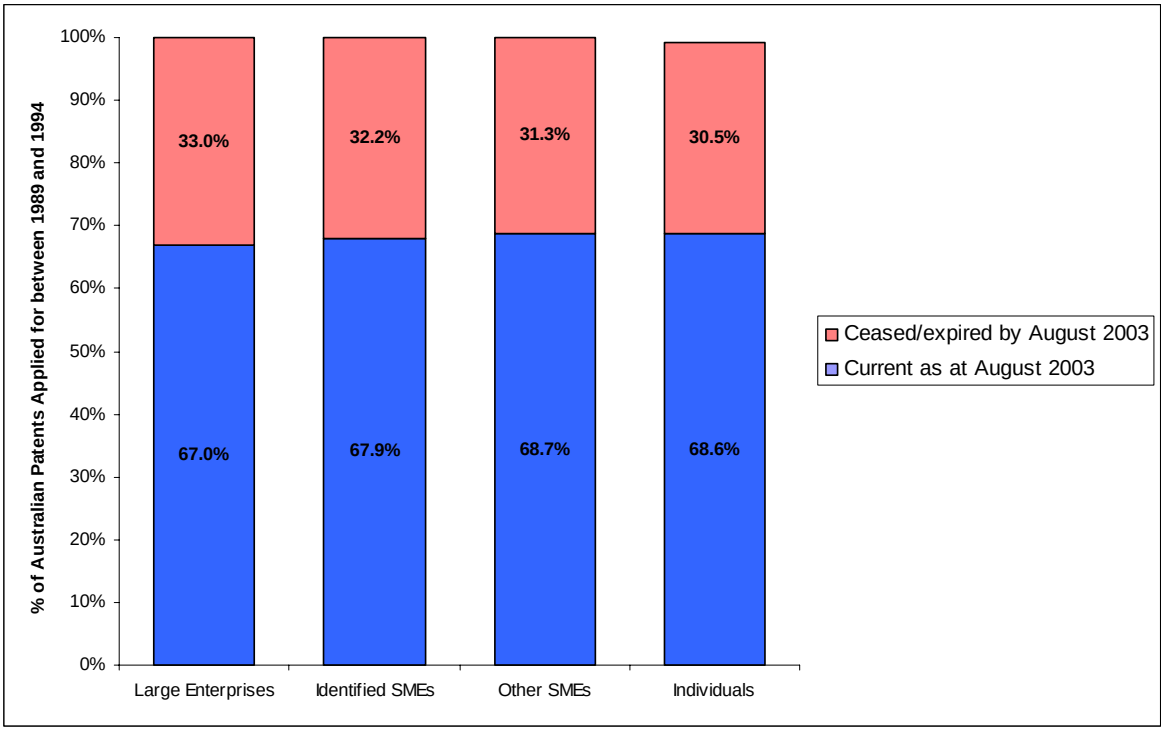
1.2.2 Patent grants and renewals

The next graph shows that once a complete application has been filed, large firms are more likely to obtain a granted patent. However, as shown in the subsequent graph, the proportion of patents that are renewed over time is the same for large firms, SMEs and individuals. This datum indicates that the inventions that SMEs seek to protect by patents are of a similar minimum value to the SME as the inventions protected by large firms.

Graph 3: Rates of granted patents by enterprise size



Graph 4: Patent renewal rates by enterprise size

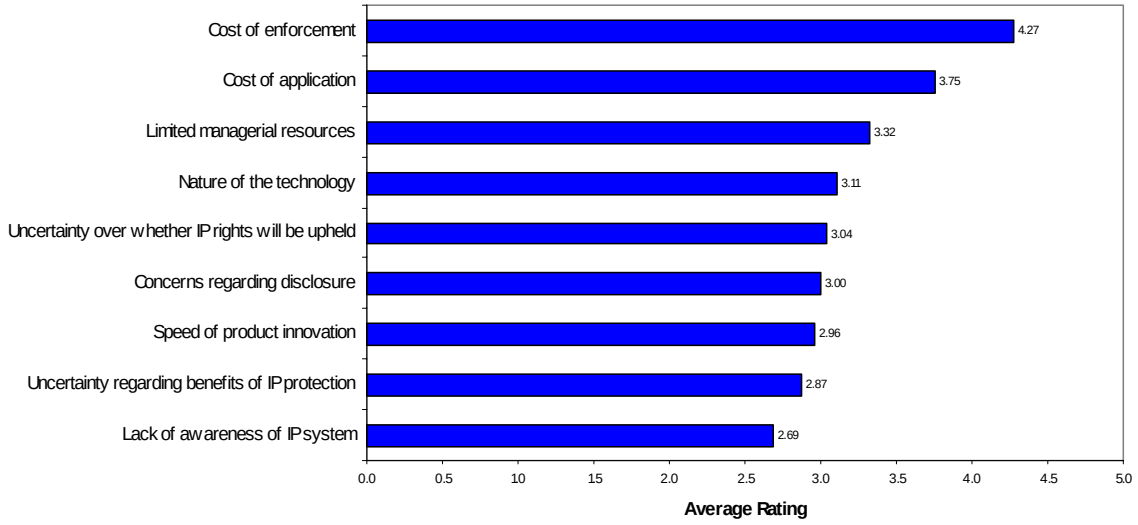


1.3 Factors inhibiting Patenting and other forms of IP Protection

1.3.1 Ranking the factors

There are a number of factors that inhibit the use of IP protection. Survey respondents were asked to rank the importance of nine of those factors. The three most important factors were cost-related**:** cost of enforcement, cost of application and limited managerial resources available to SMEs (another cost factor). Notably, lack of awareness of the IP system was the least important factor.

Graph 5: Factors inhibiting SMEs' use of IP protection



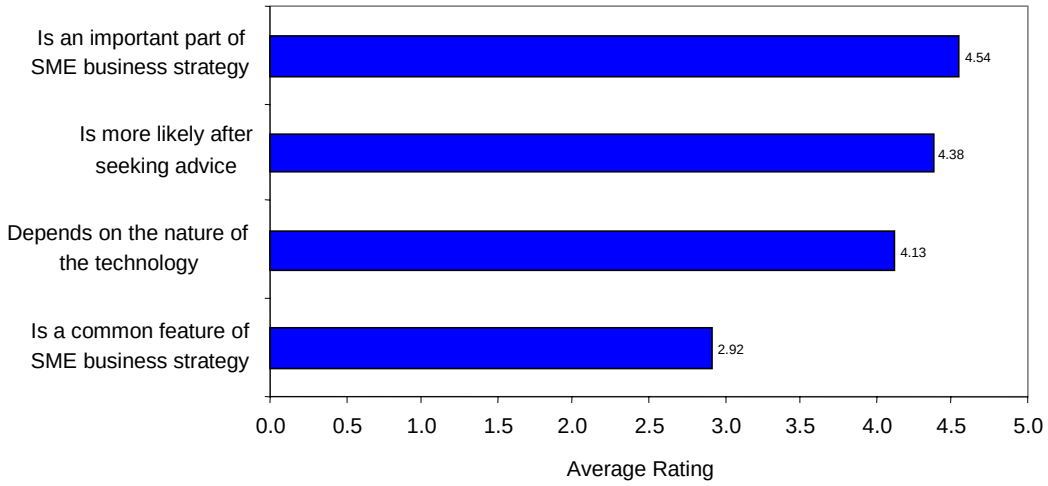
Rating scale: 1=Not important, 5=Very important

1.3.2 Is IP part of the business strategy of SMEs?

Despite the barriers, it is clear that SMEs are using the IP system; however, this does not mean that they are making *optimal* use of the system. It is possible that (despite the data presented in **1.3** above as to the rate of applications for patents, trade marks and designs) SMEs are less equipped to manage their IP effectively and to gain the maximum benefits from their innovation and their investment in IP protection.

The next graph shows that, according to the survey respondents, IP protection is an important part, but not a common feature, of the business strategy of SMEs.

Graph 6: Strategic use of IP protection by SMEs

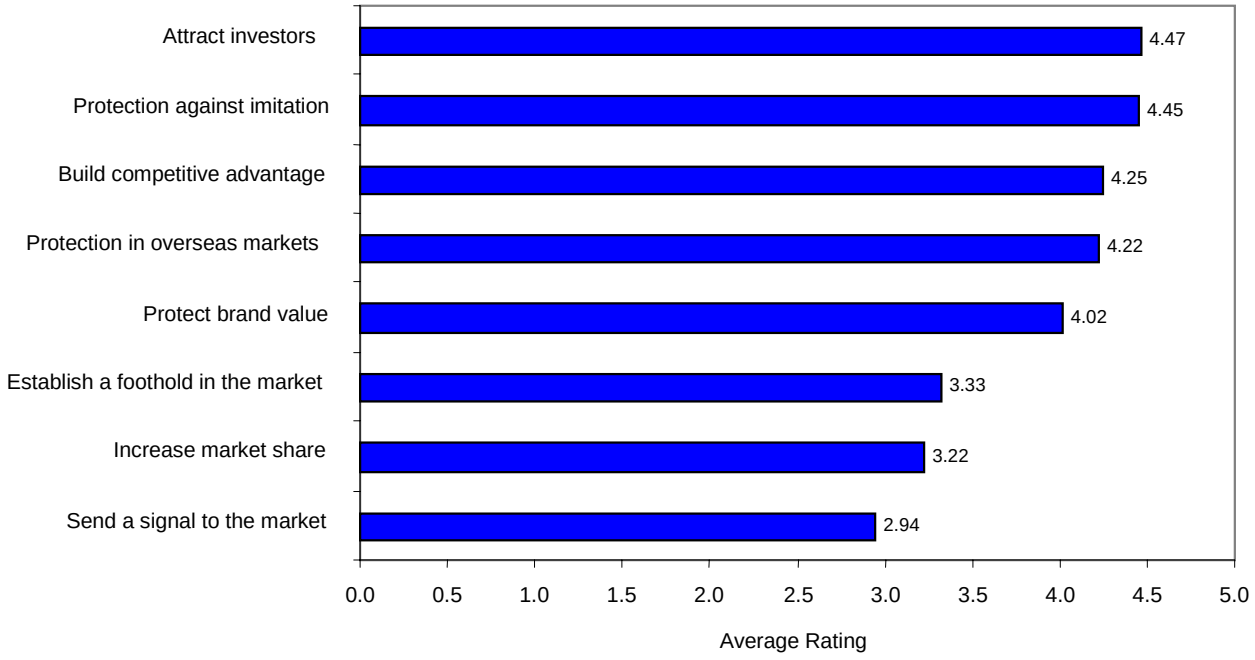


Rating scale: 1=Strongly Disagree, 5=Strongly Agree

1.4 Relationship between Exports and IP Protection

According to the survey respondents, protection in export markets is an important reason for seeking IP protection, but it is not as important as other reasons. As illustrated in the graph below, protection in export markets was ranked fourth out of eight potential reasons for applying for IP – below attracting investors; protecting against imitation and building competitive advantage. However, it was ranked above building brand value; establishing a foothold in the market; increasing market share and sending a signal to the market.

Graph 7: Reasons for using IP protection



Rating scale: 1=Not Important, 5=Highly Important

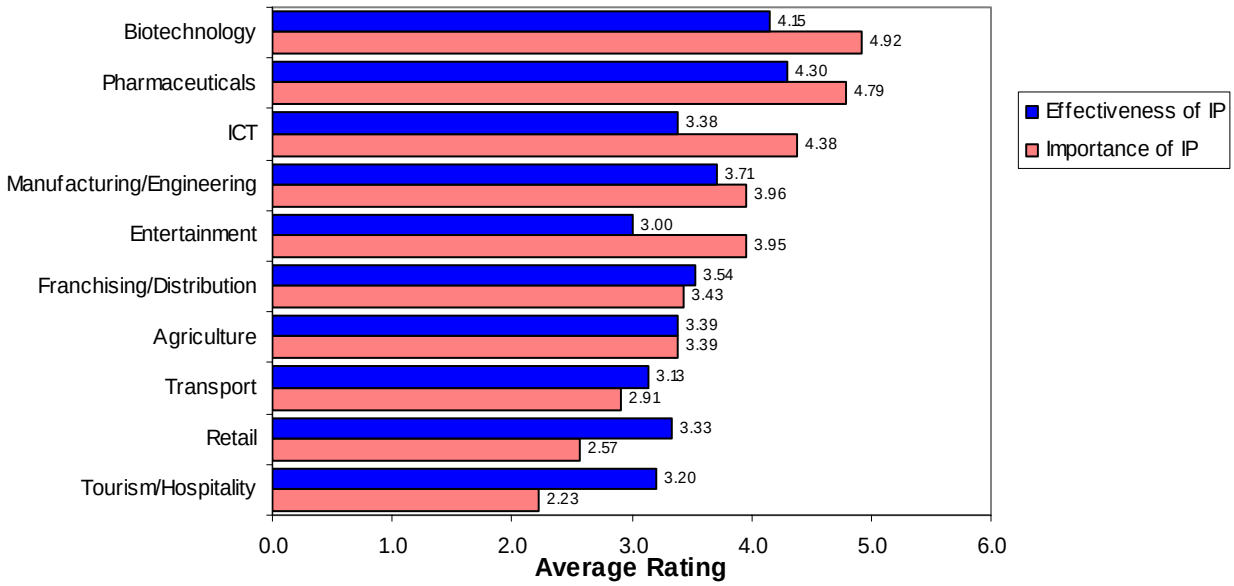
The study has also identified important issues in relation to the international protection of IP and the export performance of Australian companies. There is evidence that some Australian companies are not entering certain markets because they fear of imitation. There is also evidence that the very significant costs of international protection are a serious burden for SMEs and they have prevented some SMEs from pursuing international patents.

1.5 Effectiveness of IP Protection in meeting the needs of SMEs

Survey respondents were asked to rate the relative importance and effectiveness of IP protection for SMEs across a range of different industries. The results are presented in the graph below.

According to SME innovation partners and advisors, needs of certain industries were not effectively served by the IP system, including transport, retail and tourism/hospitality, although it should be noted that the importance of IP in these industries was considered to be relatively low. In other industries, where the importance of IP was considered to be high, IP protection was perceived to be relatively effective; for example, pharmaceuticals and biotechnology. The entertainment industry is notable in that it is an industry where IP was considered important, but the level of protection was not regarded as particularly effective. Given current developments in relation to peer-to-peer file sharing, this situation is not particularly surprising.

Graph 8: Importance and effectiveness of IP protection by industry type



Rating scale: 1=Strongly Disagree, 5=Strongly Agree

1.6 Summary of Key Findings

- The evidence does not support the view that SMEs are making less use of the IP system than are large firms.
- Nevertheless, there are perennial problems which impact on the use of the IP system by SMEs. These include the cost of enforcement, the cost of applying for protection, the perception that the benefits of the system are not significant, the complexity of the system and the limited nature of resources available to the managers of SMEs.

- SMEs have a good level of basic awareness of how to use the IP system, but lack the knowledge necessary for strategic decision-making in relation to IP, including integration of IP into a business plan.

- SMEs are a diverse group with a range of differing needs in relation to the IP system.

INTERNATIONAL COMPARISONS

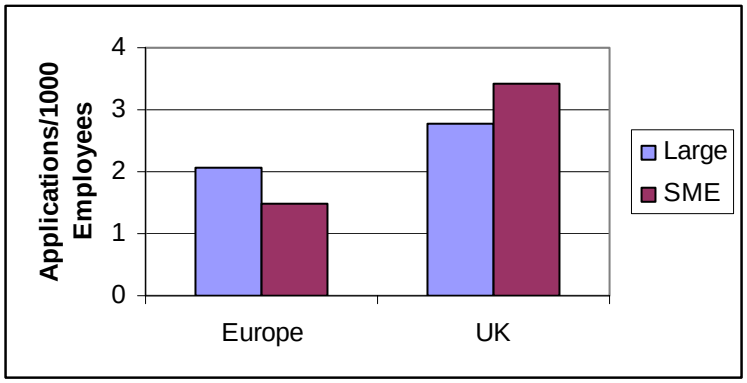
Additional research was undertaken by the Department of Industry, Tourism and Resources to compare the IP protection practices adopted by Australian SMEs with their counterparts in comparable economies. Information on the IP protection practices of companies, SMEs in particular, in the UK, Canada and the USA were collected through a literature survey and the comparison of information relating to the rates of IP protection, factors inhibiting patenting and reasons for use of IP protection were carried out taking into consideration the differences in methods used by different researchers.

Rates of Use

The international data revealed that the rate of use of IP protection by companies is directly proportional to the firm size (number of employees), supporting the findings of the Australian data. It was also found that economic factors, such as a recession or a downturn in sales, had a far stronger effect on the usage of IP protection by SMEs than in the case of larger firms.

The data did however show that in some jurisdictions (UK and EU) usage levels of IP protection by SMEs are significantly higher than in Australia.

Patent Application Rates in U.K. and Europe



Sectoral Use

The available international data suggest that the IP protection practices of SMEs do not differ from that of larger firms, with use of IP protection increasing proportionally to the size of the enterprise.

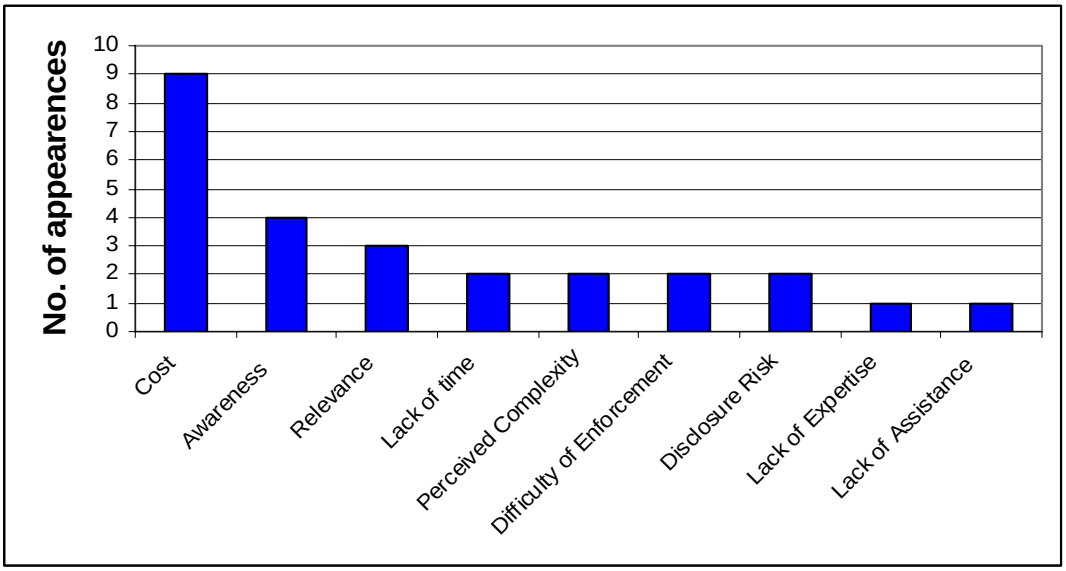
The data suggest that use of IPRs by SMEs is most prevalent in research intensive and high technology industry sectors, such as pharmaceuticals, biotechnology and ICT.

It should be noted, however, that SMEs are generally under-represented in these fields, possibly due to the large set up costs.

Inhibiting Factors

The international research shows that cost, both of obtaining and defending intellectual property rights, was the single largest factor that inhibits the use of IPRs. Other factors that were commonly identified included awareness, relevance complexity and risks of disclosure.

Inhibiting Factors (International)



Summary

IP protection practices adopted by SMEs internationally appears to demonstrate a significant degree of commonality in practices and perceptions with regard to intellectual property protection, and show that the obstacles that Australian SMEs face are not unique. The available international data are generally consistent with the findings of the Australian survey, particularly with regard to rates of usage of IP protection, reasons for use and factors that inhibit usage.

2. BACKGROUND

2.1 Objectives

The Department of Industry, Tourism and Resources has requested this study:

> "to determine whether the level of intellectual property protection by Australian SMEs is at sub-optimal levels, the reasons for this and areas for attention in policy development, and program design and delivery, to address any identified problems."

Broadly, the present study is concerned with the extent and efficiency with which Australian Small and Medium Enterprises (SMEs) are using the intellectual property (IP) system. In particular, the project comprises four basic elements:

(1) Examination of whether the relative application rates of IP by SMEs in Australia are low relative to (i) large firms in Australia; and (ii) SMEs in other industrialised nations;

(2) Identification and ranking of factors that inhibit patenting, and use of other forms of intellectual property, by SMEs;

(3) Evaluation of the extent to which these factors inhibiting IP protection impact on the export performance of Australian SMEs by industry sector; and

(4) Assessment of the extent to which the current IP protection and enforcement system meets the needs of Australian SMEs by industry sector.

2.2 Background

The "IP system" is principally the set of laws which protects the outcomes of intellectual activity: specifically patents, trade marks, copyright, registered designs and the legal protection of confidential information, as well as plant variety protection and circuit layout rights. The "IP system" refers additionally to the administration of IP laws, in particular the registration systems governing patents, registered trade marks and registered designs. IP laws are designed to enable individuals and firms to appropriate the benefit of their innovations, and thus to provide incentives for investment in such innovation. Intellectual property rights (IPRs) are recognised as an essential feature of an innovative economy. As developed economies become more knowledge-oriented, and as technology advances, such protection becomes increasingly important.

SMEs play an important role in employment and in economic activity in Australia. They are also important to certain very innovative sectors of the economy, such as biotechnology. The literature establishes that IP is valuable to SMEs; it protects them from imitation and facilitates trade in the market for ideas in certain industries and technology areas. However, SMEs may have at their disposal better and more efficient means of

protecting their competitive advantage and investments, such as using secrecy, lead time and organisational complexity (Levin *et al.*, 1987, Cohen *et al.*, 2000, Iversen, 2002, p71).

Nevertheless, concern that SMEs are not making optimal use of the IP system is widespread both in Australia and overseas. Specifically, it is perceived that SMEs face particular problems in making effective use of the IP system. Some recent studies do show that SMEs face particular barriers in using the IP system (Literature Review in Volume II, OECD (2000)). As a result, the last few years have seen the development of a significant number of programs, in Australia and overseas, aimed at encouraging, and facilitating use of IP by SMEs. In 2000, the World Intellectual Property Organisation (WIPO) established a new program of activities focusing on the IP-related needs of SMEs (WIPO, 2002a). At the same time, the OECD became interested in this area of policy as part of its broader concern with innovation and patenting (OECD, 2000). A large number of countries have also introduced programs directed at facilitating use of the IP system by SMEs. The range of these programs is illustrated by the collection of "best practices" to be found on WIPO's website (WIPO, 2003) and a similar collection on the European Union site (European Union).

Similar developments have occurred in Australia. A range of programs and resources have been made available to assist SMEs in understanding and utilising IP laws. However, no clear picture of how Australian SMEs are using the IP system has emerged. There is no existing study or survey identifying which SMEs are using the IP system, or how this might vary by industry. Much of the evidence concerning IP use, and any barriers that SMEs face in making use of IP, is anecdotal. This gap is not peculiar to Australia. It is only relatively recently that real attempts have been made to conduct any rigorous study of the use of the IP system by SMEs.

Attempting to fill this gap in relation to Australia, this study provides data on current use of the IP system by Australian SMEs; specifically, the extent to which SMEs are using the IP system and in what industries, and what factors impact on that use. However, it should be noted that a higher rate of IP usage is not necessarily a more efficient allocation of resources, in that there are costs associated with completely appropriating all the benefits from a creation. From an economic point of view, the optimal level of IP protection balances the tension between giving enterprises, through strong IP regulation, sufficient incentive to engage in innovation, and the benefits (including improvements in knowledge) to be obtained by other firms, and the general public, by granting free and unfettered use of IP.

In order to achieve this balance, it is important to strike a median between making IPRs too easy to obtain and too hard to obtain. On the one hand, if the process is too difficult, the costs can become prohibitive. On the other hand, if it is too easy, the patent may be worthless, and may even be misleading, as patentees may feel they have protection against infringement when, in reality, the weakness of the patent will be uncovered later in litigation. As a result, some SMEs may be better off devoting resources to ensuring their production and distribution networks are strong, or to simply developing their product.

SMEs have to make decisions about IP use:

Company G is a small Australian R&D company, which specialises in developing surveillance equipment using sonar technology. It has made a deliberate, considered decision ***not*** *to seek international patents. This decision was based on a cost-benefit analysis. The costs of international patents are very high (the estimate given was some $100,000 for each patent, if coverage was sought in Australia, the US, and Europe). These had to be weighed against the risks of imitation and infringement, and the disadvantage of having to disclose the technology, where imitators could not be pursued, which would arise in the situation where international patents were not obtained. The decision of Company G was to rely on other methods – confidentiality agreements, staying ahead of the market, and simply competing with imitators. The case study illustrates a basic point: there are alternatives to using the IP system, and rational SMEs may choose these in preference to seeking IP protection.*

3. METHOD OF INQUIRY

The objective of this study was to identify the level of use of the IP system by Australian SMEs by undertaking the following:

- A comprehensive review of the academic and public policy literature;
- An analysis of the IP Australia databases;
- A number of consultations with industry and government organisations;
- Two surveys; and
- Ten case studies of innovation by SMEs.

3.1 Literature review

The first stage of the study involved a comprehensive literature review. The complete literature review is presented in Volume II of this report. It covered academic research into the effects of firm size on innovation and more general research on policy initiatives aimed at providing assistance to SMEs. The objective was twofold: (i) to identify any research substantiating the conventional wisdom that SMEs are using the IP system at a sub-optimal level; and (ii) presuming the conventional wisdom to be accurate, to identify empirical research providing possible reasons for this situation. Such research would enable the present study to apply similar techniques to the analysis of the use of IP by Australian SMEs.

Somewhat surprisingly, no such research exists. The literature review notes a number of limitations that prevent a comparison of the performance of Australian and international experience. First, there is no universal definition of what constitutes an SME. Many of the existing studies focus on large firms, and only deal with SME issues in passing. Second, the literature is overwhelmingly focused on patent regimes: very little work has been done on other IPRs. Third, there is little empirical analysis of the factors affecting the use of IP by SMEs. There are numerous assertions and conjectures, but little hard evidence.

As a result, there is no broadly comparable set of international studies providing robust empirical findings on use of the IP system by SMEs against which Australian information can be readily compared.

3.2 Analysis of the IP Australia data base

The second stage of the study involved the construction of a customised data set from available administrative data bases, to investigate the extent of IP usage by SMEs. (The Australian Bureau of Statistics (ABS) does not collate IP data, and IP Australia does not collect details on company size or industry.) Constructing the data set required a computer

match of company names from the IP Australia data base on patent, trade mark and design applications, to two enterprise data sets: IBISWorld, which contains extensive accounting data including size and major industry, and, the Australia OnDisc (AOD) data base, which includes multiple industry classifications. On average, a match was made for 40 to 50 per cent of company IP applications (see Chapter 3 in Volume II for further details on the matching process).

Ideally, the construction of this data base would enable a comparison of the intensity of the IP usage rate by Australian SMEs with SMEs from other countries, in part, to assess how local companies differ from their overseas counterparts. This comparison was not possible, however, since there were no other comprehensive studies of IP usage intensities according to firm size. Some overseas jurisdictions provide information on the numbers of patents by large enterprise and SMEs but this number has little economic meaning since IP counts are expected to be greater for large enterprises, given their higher production levels.

A further problem involved in undertaking comparisons is the differences in definitions of an "enterprise" across data bases. Many enterprise data sets are drawn from administrative or accounting data bases and are unlikely therefore to fully accord with the economic meaning of a complete enterprise. There are several main areas of difference:

- Self employed production entities with no employees are not classified as an enterprise in some ABS data sets but can be included in others.
- The ABS will often split large enterprises into management units and count these as separate entities. The basis for this division is often made on practical accounting lines rather than along ownership or production lines.
- Some data bases count parent and subsidiary organisations as separate entities, while others do not. Subsidiaries may or may not be listed separately with ASIC. The rules for deciding when a partially owned company is or is not a subsidiary can vary, although the convention is set at a minimum of 50 per cent.
- The treatment of government administrative organisations varies, some data sets include these as 'enterprise' or 'firm' and others do not.
- Franchised organisations with the same name can appear as one or many organisations depending on the data set.
- Farms are often excluded from lists of enterprise.

3.3 Consultations

In the third stage of the study, consultations with key industry groups were undertaken in order to inform the analysis of the key issues facing the use of IP by SMEs. The consultations were aimed at providing a reliable source of information verifying the importance of various factors identified in the literature review. They also provided another important role: to help in the identification of key issues to be included in the survey questionnaires.

Consultations were conducted, via a semi-structured interview format, with representatives from the following organizations:

- AusBiotech;
- Austrade;
- Australian Industry Group;
- Australian Institute for Commercialisation;
- Australian Venture Capital Association;
- iLab: High Technology Incubator in Queensland;
- InnovationXchange;
- Innovic;
- Institute of Patent and Trade Mark Attorneys of Australia;
- Licensing Executives Society:
- Small Business Centre of Excellence at CPA Australia;
- Triton Foundation.

Each of the consultations was undertaken with a senior executive within the nominated organisation. A complete description of the organisations included in the consultation process is presented in Chapter 4 of Volume II of this report.

One conclusion to be drawn from the consultations is that it is very difficult to make statements about the issues which face "all SMEs". These businesses are a heterogenous group: they vary considerably, and, as a result, face different issues in relation to the use of IP.

Three illustrative SMEs:

A low-technology small manufacturer producing and selling products which do not require expensive, long lead-time research: such a firm may be highly innovative but not confronted with IP issues as a condition or pre-requisite of doing business. Such a firm is more likely to be concerned with preventing imitation than licensing or cross-licensing issues, and is more likely to require basic information and assistance in making effective use of the IP system. Company A provides an example of this kind of SME. Company A is a micro company consisting of a husband and wife team which designs furniture and lighting. It has two registered designs and some potential copyright protection. It has not used this IP to date. The company registered its most recent design based on a genuine fear that it might be copied.

An SME in the services industry which does not produce patentable products, but which instead delivers services and is more concerned with the development of brand and customer loyalty. This kind of SME has concerns relating to IP, but might require information about IP such as trade marks and copyright, often in the context of licenses and franchises. Consultations with industry groups highlighted this kind of SME; organisations such as Innovic dealt regularly with these SMEs.

A high technology/research SME: some Australian SMEs, particularly in high technology industries, may be very involved in research and development of products, but may not manufacture or distribute those products themselves. For SMEs operating in this environment, IP is a precondition of doing business. They are, of necessity, more

sophisticated users of IP, with different needs from other SMEs. Amongst the most sophisticated SME users of IP encountered in the course of this study were those who are operating in the market for ideas: that is, selling their technology through licensing, partnering or buy-out rather than commercialising it fully themselves. This is true, for example, of many SMEs in the biotechnology industry, and those who seek capital from venture capitalists with a view to selling the company at a later stage. The other key reason for applying for IP is to facilitate the obtaining of financing, and to send positive signals to investors about the worth of the company. Company H, a research-oriented biotechnology firm specialising in chemical compounds for the pharmaceutical industry, provides a relevant example. The company focuses on early stage research and innovation, patenting inventions with the aim of subsequently developing international partnerships to fully commercialise and distribute the resulting products, for example, through licensing arrangements.

3.4 Design of the survey instrument

The fourth stage of the study was the surveying of key stakeholders in the IP protection area. Two surveys, each of 50 organisations, were undertaken. One survey was tailored for "Innovation Advisors" – organisations that provide information and advice to firms undertaking innovative activities, such as IP lawyers, patent and trade mark attorneys, and COMET business advisors. The other survey was tailored for "Innovation Partners" – organisations that play a more active role in the innovation and commercialisation process, such as venture capitalists, business angels, and high-tech incubators.

The overall response rate was 49 per cent. While the overall response rate is an important factor in all surveys, it is also important to consider the distribution of the responses. A full description of the survey respondents is provided in Chapter 5 of Volume II of this report. Standard statistical procedure for designing surveys is to use a large sample randomly drawn from a population. This procedure is intended to ensure that the responses received will also be random and therefore not biased. In this survey, however, a different approach was adopted. A small (non-random) sample was used. One of the inherent problems with small-sample surveys relates to the distribution of responses. The larger the sample size, the greater the likelihood that the sample will reflect the characteristics of the population. A small sample size, therefore, may not be representative of the population. However, this does not appear to be a problem here since the respondents were evenly dispersed across a range of organisations and industries.

Survey respondents were asked a range of questions relating to the factors affecting the use of IP protection by SMEs. For most of the questions, respondents were asked to rate their response on a 1 to 5 Likert scale. The responses to these questions are used throughout this report.

3.5 Case studies

An understanding of the barriers faced by Australian SMEs in using the IP system requires some recognition of the kinds of uses which they are making of IP. In order to understand and elaborate on some of these issues, case studies have been used in the report as

illustrations of key issues. The case studies were undertaken with companies from a range of industries.

The case studies illustrate the fact that Australian SMEs vary widely in the kinds of use they make, or wish to make, of the IP system. Some SMEs are mainly concerned about preventing imitation and free riding. Good examples are companies in the furniture and design, software or the fashion industries: for example, see Company A (furniture and lighting design), Company C and F (clothing and fashion), and Company D (software design). For these companies, the need for basic information and enforcement costs are major issues. Other small businesses in Australia make highly sophisticated use of the IP system, obtaining protection with a view to licensing cutting edge technology: for examples, see Company E (research-based drug discovery), Company H (research-oriented biotechnology), and Company J (power generation technologies). The barriers faced by these companies are quite different, involving particular provisions of the *Patents Act* (Company J) or the difficulties involved in dealing with university researchers and university IP policies (Company E).

4. RESULTS

4.1 Application Rates for IP Protection by SMEs

This section completes the initial component of the study. It analyses the database of IP registrations collected by IP Australia, and links this information to more detailed information about firms.

4.1.1 Profile of SMEs in Australia

Overwhelmingly, most businesses in Australia are SMEs employing less than 200 people, although the precise percentage depends on the definition of a business. ABS data, which excludes businesses which have no employees, estimate that 99.5 per cent of firms are SMEs.[1] This figure covers all industries except agriculture, forestry and fishing, general government administration and defence. Including the primary produce industry and self-employed increases this percentage. Large as it is, this figure is further understated as the ABS collect data on a management (or accounting) unit basis, a practice which is likely to overstate the number of large units (to the extent large enterprises include one or more large management units). The IBISWorld database, which comprises only large and medium enterprises in Australia, estimate that the number of large enterprises is half the number of the large ABS management units.

According to data presented in Table 1 from the ABS, IBISWorld and the AOD, the number of SMEs in Australia in 2001 lies in the range of 600,000 to 900,000. The lower ABS figure excludes businesses and farms from agriculture, forestry and fishing, general government administration and those businesses which have no employees and the upper figure is drawn from the Yellow Pages listing (AOD) of all businesses less the number of large IBISWorld businesses.

As well as being numerous, SMEs are also economically important. According to Table 1, they accounted for 62 per cent of employment, 49 per cent of value added and 15 per cent of business assets in 2000-01 (ABS). The average number of employees in the ABS defined SME was 6 compared with 753 for large (management unit) businesses.

[1] The ABS defines 'SME' as a business that employs less than 200 people and has not more than $200 million in assets.

Table 1: Profile of SMEs, [(a)] Australia, 2001

	ABS (2000-01)[(b)]		IBISWorld (2001)[(c)]		AOD SME (2001)[d)]
	Large	SME	Large	Medium	SME
Operating businesses (no.)	3,229	607,663	1,576	305	910,272
Average employment (no.)	753	6	33,615	97	
Average total revenue ('000)	228,769	1,007	580,049	115,820	
Average profit ('000)	27,156	62	42,471	3,125	

Notes: (a) Large=management units which employ 200 or more persons or have assets worth more than $200m, SME=management units which employ less than 200 persons and do not have assets worth more than $200m.
(b) ABS data excludes all agriculture, forestry and fishing businesses; all businesses without employees (including self-employed only businesses); and general government.
(c) IBISWorld businesses are either the parent company or, in the case of foreign owned companies, the highest Australian accounting unit. As such, large enterprises will include several ABS management units. Size data is missing for about 4 per cent of IBISWorld businesses.
(d) AOD SME includes all businesses listed in Australia OnDisc except for those classified as large IBISWorld businesses.
Sources: ABS Business Operations and industry Performance, Australia, 2000-2001, cat 8140.0. IBISWorld data, Australia OnDisc.

The relative proportions of large and SME firms clearly vary by industry, and much of this can be attributable to different levels of the minimum efficiency scale (MES) in each industry. Data on both the average employment across industries (Table 2) and the distribution of large and SME firms across industries (Table 3) show that SMEs are more likely to be found in: personal and other services; health and community services; construction; agriculture, forestry and fishing; property and business services; and retail trade. Conversely, they are least likely to be found in mining; electricity, gas and water; and communication services where high MES are found. To the extent that the technologies found among the latter industries are more easily protected through legal IP means, perhaps because of the intrinsic nature of the technology, it is expected that SME IP rates will be lower. In fact, it was found (see below) that patenting rates by SMEs are considerably lower in the mining and electricity, gas and water services because of the lower number of SME firms.

Table 2: Average employment by industry, Australia, 2000-01

	Industry	Average employment
A	Agriculture, Forestry and Fishing	4.7[(a)]
B	Mining	50.5
C	Manufacturing	19.9
D	Electricity, Gas and Water Supply	176.7
E	Construction	4.2
F	Wholesale Trade	10.2
G	Retail Trade	10.1
H	Accommodation, Cafes and Restaurants	14.0
I	Transport and Storage	10.6
J	Communication Services	26.4
K	Finance and Insurance	13.3
L	Property and Business Services	7.4
M	Government Administration and Defence	na
N	Education	na
O	Private Community Services	13.0
P	Cultural and Recreational Services	10.7
Q	Personal and Other Services	5.5
	Total	10.1[(b)]

Note: (a) 1999-2000, (b) excludes agriculture, forestry and fishing.
Source: ABS Business Operations and Industry Performance, 2000-01, cat 8140.0.

Table 3: Percentage distribution across industries, by size, Australia, 2001

	Industry	Large	SME
		%	%
A	Agriculture, Forestry and Fishing	1.4	3.0
B	Mining	5.8	0.2
C	Manufacturing	26.9	25.1
D	Electricity, Gas and Water Supply	1.7	0.0
E	Construction	4.2	8.2
F	Wholesale Trade	13.3	4.4
G	Retail Trade	8.7	11.2
H	Accommodation, Cafes and Restaurants	0.9	4.4
I	Transport and Storage	5.5	3.5
J	Communication Services	1.3	0.7
K	Finance and Insurance	11.2	1.2
L	Property and Business Services	12.4	17.5
M	Government Administration and Defence	0.0	0.3
N	Education	0.3	3.2
O	Health and Community Services	2.7	7.0
P	Cultural and Recreational Services	2.3	3.4
Q	Personal and Other Services	1.5	6.8
	Total	100	100
	No. of enterprises	1,576	907,830

Source: IBISWorld data base (large), Australia OnDisc 2001.

4.1.2 Invention and Innovation Potential

In the absence of clear evidence to the contrary, it was assumed for the purposes of this study that the invention and innovation potential did not vary between the large and the SME sector overall. Further, given that all invention is a human endeavour, and in the absence of an established measure of invention and innovation potential, the number of employees in an enterprise was taken to be the best available measure of innovation potential. Thus, the rate of IP usage per innovation potential was the percentage of patents, trade marks and designs per employee.

4.1.3 SME use of IP protection

Data on the number of patents, trade marks and designs applied for by enterprises, which are presented in Table 4, Table 5 and Table 6, show that IP counts are consistently related to enterprise size. According to Table 4, about 6 per cent of large enterprises apply for at least one provisional patent in any given year compared with 2 per cent of SMEs (most of which are medium rather than small). 26 per cent of large enterprises apply for at least one trade mark compared with 16 per cent of SMEs and 4 per cent of large companies apply for a design compared with 1 per cent of SMEs. Disaggregation of IP applicants by enterprise size and industry has been undertaken by matching the names of applicants across first to large enterprises listed in the IBISWorld data base, and second, SMEs listed in the AOD data base.

Table 4: Annual patent[(a)] applications per enterprise by enterprise size, 1989-2002

Count	Large	Medium	Unknown	Total
0	93.9	98.54	99.18	94.92
1	3.1	1.09	0.58	2.65
2 to 5	2.15	0.37	0.23	1.77
6 to 15	0.73	0	0	0.57
16 to 40	0.15	0	0	0.05
Total	100	100	100	100
Sample Size	19,143	4,392	856	24,391

Note: (a) Complete standard applications and PCT applications that have entered the national phase.
Sources: IP Australia, IBISWorld data, Australia OnDisc.

Table 5: Annual trade mark applications per enterprise by enterprise size, 1989-2002

Count	Large	Medium	Unknown	Total
0	73.59	84.27	93.69	76.22
1	8.04	6.9	2.92	7.66
2 to 15	15.79	8.43	3.41	14.01
16 to 50	2.08	0.29	0	1.67
51 to 100	0.5	0.06	0	0.3
101 to 250	0.18	0.02	0	0.03
Total	100	100	100	100
Sample Size	19,143	4,392	856	24,391

Sources: IP Australia, IBISWorld data, Australia OnDisc.

Table 6: Annual design applications per enterprise by enterprise size, 1989-2002

Count	Large	Medium	Unknown	Total
0	96.00	98.79	99.53	96.63
1	1.57	0.59	0.23	1.34
2 to 5	1.53	0.33	0.24	1.26
6 to 15	0.66	0.19	0	0.55
16 to 50	0.26	0.09	0	0.19
51 to 100	0.03	0	0	0
125	0.01	0	0	0
Total	100	100	100	100
Sample Size	19,143	4,392	856	24,391

Sources: IP Australia, IBISWorld data, Australia OnDisc.

Table 7 and Table 8 indicate that a similar relationship between firm size and patent counts can be found in both Europe and the USA. However, these data are not strictly comparable, nor are they comparable with the Australian data, given that each study uses differing size groups.

Table 7: Percentage of enterprises that had applied for a patent in the last 5 years by enterprise size, Europe, 1994

Enterprise size	Percentage
1-19 employees	11%
20-99 employees	15%
500-1000	55%
All	16%

Source: Iversen, 2002, p35.

Table 8: Percentage of Norwegian enterprises that had applied for a patent in the last 3 years by enterprise size, 1997

Enterprise size	Percentage
10-49 employees	11%
50-99 employees	14%
100-199	16%
200+l	28%

Source: Iversen, 2002, p70.

The differences between large enterprise and SMEs, however, say very little about rate of usage of IP. By virtue of their size, large enterprises tend to be more active in all respects and it is therefore not surprising that they are more likely to apply for IP in a given period of time. A more meaningful comparison can be made in respect of the intensity of IP usage. Table 9 presents this data for large and medium enterprises separately. However, for the sake of comparison, the IP application rate for other indices of firm size (revenue and profits) has also been presented.

Table 9: Average Australian patent[(a)] , trade mark and design intensity[(b)] by enterprise size, 1989 to 2002

	Large	Medium	Unknown	Total
Patents/Total revenue $b	8.5	0.7	1.4	6.8
Patents/Net profit before tax $b	12.1	21.0	-0.1	13.7
Patents/Thousand Employees	0.4	1.1		0.5
Trade marks/Total revenue $b	28.8	24.7	5.4	27.3
Trade marks/Net profit before tax $b	145.1	3,072.9	99.4	801.5
Trade marks/Thousand Employees	5.1	13.0		6.6
Designs/Total revenue $b	1.0	1.1	0.2	1.0
Designs/Net profit before tax $b	17.6	178.5	0.3	53.2
Designs/Thousand Employees	0.2	1.3		0.4

Note: (a) Complete standard applications and PCT applications that have entered the national phase. 'Australian' means the Complete application either originated in Australia or the address of the applicant was Australia. (b) Revenue, profits assets and employees are lagged by 2 years (to reduce possible endogeneity)
$b is billion dollars.
Sources: IP Australia, IBISWorld data, Australia OnDisc.

In Table 9, the first three rows give the number of complete patent applications as a ratio of total revenue, profits, assets and employees in the two years prior (this is done to remove possible effects of the patent application on the denominator). This reveals that as a ratio of revenue and net profits before tax, large enterprises are greater users of patents than

medium enterprises. However, as a ratio of employees, medium size enterprises' patent intensity is nearly three times that for large enterprises. Research undertaken by CHI Research and summarised in Table 10, reveals that in the US, SMEs had a patenting rate 14 times higher than large enterprisess. (The US definition of an SME was employment between 5 and 500 employees. This ratio was only calculated for the 1071 enterprises which had applied for 15 to 45 patents between 1996 and 2000.)

The picture is quite different for trade marks. Trade marks are taken out when an enterprise wants to distinguish their product either from their existing stable of products or from competitors' products. To the extent that new trade marking heralds the launch of a novel good on to the market, it can be regarded both as a measure of innovation and a form of IP protection (subject to the caveats listed above). Data on trade marking demonstrates clearly that medium-sized enterprises are considerably more intensive users of trade marks than are large enterprises. The only exception is the number of trade marks per revenue, where large enterprises are slightly higher.

Referring again to Table 9, it can be seen that medium size enterprises are slightly more intensive users of registered designs. With the exception of design applications per profit, the ratios for medium enterprises are marginally higher than those for large enterprises.

These findings also hold if the IP application rate per employee is estimated using ABS employment data in the denominator. In Table 11, the number of annual patent, trade mark and designs counts in the large enterprise sector (defined as those applicants that match across to IBISWorld) in 2000-01, are compared with the residual applicants which are assumed to belong to the SME sector. These are divided by the number of employees in each sector as measured by the ABS. The ratios clearly reveal that while the patenting rate between the two sectors is equivalent, the trade marking rate, is considerably higher for the SME sectors and slightly higher for designs.

A more accurate representation of potential innovativeness would adjust the employment data for the skills of the workforce, and in addition, adjust the application rate for potential IP relevance by disaggregating by industry or technology class. However, this level of detailed analysis has not been possible within the time and scope of the current study.

Given these findings, this study tentatively concludes that if the creative potential of an enterprise is primarily determined by the number of employees it employs, then it cannot be said that SMEs are less likely to avail themselves of the IP system than are large enterprises.

Table 10: Patenting propensity by enterprise size in manufacturing, USA 1996-2000

	Small firms (0-500 employees)	Large firms (>500 employees)	Total
All firms			
Employment share	41%	59%	100%
No. firms (1999)	328,713	4,957	333,670
High patenting firms (>15 patents between 1996 – 2000)			
No. firms	356	688	1044
Patents per employee	0.191	0.014	

Source: CHI Research, 2003

Table 11: Australian patent, trade mark and design applications per employee by enterprise size, Australia, 2000-01

Type of IP	Annual count per thousand employees[(b)]	
	Large (IBIS)	**SME (AOD)**
Annual patent applications(a)	0.35	0.38
Annual trade mark applications	2.44	4.19
Annual design applications	0.22	0.32

Note: (a) Complete standard applications and PCT applications that have entered the national phase. 'Australian' means the Complete application either originated in Australia or the address of the applicant was Australia. (b) excludes agriculture, forestry and fishing.
Source: ABS Business Operations and Industry Performance, 2000-01, cat 8140.0, IP Australia.

4.1.4 SME patenting by technology and industry

Patent applications data have been disaggregated by technology class (using the Office of Science and Technology (OST) classification system) for both large enterprise and SMEs. Table 12 shows that over the past 14 years, SMEs have been more likely to apply for complete patents in the areas of: transport; agriculture/food machinery; and thermal techniques, and least likely to apply in the areas of: space technology; weapons; semiconductors; and materials and metallurgy.[2] Individual patent applicants, although differing from companies on average, were closer in their technology classification to SMEs than the large companies. The most common technology areas for individuals were: consumer goods and equipment; civil engineering; building, mining; transport; and agriculture/food machinery (that is, the mechanical technologies). Given the tax and legal advantages of owning a patent through a company rather than a person, it is expected that the overwhelming majority of individual patent applicants are non-incorporated household inventors.

These differences by technology area between large enterprises and SMEs are considerably more modest than the differences between major industry sectors. As shown in Table 13, which uses the ANZSIC classification system, the greater SME patent numbers are in: manufacturing; wholesale trade; and property and business services. However, when compared with large enterprises, SMEs are more likely to apply for patents in: agriculture, forestry and fishing; government administration and defence (these being mainly public sector research organisations); retail trade; and in construction. This bias in patenting nevertheless resembles the comparative distribution of firms by industry (see Table 3) and not all of it can be attributable to a bias in the patentability of inventions for SMEs by industry.

To control for the differential distribution of SMEs by industry, the first two columns of data from Table 13 were dividided by the respective columns from Table 3. These ratios are presented in Table 14. A ratio less than one indicates that the industry's share of patents is less than its share of enterprises and conversely for ratios above one. Ideally those ratios would apply to the distribution of employment, rather than enterprise, but that data is not publicly available. Nonetheless, the enterprise data show that large education enterprises (mainly universities) have the highest patent intensity overall, while electricity gas and water SMEs are the most patent intensive SME group.

[2] The technology class of companies that were not classifiable by size, being unmatched to either IBISWorld or the AOD data bases, resembled most closely the SME sector.

In terms of the performance of SMEs relative to large enterprises, the most substantial positive gap between SMEs and large enterprises occurred in electricity, gas and water, and government and defence. However, this gap might be illusory, due to discrepancies in the classification of public and semi-public research organisations. For instance, IBISWorld, classified CSIRO as a business service, whereas the AOD classified smaller institutions as government and defence.

In any event, the data reveal that the mining, and electricity, gas and water industries are also patent intensive. This statement applies both to large enterprises and to SMEs, but with more force in relation to SMEs. In addition, SMEs in wholesale trade and property and business services are relatively patent intensive.

The pattern for Norway has some similarities with Australia. According to Iversen (2002, p78), SMEs were most likely to apply for a patent in the industries where SME firms dominate, but in terms of intensity, the industries with the most SME patents per enterprise were R&D services, machinery and equipment, and electrical equipment.

If it is accepted that the latent aspiration or potential for SMEs to invent and innovate, adjusted for firm size, is the same as for large enterprises, then their different usage rate of the IP system by industry should indicate, compared with large enterprises, either that:

- they are more or less knowledgeable about costs and benefits from using the IP system, and this knowledge translates into differential usage rates, or
- the actual costs and benefits from using the IP system are well understood but differ because of factors inherently associated with business size, or
- the potential innovativeness of SMEs differs because they have a different skill mix of employees.

Table 12: Percentage distribution of Australian patent applications[(a)] by OST technology class, by enterprise size, Australia, 1989-2002

OST technology class	Companies				Individuals
	Large (IBISWorld)	SME (AOD)	Ratio of SME/large	Unmatched[(b)]	
Electrical devices - electrical engineering	3.41	4.25	1.25	3.16	2.70
Audiovisual technology	1.18	2.22	1.88	1.43	1.62
Telecommunications	4.68	2.35	0.50	2.15	1.36
Information technology	2.90	4.02	1.39	6.60	2.25
Semiconductors	0.45	0.05	0.11	0.06	0.04
Optics	2.38	1.22	0.51	1.41	0.54
Analysis, measurement, control	0.00	0.00	na	4.82	4.08
Medical engineering	3.71	4.23	1.14	5.30	5.21
Organic fine chemical	5.45	2.35	0.43	1.51	0.33
Macromolecular chemistry	2.28	0.54	0.24	0.85	0.30
Pharmaceuticals, cosmetics	4.23	2.06	0.49	2.29	1.19
Biotechnology	7.33	2.64	0.36	1.69	0.65
Materials, metallurgy	6.56	1.27	0.19	1.43	0.69
Agriculture, food	1.72	1.20	0.70	1.50	0.81
General processes	4.27	4.32	1.01	3.92	2.54
Surfaces, coatings	2.22	1.02	0.46	1.01	0.54
Material processing	0.00	0.00	na	2.49	1.87
Thermal techniques	1.38	3.35	2.43	2.37	1.64
Basic chemical processing, petrol	2.33	1.38	0.59	1.97	1.05
Environment, pollution	1.08	1.40	1.30	1.35	0.78
Mechanical tools	1.97	2.15	1.09	1.77	2.14
Engines, pumps, turbines	1.15	1.08	0.94	1.90	2.45
Mechanical elements	3.08	5.40	1.75	4.67	4.34
Handling, printing	5.40	7.03	1.30	9.08	6.48
Agriculture/food machinery	1.43	4.29	3.00	4.87	8.50
Transport	1.40	5.94	4.24	5.45	9.05
Nuclear engineering	0.00	0.00	na	0.08	0.07
Space technology, weapons	2.01	0.27	0.13	0.35	0.61
Consumer goods & equipment	4.82	9.43	1.96	9.50	19.37
Civil engineering, building, mining	10.42	16.25	1.56	15.02	16.81
Total	100.00	100.00	1.00	100.00	100.00

Note: (a) Complete standard applications and PCT applications that have entered the national phase. 'Australian' means the Complete application either originated in Australia or the address of the applicant was Australia.
(b) The approximate 40 per cent of patents which were matched to neither IBISWorld or AOD had a technology distribution that was close to the distribution for SMEs. This supports the view that the patent applications that are unmatched, and therefore not classifiable by size, are most likely SMEs.
Sources: IP Australia, IBISWorld data, Australia OnDisc. Table 17, Volume II.

Table 13: Percentage distribution of Australian patent applications[(a)] across industries, by enterprise size, Australia, 1989-2002

Industry (ANZSIC)		Large (IBISWorld)	SME (AOD)	Ratio of SME/large
A	**Agriculture, Forestry and Fishing**	0.04	1.99	49.8
B	**Mining**	10.56	0.84	0.1
C	**Manufacturing**	36.86	55.15	1.5
D	**Electricity, Gas and Water Supply**	2.80	0.36	0.1
E	**Construction**	0.68	4.88	7.2
F	**Wholesale Trade**	5.92	7.35	1.2
G	**Retail Trade**	0.27	2.58	9.6
H	**Accommodation, Cafes and Restaurants**	0.00	0.23	NA
I	**Transport and Storage**	0.57	0.61	1.1
J	**Communication Services**	2.58	0.05	0.0
K	**Finance and Insurance**	1.58	0.54	0.3
L	**Property and Business Services**	16.94	20.34	1.2
M	**Government Administration and Defence**	0.13	1.65	12.7
N	**Education**	19.34	0.38	0.0
O	**Health and Community Services**	1.20	2.08	1.7
P	**Cultural and Recreational Services**	0.43	0.34	0.8
Q	**Personal and Other Services**	0.11	0.63	5.7
Total		100.00	100.00	1.0

Note: (a) Complete standard applications and PCT applications that have entered the national phase. 'Australian' means the Complete application either originated in Australia or the address of the applicant was Australia.
Sources: IP Australia, IBISWorld data, Australia OnDisc.

Table 14: Relative number of Australian patent applications[(a)] across industries as a ratio of relative number of companies within each industry, by enterprise size, Australia, 1989-2002

Industry (ANZSIC)		Large (IBISWorld)	SME (AOD)
A	**Agriculture, Forestry and Fishing**	0.03	0.67
B	**Mining**	1.81	4.00
C	**Manufacturing**	1.37	2.20
D	**Electricity, Gas and Water Supply**	1.70	9.00
E	**Construction**	0.16	0.60
F	**Wholesale Trade**	0.44	1.68
G	**Retail Trade**	0.03	0.23
H	**Accommodation, Cafes and Restaurants**	0.00	0.05
I	**Transport and Storage**	0.10	0.17
J	**Communication Services**	2.03	0.08
K	**Finance and Insurance**	0.14	0.45
L	**Property and Business Services**	1.37	1.16
M	**Government Administration and Defence**	0.00	5.32
N	**Education**	77.36	0.12
O	**Health and Community Services**	0.45	0.30
P	**Cultural and Recreational Services**	0.19	0.10
Q	**Personal and Other Services**	0.07	0.09
Total		1.00	1.00

Note: (a) Complete standard applications and PCT applications that have entered the national phase. 'Australian' means the Complete application either originated in Australia or the address of the applicant was Australia.
Sources: IP Australia, IBISWorld data, Australia OnDisc.

4.1.5 SME patenting grant and renewal rates

There has been little comment so far on the seriousness of the intentions of the various patent applicants. Turning to this issue, it was found that the rate at which complete patent applications were successfully examined and granted – sometimes several years later – was significantly different across sectors. Table 15 shows that the seal rate for complete patents applied for between 1989 and 1994 varied from 66.9 per cent for complete patent applications by large enterprises, to 55.6 per cent for SMEs and 42.0 per cent for individual applicants. However, once granted, the patents *do not* appear to be equally valuable across sectors. As shown in Table 16, two thirds of complete applications taken out between 1989 and 1994 are still being renewed in every sector as at August 2003.

It can reasonably be assumed that the patent for an invention that continues to be renewed has value to the owner greater or equal than the renewal fees. (However, it should be noted that it is possible that the patent for an invention has a large estimated value to the owner but lack of funds does not permit the owner to pay the renewal fees and the uncertainty surrounding its future value impedes its sale to a more prosperous owner). Accordingly, the evidence suggests that the same proportion of SMEs inventions, or the legal rights pertaining to these inventions, pass this threshold value as large company inventions do. Put another way, there is no evidence that SMEs inventions are less valuable than large company inventions.

Table 15: Rates of granted patents by enterprise size, Australia

Australian patents[(a)] applied for between 1989 and 1994 (granted status 2003)	Large (IBIS)	SME (AOD)	SME not matched	Individuals	Total
Not granted by Aug 2003	1,139	748	1,025	4,090	7,002
%	*33.2*	*44.4*	*40.4*	*58.0*	*47.6*
Granted by Aug 2003	2,297	936	1,512	2,961	7,706
%	*66.9*	*55.6*	*59.6*	*42.0*	*52.4*
Total	3,436	1,684	2,537	7,051	14,708
%	100	100	100	100	100

Note: (a) Complete standard applications and PCT applications that have entered the national phase. 'Australian' means the Complete application either originated in Australia or the address of the applicant was Australia.
Sources: IP Australia, IBISWorld data, Australia OnDisc.

Table 16: Patent renewal rates by enterprise size, Australia

Australian patents applied[(a)] for between 1989 and 1994 (renewal status, August 2003)	Large (IBIS)	SME (AOD)	SME not matched	Individuals	Total
Still current by August 2003	1,976	1,123	1,817	4,902	9,818
%	66.96	67.85	68.67	69.52	68.64
Ceased or expired by August 2003	975	532	829	2,149	4,485
%	*33.04*	*32.15*	*31.33*	*30.48*	*31.36*
Total	2,951	1,655	2,646	7,051	14,303
%	*100*	*100*	*100*	*100*	*100*

Note: (a) Complete standard applications and PCT applications that have entered the national phase. 'Australian' means the Complete application either originated in Australia or the address of the applicant was Australia.
Sources: IP Australia, IBISWorld data, Australia OnDisc.

Understanding the use of provisional applications, and why they are not always pursued to grant

Some evidence of strategic use of the provisional patent application is provided by the case studies.

Company E is a biotechnology company with a robust, considered patenting strategy. They tend to aggressively apply for patents in the initial stages of development, and then review their strategy when the provision patent is about to expire, to determine how to proceed with that particular product. In the meantime, a new version of the product may have been tested, and proven more useful, so that patenting efforts (and resources) will then be focused on the better product.

Company G, a sonar technology company, applied for provisional patents and then was sold, as a company, to investors. The provisional applications were useful for attracting investors.

Further comments were received in a number of the consultations: that some SMEs used provisional patents to gain them lead time, or short term protection, without intending to pursue the patent through to grant.

4.2 Factors inhibiting Patenting and other forms of IP protection

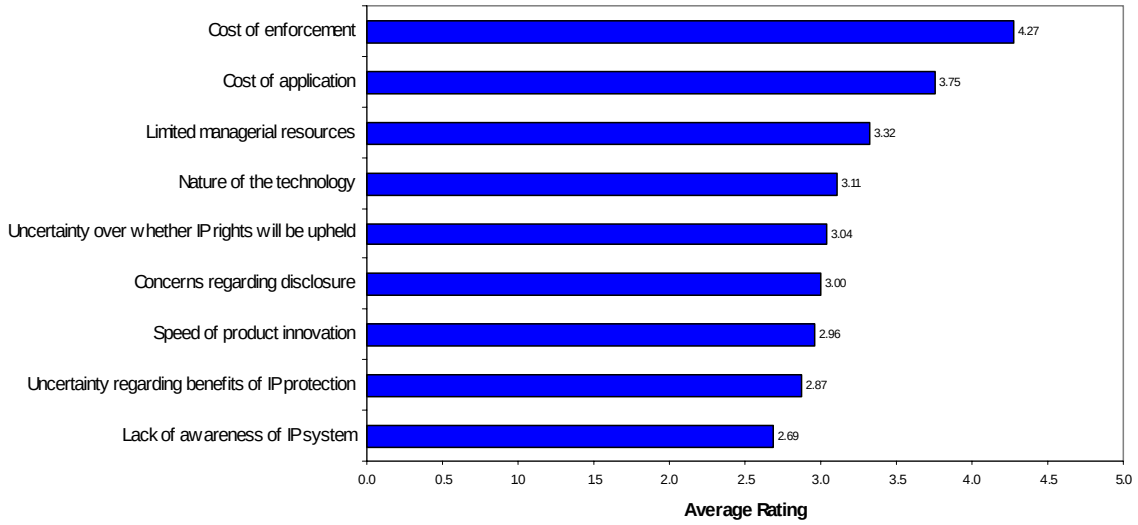
This section considers the important question of barriers to use of the IP system by SMEs. The information presented in this section was obtained from the consultations and surveys. Case studies provide illustrative examples supporting the results from the consultations and surveys. The section also considers the related issue of the extent to which use of the IP system is part of the business strategy of SMEs.

The study focused on the barriers that face SMEs in particular. Given the study's finding that the intensity of use of the IP system by SMEs was the *same or higher than large enterprises*, it is possible that the factors outlined below actually affect all enterprises in their use of IP.

4.2.1 What factors are most important in inhibiting use of the IP System by SMEs?

Figure 1 below presents a ranking of the factors that are most important in inhibiting use of the IP system, as evaluated by their advisors (patent and trade mark attorneys, and COMET business advisors), and partners (such as venture capitalists, business angels, and high-tech incubators).

Figure 1: Factors inhibiting the use of IP protection



Rating scale: 1=Not Important, 5=Very Important
Source: IPRIA Innovation Advisors and Innovation Partners Surveys 2003

This report deals with the main factors affecting SMEs' use the IP system below, under three broad headings:

1. The costs of the system;
2. The perceived benefits of the IP system; and
3. Knowledge, and understanding, of the system.

4.2.2 Cost

Professional fees incurred when obtaining and enforcing IP

The indications from the present study are that cost was a significant barrier to use of the IP protection system. From Figure 1, it is clear that the costs of both obtaining *and* enforcing IP protection were important. The results show that the highest average rating (4.27) was for cost of enforcement, while the second highest average rating (3.75) was for cost of application. These results are not surprising: the literature review indicates that the cost of obtaining and enforcing protection is known to be an important factor in relation to the use of IP by SMEs. Use of the IP system is expensive, and SMEs face liquidity constraints more significantly than those facing larger enterprises. In consultations conducted with various industry and government bodies, it was this factor which was most frequently raised.

Application cost

In the course of the consultations, several interviewees emphasised that the basic application fees collected by IP Australia were a significant issue for SMEs. Indeed, as the Annual Report of the Department of Industry, Tourism and Resources 2002-2003 noted, Australia is currently rated the 11th least expensive (6th in 2001-02) out of 29 OECD countries in terms of patent fees, and 18th (15th 2001-02) in terms of trade mark fees. However, legal professional costs– that is, the cost of obtaining advice and assistance from attorneys – were perceived as the most significant costs.

Legal professional costs are significant particularly in relation to patenting overseas, because in that scenario, it is necessary to obtain both Australian and international legal advice.

Information collected from the consultations and case studies also suggested that the salience of application costs varied between industry sectors. For some SMEs, the cost of gaining IP protection, although high, was simply a necessary cost of business. This was particularly true of the biotechnology industry or other research-intensive industry sectors, where patents were "business critical" (due to the considerable sunk costs before any product is developed). For these enterprises, the costs were a burden, but one that simply needed to be surmounted. For other enterprises which could operate their business without IP protection, these costs might have impelled them to choose other ways to appropriate the benefits of their innovation: such as secrecy, bringing the product rapidly to market, or constant innovation.

Exploring application and professional costs

Company A is a micro-business: a husband and wife team designing furniture, lighting and upholstery for large organisations, including hotels. They have registered two of their designs which they believe are at more risk of being copied. They commented that the very low application fees were affordable, and accessible to small companies. Nevertheless, when a much larger company did infringe their registered design, the reality was that they did not have the resources to pursue the matter through a lawyer. In this case, the IP system did not meet their particular needs – and enforcement costs were the issue. Interestingly, they intend to keep registering, for 'peace of mind' and so that they can pursue action in the future.

Where legal advice is required for applications, these can quickly mount up. The application costs for international patents were very important in Company G's decision to use other methods such as secrecy, and staying ahead of the market.

Enforcement costs

The literature review also highlights that SMEs' liquidity constraints place them at a particular disadvantage when it comes to enforcing IP. SMEs which perceive they are unable to enforce IP will see less value in obtaining costly IP protection in the first place.

Enforcement costs are a very significant issue in relation to all the different forms of IP. There is strong evidence in the survey results supporting the argument that enforcement costs are a significant barrier to IP use. In particular, cost of enforcement was considered the most important factor inhibiting IP use – the average rating for this factor is 4.27.

The case studies indicate that SMEs were concerned about their ability to effectively enforce their IP rights. In particular, litigation was perceived as complex, costly and uncertain in outcome. For these reasons, it was not viewed as practically accessible to SMEs. It is presumed that SME confidence in the IP system as a whole would increase, if a simpler and less expensive enforcement procedure were readily available.

A further factor impacting on enforcement costs is the difficulties associated with obtaining patent insurance in Australia. Patent insurance is expensive and offered by few insurers. There are two types of patent insurance. The first protects a patent holder against loss due to infringement of a patent. The second protects the insured against infringement claims by a patent holder. Patent insurance is one area of financial assistance that could usefully be made available to SMEs by the public sector, provided premiums are affordable. A number of interviewees, during the consultations, mentioned the need for accessible patent insurance.

Exploring the impact of enforcement costs

Enforcement costs impact different companies differently. For some firms, enforcement costs may be a barrier to enforcement, but not to the use of the IP system, as IP registrations serve purposes other than enforcement. Company B is a small manufacturer which sells water sterilisation products which it has designed and developed. For Company B, the potential costs, and uncertainty, of enforcement through the courts mean that, in their view, it is simply not an option. This view has not, however, prevented them applying for, and obtaining, a set of patents for their technology. They see these patents as tools which may slow down imitators, but which are more important for marketing, promotion, and to obtain financing. Company A, a furniture and lighting design company, also continues to register designs despite being unable to enforce these through the courts – for peace of mind.

Some SMEs, on the other hand, have used the IP enforcement system to great effect. Company C, a clothing designer and retailer, has a strategy of suing all imitators who do not respond to letters of demand for infringement of copyright. These legal proceedings have always been settled prior to hearing. Company C say that this aggressive strategy has been relatively successful in "stemming the flow" of imitators, and in generating a change of culture within the industry. Even here, however, this has taken a considerable investment of resources which not every small company could afford. One of Company C's current legal matters has already consumed approximately $80,000 in legal fees and, at the time of the interview, was still in progress. It is also notable that another company interviewed, Company F, a fashion design company, had found actions based on design registrations more effective in obtaining settlements than copyright actions.

Complexity and constraints on managerial resources

It is well known that the IP system is complex, and that understanding it takes an investment of resources. Many SMEs face resource constraints – including limits to managerial resources – which can make this investment impossible. IP is a complex area and its management is usually handled by senior staff members. In SMEs, the time of senior management is especially valuable and time spent preparing patent applications (for example) and monitoring the use of IP by other firms may represent a considerable proportion of available time.

As a result, many SMEs tend to be focused on getting the product to market, a process which itself takes a lot of resources, and may take priority over obtaining IP protection. Interviewees, including Innovic and the Triton Foundation, stated that complexity of the process of patenting was a key reason for not patenting: firms may start off thinking they want a patent, but once they investigate, find that too much effort is required to make it effective. The survey addressed the issue of the impact of limited managerial resources on SMEs' use of IP protection. Figure 1 indicates that this issue was the third most important factor – the mean rating by the survey respondents was 3.32.

Once again, there is variation between different kinds of SMEs, and different industry sectors. The availability of managerial resources for IP management will, not surprisingly, depend in part on whether IP is "business critical" or not. Anecdotal evidence from industry consultations and the case studies suggested that enterprises in high technology areas, which depend on patents, were more likely to employ an IP Manager, even if the enterprise was very small. In other small enterprises, managers with responsibility for IP had many other demands on their time which are likely to take precedence. It should also be noted that the time commitment required to carry out the task of applying for a patent was perceived as a burden, and in itself, a barrier to proceeding with the application.

Overcoming the resources problem through efficient internal systems

Some firms have found ways to overcome the problem of the diversion of managerial and research resources (which would otherwise be devoted to the production of new products) inherent in the application process. Company J, for example, a research-intensive company developing cutting edge energy generation technology, had made a point of streamlining the process, minimizing the upfront investment of time by inventors in order to encourage reporting of possibly patentable innovations. They had a simple, 10-question form stored on the firm intranet which, according to the interviewee, required no more than half an hour to fill out.

4.2.3 Perceived Insufficiency of Benefits

Another potential barrier which prevented SMEs from using the IP system was the perceived insignificance or non-existence of the benefits.

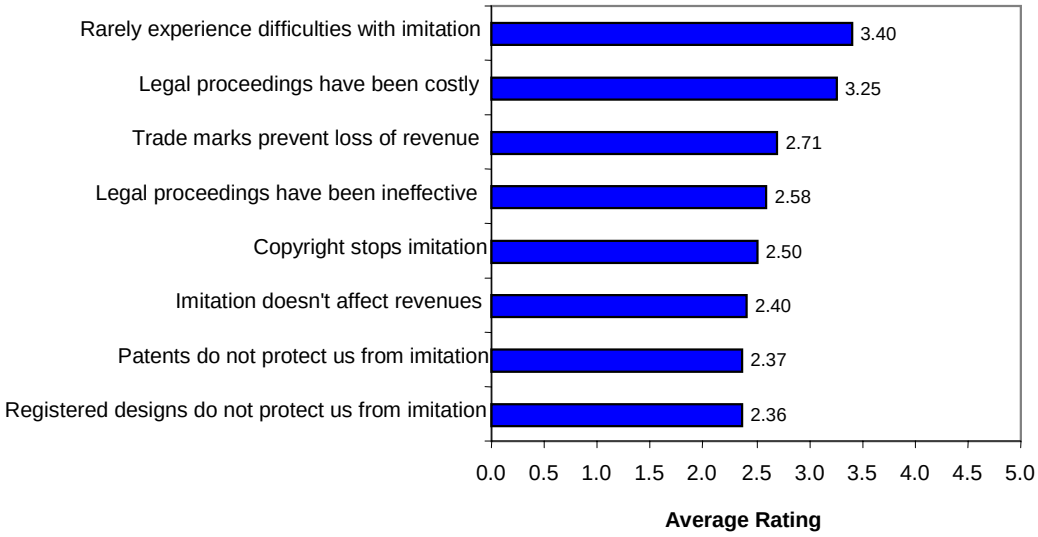
<u>Prevention of imitation</u>

IP law protects against imitation. However, some SMEs feared that, even if they *had* IP protection, such as a patent, it would not prevent large companies with deep pockets and/or overseas imitators with low costs from imitating their products. Larger companies would in any case have the resources to cover litigation costs, notwithstanding the merits of the SME's case. Overseas enforcement litigation was not an option for many smaller players. Two interviewees in the consultation process mentioned this issue as a real concern, and two case study companies had actually experienced problems of this kind: Company A (a furniture design company), and Company D (a software design company). Thus, there was uncertainty in the IP protection system: even if a company had IP protection, it would be no guarantee against imitation by competitors.

Furthermore, there was uncertainty regarding the outcome of any litigation – much of the empirical literature in the US suggested that patent holders are much less likely to succeed in litigation than the alleged infringers (Anton and Yao,1994, Allison and Lemley 1998. Some Australian studies have found similar results: Drummond, 2000). If the same is true in Australia, as some studies suggest, it may be that low expected benefits play an important role in the strategic decision whether to use IP protection. The impact of uncertainty on the use of IP by SMEs was examined in the survey. As indicated in Figure 1, uncertainty regarding whether a court will be able to uphold a company's IP rights was a significant factor inhibiting the use of IP (it has an average rating of 3.04).

In the Innovation Partners' survey, direct questions were asked regarding experiences with copying and imitation by competitors. Specifically, questions were directed at the effectiveness of different types of IP protection (copyright, trade marks, registered designs and patents) against imitation, with the aim of ascertaining the relative effectiveness of different IP protection mechanisms. The results are presented in Figure 2. There are two notable points contained in the results. First, while the companies surveyed did not experience imitation very often (average rating of 3.4), when imitation occurred, it had a significant effect on revenues (average rating of 2.4). The potential loss in revenue suggests that companies will be prepared to make investments in order to prevent imitation. Second, the survey respondents indicated that patents, registered designs, copyright and trade marks are all fairly neutral at protecting company's IP assets.

Figure 2: Innovation partners' experience with imitation and copying



Rating scale: 1=Strongly Disagree, 5=Strongly Agree
Source: IPRIA Innovation Partners Survey 2003

Anecdotal evidence from interviewees indicated that imitation was particularly of concern in consumer merchandise industries. Company D, a software company, had problems with, and fear of, imitation. Imitation has also been of considerable concern in the fashion industry. The two fashion industry companies interviewed both indicated that, in the past, copying was rampant in that industry, and this problem persists. On the other hand, a recent, more aggressive, attitude towards enforcement of rights in the fashion industry appeared to have led to some change in culture and a reduction in imitation and its acceptability.

Disclosure of inventions

There were mixed responses to the issue of disclosure. Some interviewees indicated that having to disclose their idea or invention was not a major barrier to using the IP system. Others, however, stated that SMEs worry about disclosing their ideas to get a patent and then not being able to enforce the patent should imitation occur. The fear of imitation is thus a sub-element of this particular concern. Problems associated with disclosure may also

be highly industry-specific since it is only technologies that are easily replicable that will be affected. In general, the responses to the survey provided only limited support for the notion that disclosure was an important factor in inhibiting the use of IP protection. The mean rating for disclosure was 3.00.

4.2.4 Ignorance/Lack of Information

It is necessary to distinguish two types of information gap, both of which affect SMEs, and both of which might constitute a barrier to use of the IP system:

- lack of basic information about how the IP system works; and
- lack of knowledge about how to make *good* use of the IP system (as illustrated by a specific examination of whether SMEs are integrating IP management into their business strategy in an efficient manner).

<u>Lack of basic information about how the IP System works</u>

For some SMEs, particularly the smallest and newest SMEs, ignorance of the possibilities for using the IP system might constitute a barrier to use. Consultations with relevant government and industry bodies indicated that new enterprises were often, or even typically, not aware of IP issues, and certainly did not have a sophisticated understanding of IP issues.

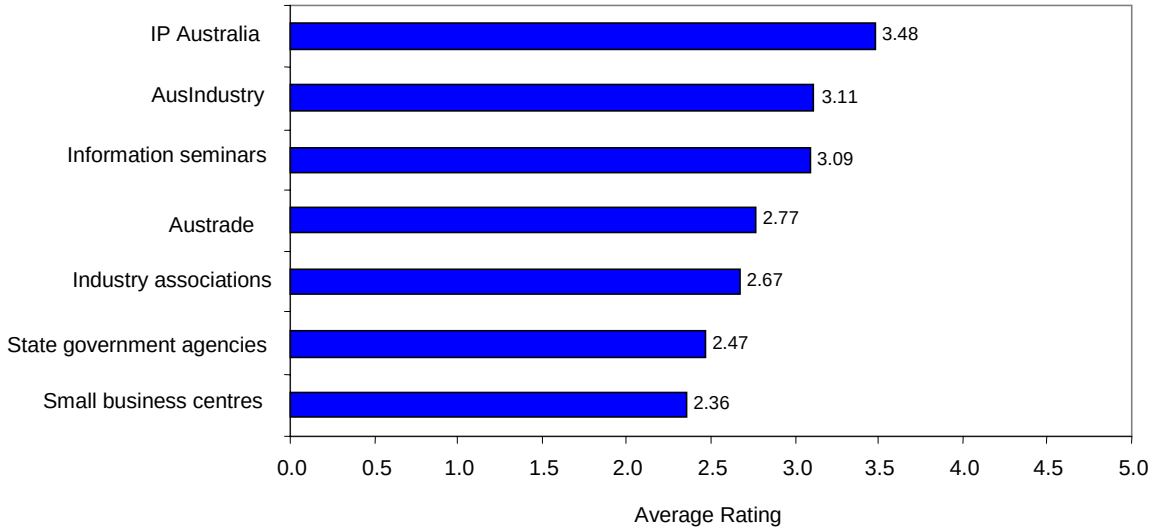
However, the results of this study did not indicate that basic ignorance was a significant problem. The study found that SMEs were applying for IP at rates which were, if anything, higher per employee than those of large enterprises. This finding suggested that SMEs did in fact “know about” IP.

This notion is further supported by the survey results. As indicated in Figure 1, lack of awareness of the IP system rated lowest on the list of factors inhibiting the use of IP protection. The potential for respondent bias in these results should be, however, be kept in mind. SMEs which deal with the advisors and innovation partners surveyed, where advisors include patent and trade mark attorneys, and COMET business advisors and innovation partners include venture capitalists, were likely to be more well-informed than small inventors, such as those dealt with by Innovic and the Triton Foundation. These latter groups were of the view that small inventors were certainly less savvy in relation to the IP system. In light of these considerations, this survey result is somewhat equivocal.

Survey results indicated that IP Australia’s programs have been successful in this area. A number of interviewees praised IP Australia’s efforts in this regard: specifically, in relation to its website, materials, and awareness-raising programs, including Smart Start, IP Access, and the IP Toolbox. Respondents were asked to rate the importance of certain organisations in providing information regarding the IP protection system. The results are illustrated in Figure 3. The results generally supported the view expressed in the consultations that IP Australia had played an important role in the dissemination of information relating to the use of IP protection. This information was regarded as high quality. Other sources of information were considered to be useful: one interviewee commented that 90 per cent of small businesses used their accountant as a first point of reference for advice on business issues, even though many accountants were not particularly familiar with the IP system.

Survey results indicated that SMEs are more dependent on outside advice and assistance in relation to IP protection than are larger enterprises. One major difficulty for SMEs regarding the use of IP is that there are multiple sources of information for SMEs in relation to IP. SMEs might receive information from IP Australia, advice from business advisers and IP lawyers, in addition to assistance from multiple government programs. Assembling this information, and evaluating it, involved an investment of time and managerial resources that might be off-putting. A number of interviewees in the consultations commented on the "fragmentation" of information in this area, and the need for more coordination between the many competing State and Federal government programs. The need for more coordination was noted as particularly important for SMEs with limited managerial resources (such as, most significantly, time and attention).

Figure 3: Importance of organisations in providing IP information



Rating scale: 1=Not Important, 5=Highly Important
Source: IPRIA Innovation Advisors and Innovation Partners Surveys 2003

"Knowing about" IP does not necessarily equate to an ability to make effective and efficient use of the system. Further, survey results suggested that a number of "myths" were in circulation. Whilst a detailed and comprehensive review on the precise state of SMEs' knowledge in this area is beyond the scope of the present study, certain findings have come to light, as follows:

- *Patents*: Several interviewees noted that many SMEs were under the impression that a provisional patent application provided them with protection, or even that the grant of a patent amounted to a belief (by someone, possibly IP Australia) that the product sought to be patented was commercially viable;
- *Copyright*: Interviewees commented that there was a lack of accessible information, and no obvious government source of basic information on copyright. It was observed that the lack of information about, and understanding of, copyright in particular might be connected with the fact that IP Australia was not responsible for this area;

- *Trade marks and business names*: one interviewee stated that there is confusion regarding the overlap between trade mark, business name registration and company name, particularly when dealing across state lines.

IP as business strategy: Lack of knowledge about how to make good use of the IP system

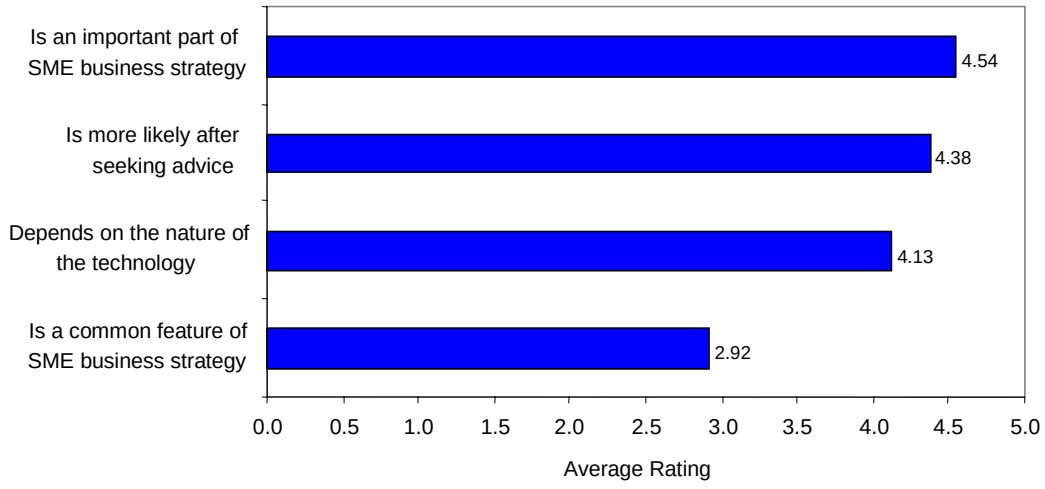
The other area of ignorance which was highlighted by our interviews and case studies related to the *strategic* use of IP. SMEs may not be fully aware of the potential benefits of using IP beyond stopping a particular imitator – they do not know "what IP can do for them". Strategic thinking can and perhaps should occur at a number of levels. At the most basic level, it may involve decisions about when to file for a patent, which patents to prioritise when liquidity constraints prevent payment of all the relevant fees on a suite of patents.

The decision as to when to patent arose as a critical issue in a number of consultations. It was pointed out that patenting "too early" in the process of developing a product might ensure a priority date, but might nevertheless result in the premature onset of international fees. Alternatively, inventors might file for a provisional patent early and then decide to commercialise just as their 12 month period is running out. The issue of liquidity constraints is particularly pertinent in the area of biotechnology where it is not uncommon to obtain a range of patents surrounding a technology, some of which may be more important than others.

SMEs may also be ill-equipped to think about the strategic use and management of IP. As one interviewee commented, while IP Australia provides good "nuts and bolts" information, it is not a source of strategic knowledge of how to use IP. Another interviewee commented that SMEs tend to address IP in response to a problem, rather than as part of an overall business strategy.

This issue is reflected in the results presented in Figure 4. Respondents were asked about some of the strategic issues facing the use of IP protection by SMEs. The most striking feature of the results was the differential between the importance of, and the use of, IP protection as part of SME business strategy. On the one hand, respondents strongly agreed that IP protection was an important component of business strategy. On the other hand, however, clearly, it was not a common feature of SME business strategy. A number of interviewees said that IP protection was not the most critical factor in successful innovation and growth for SMEs. IP was considered merely one element in a larger suite of issues that SMEs were required to address to succeed. For some SMEs, the correct business and distribution networks were more important.

Figure 4: Strategic use of IP protection by SMEs



Rating scale: 1=Strongly Disagree, 5=Strongly Agree
Source: IPRIA Innovation Advisors Survey 2003

The issue of whether business strategies had incorporated IP issues was raised during consultations and most interviewees agreed that IP issues were incorporated in practice. A number of interviewees commented on the lack of strategic thinking or planning around IP, the problem of trying to get SMEs to think of IP as a commercial asset rather than something to consider only when a problem arises. Some interviewees commented that strategic thinking around IP requires a level of sophistication that is simply not extant in many SMEs, particularly very small SMEs.

On the one hand, the absence of an IP management strategy is arguably related in part to the cost barrier: one interviewee suggested that some SMEs consider an IP strategy but immediately dismiss the idea on the basis of a cost-benefit calculation. On the other hand, other interviewees suggested that effective IP management is really about the people available. Comments were made by several interviewees that there was a limited pool of people experienced in IP management and commercialisation, particularly in high technology areas. This dearth of experience is particularly critical where increasingly know how is the key to successful innovation and commercialisation.

The level of ignorance appears to vary with industry sector. For example, according to various interviewees, basic ignorance was less of an issue in the biotechnology industry. Another interviewee commented specifically that the university sector and university technology commercialisation sector were likely to be more aware than the private sector of IP issues. Two interviewees commented that service-oriented firms – for example, financial services, entertainers etc – were less likely to understand the benefits of using IP, whereas manufacturing firms had a better understanding of the costs and benefits.

Two specific patent-related issues were raised by interviewees. The first was that SMEs may not receive good advice about *whether* to patent. Several interviewees mentioned that patent attorneys – the first port of call for advice on using the IP system – had little incentive to advise against obtaining a patent, even where there is no prospect of commercial success for a product. It should be noted that other interviewees were at pains

to point out that patent attorneys frequently did provide such advice. The issue is nevertheless concerning. The second issue was the timing of applying for a patent. Iverson's Norwegian study found that SMEs tend to patent too early, and too broadly. Several interviewees in the present study also commented that inventors patented too early, when the final form of the product was not yet settled.

At the same time, for some industry sectors, it should be noted that IP protection in the form of patents, and/or an IP strategy, is a prerequisite to the formation of the right networks. As noted above, there is a distinct set of Australian SMEs for whom IP is fundamental to business strategy, and indeed, to the survival of the business. These include a set of SMEs who are aiming not to manufacture high technology goods themselves, but rather to develop the technology and then license to, or partner with, larger (often international) enterprises. The literature review indicates that manufacturing is not the only path to success and that partnering with larger enterprises is also a potentially successful route for innovative small enterprises. Several interviewees confirmed this view, as did several of the case studies, in particular, the high technology companies: Company J, a research-intensive firm in energy generation, adopted this business model, as did two biotechnology firms interviewed, Companies H and I.

The *Framework Paper of the Working Group on Managing Intellectual Property for the National Innovation Summit in 2000* stated that the emphasis should be placed on initiatives to remove institutional impediments to the effective management of IP, rather than initiatives to alter the IP system itself. (Working Group on Managing Intellectual Property, 1999) The view of the Working Group was that, by and large, the system itself is effective, but that there are impediments to innovation which can be addressed. The results of the present study provide some support for that view.

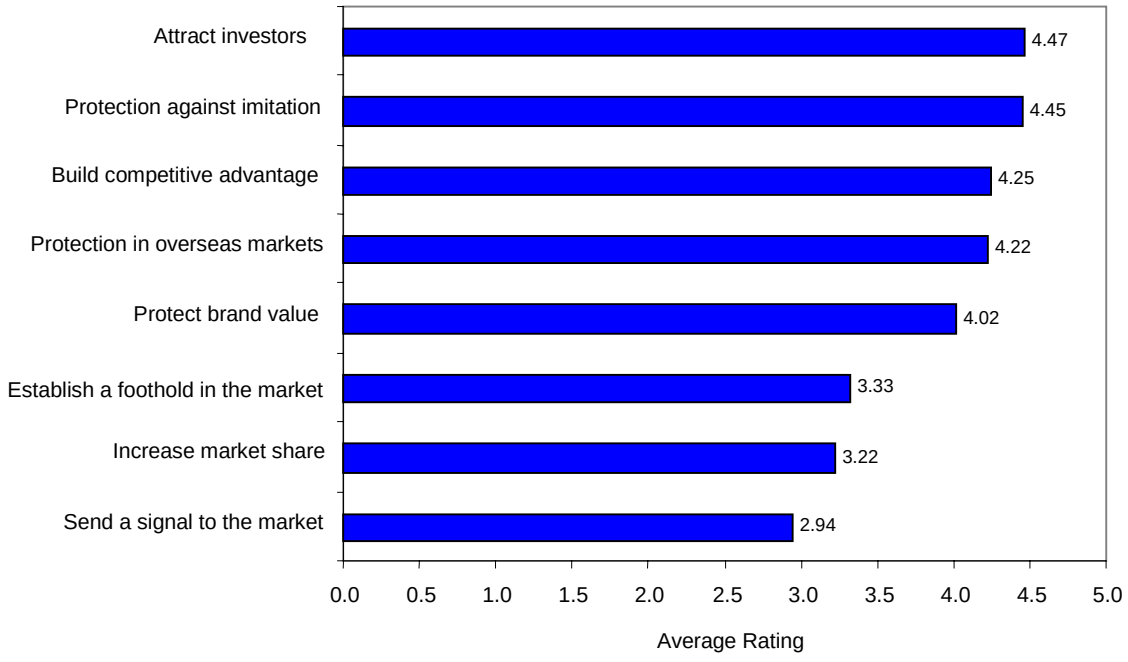
4.3 IP Protection and Export Performance of SMEs

Issues regarding the international aspects of IP are examined through analysis of the surveys and the case studies. Such issues include the impact of use, or non-use of IP on export performance. Case studies included companies that were either presently exporting or intending to export in the future.

4.3.1 The relationship between export intention and use of the IP system

As a starting point, in considering export issues, it is important to understand the full range of reasons why SMEs seek (or use) IP protection: an intention to export is one of many possible reasons for using IP protection. For the purposes of this study, it is imperative to grasp the underlying motive for the decision to use IP protection and, in particular, to establish the significance of intention to export as a factor viz a viz other possible factors informing the decision. The data obtained from responses to this question in both surveys are set out in Figure 5.

Figure 5: Reasons for using IP protection



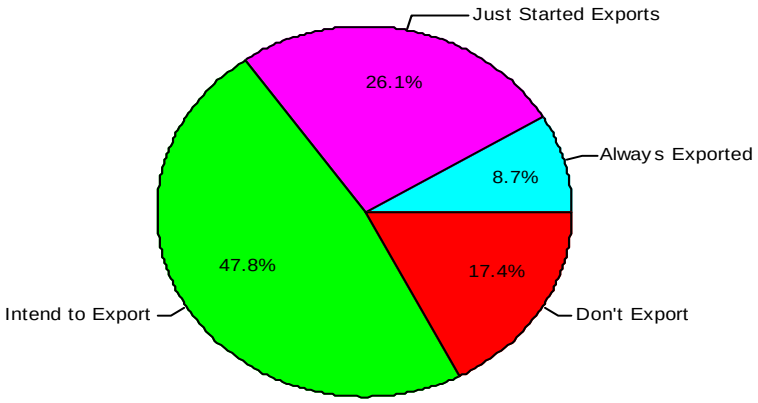
Rating scale: 1=Not Important, 5=Highly Important
Source: IPRIA Innovation Advisors and Innovation Partners Surveys 2003

Figure 5 indicates that protection in overseas markets was an important factor in the decision to use IP protection – it had an average rating of 4.22. There are, however, three other factors that were considered more important by the survey respondents: attract investors (average rating of 4.47), protection against imitation (average rating of 4.45), and

building competitive advantage (average rating of 4.25). Overall, this response suggests that export intention is an important dimension of the decision to use IP protection.

It was relevant to ascertain whether the respondents had direct experience with exporting. Surveys were sent to Partners and Advisors rather than directly to SMEs. Nevertheless, these respondents were able to shed some light on this question. Figure 6 illustrates the importance of exporting for the Innovation Partners. It indicates that approximately 82 per cent of the Partner organisations that responded to the survey either exported at the time of the survey or intended to do so in the near future.

Figure 6: Breakdown of innovation partner export involvement



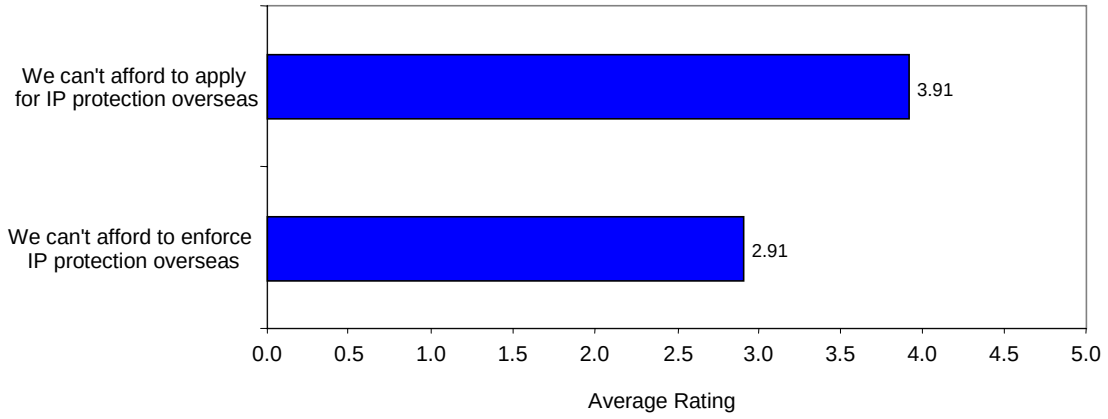
4.3.2 Overseas enforcement of IP rights

The consultations provided further insights into export-related issues. Consultation with Austrade confirmed that *enforcement of IP rights in overseas territories is a major issue*. Enterprises wishing to sell goods and services overseas markets may be reluctant to do so if they believe that their IP can be easily appropriated. There are two factors that are important here. First, this problem may be more acute in countries that have unstable political and legal environments, or those which do not have a history of IP protection, since IP rights will be harder to enforce in these environments. Second, disclosure problems may be particularly acute for certain goods like registered designs; Austrade provided a hypothetical example of an architect designing an airport in South East Asia. In this scenario, a significant concern in relation to investing in the design would be the difficulty in preventing misappropriation of the design, in the absence of strong IP protection mechanism in that region.

Problems facing SMEs intending to export
The characteristic problems facing Australian companies with easily-copied innovations in relation to overseas markets are illustrated by the case study of Company D, a software development company. Company D made a considered decision not to enter certain export markets (in particular, the Asian market) because it was concerned about potential piracy. Company D had little or no means of combating imitation in overseas jurisdictions. This situation represents a significant problem for companies, such as Company D, which rely on the export market for much of their revenue. Company D argued that the Australian government should assert diplomatic pressure, in order to encourage foreign governments to take IP infringements seriously.

The importance of the cost of application and enforcement of IP rights in overseas markets was reinforced by the results in the Innovation Partner survey, which are presented in Figure 7. It is quite clear from the results that the cost of enforcing IP rights in overseas markets is a significant problem for SMEs.

Figure 7: Cost of IP protection in overseas markets



Rating scale: 1=Strongly Disagree, 5=Strongly Agree
Source: IPRIA Innovation Advisors and Innovation Partners Surveys 2003

Some particularly innovative and entrepreneurial SMEs have found ways to turn matters to their advantage; for example, through licensing or distribution deals which transfer the risks of international litigation to overseas partners. Such mechanisms are not, however, likely to be available to all SMEs.

4.3.3 Other issues relating to international IP

In addition to the issue of difficulties associated with enforcement overseas, three further issues relating to the relationship between IP protection and the export performance of Australian SMEs, emerged from the consultations:

1. The international aspects of intellectual property were amongst the most poorly understood aspects of the system. For example, several interviewees noted that some SMEs appeared to believe that the grant of a patent, or even the application for a provisional patent, conferred worldwide protection.

2. For those SMEs which understood, or were informed of, the need to apply for international protection, particularly in the area of patents, the cost of these international applications was a significant barrier to protection. A number of interviewees strongly emphasized that the international fees were beyond the means of many SMEs. International fees tended to arise at a time when many smaller, and particularly start-up, enterprises, did not have the necessary financial resources because the invention is not yet fully commercialised.

3. At the same time, interviewees emphasized that IP protection may be most important for SMEs intending to operate in international markets. In this context, IP protection is important in the sense that international partners might require an IP "portfolio" and an IP strategy as a precondition of international partnerships and licensing deals. SMEs entering into international partnerships with such preconditions have benefited from the internationalisation of the patent system, and the Patent Cooperation Treaty (PCT). The PCT was concluded in 1970, amended in 1979 and modified in 1984. The PCT is administered by WIPO. It makes it possible to seek patent protection for an invention in each of several countries by filing an "international" patent application. Australia became a party to the PCT in 1980.

Strategies for dealing with the costs of international patent applications

The costs of applying for patents in overseas jurisdictions are considerable, and represent a barrier to use of the IP system. Company G, a small Australian R&D firm which develops coastal surveillance systems, found it particularly difficult to decide whether to pursue various overseas patent applications. Finally, concluding that the associated benefits did not outweigh the considerable costs, Company G abandoned its applications.

The accumulation of professional costs associated with applying for patents internationally was considered a particular problem. Company E observed that international applications for patents typically involved 'cost-stacking' whereby legal fees are increased substantially by the necessity of retaining a local lawyer to liaise with lawyers in every overseas jurisdiction in which an application is made. Thus, for each item of correspondence between the firms, Company E would be charged by more than two law firms.

Some companies had developed systems for dealing with these issues. Company J, a high-technology research firm working in energy generation technologies, provides a good example. Company J's standard practice was to apply for patents in its "priority one" countries in every instance. "Priority one" countries were major markets or countries where a key competitor was based. It would then apply in a subset of its "priority two" and "priority three" countries. The system was designed to ensure that one or two patents were obtained in as many countries as possible, the emphasis being on gaining a foothold in the lesser priority countries, rather than attempting to attain complete coverage everywhere. More detail is provided of this system in Volume II of this report.

4.4 IP Protection and Enforcement Systems and the Needs of SMEs

Whether the existing IP protection system meets the needs of Australian SMEs is difficult to say. While it is not possible to make broad generalisations regarding the needs of a heterogeneous group of SMEs, it is clear that, in principle, every SME requires a cheap and effective means of preventing imitation of its products.

The study indicates that SMEs nevertheless have other reasons for using the IP system (than that of preventing imitation). These reasons can be divided into two categories: those relating to trade in the market for ideas, and those relating to finance and investment. In relation to the first category, the literature review (see Chapter 1 of Volume II) established that recent research shows that strong IP protection facilitates trade in markets for ideas. Industry consultations and case studies provided some support for this proposition, tentatively indicating that IP may be most used by SMEs operating in the market for ideas. These SMEs operated in the market for ideas, in the sense that they sold their technology through licensing, partnering or buy-out, rather than commercialising it fully themselves. SMEs in the biotechnology industry, and SMEs seeking capital from venture capitalists with a view to selling the company at a later stage, provide relevant examples. In relation to the second category, industry consultations and case studies indicated that obtaining financing and sending positive signals to investors about the worth of the company were key reasons for applying for IP protection. These reasons were linked to the first category in that investors might be attracted by the possibility of selling a company or its technology. It is important to note that a relatively small number of SMEs were the subject of a case study, which necessarily qualifies any conclusion to be drawn from the case studies. Nevertheless, the coincidence of the theoretical findings contained in the literature review and the factual findings of the industry consultations and case studies is significant.

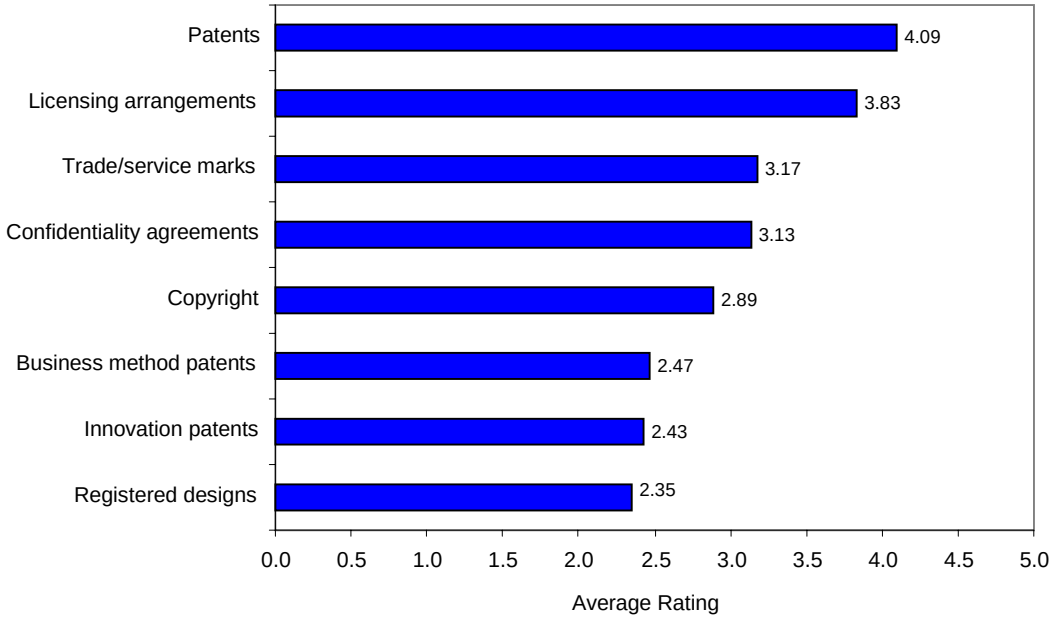
SMEs use a range of mechanisms to reap the benefits of their innovations. Industry consultations and discussions with particular innovating companies substantiate this proposition. Mechanism for capturing the value of, and protecting, innovations included, but were not limited to, formal IP protection. Common informal mechanisms included:

- Lead time (that is, getting to market quickly);
- Secrecy (which, depending on the technology, could be crucial, particularly for processes);
- Good business strategies: partnering, marketing, effective market research before producing the product;
- Understanding the commercialisation process;
- Gaining market acceptance.

The surveys provided indicators of the effectiveness of the existing IP protection system. The first indicator was the measure of how effective the different types of IP protection had been in protecting SMEs' IP. The survey asked both Advisors and Partners to rate the effectiveness of IP mechanisms in protecting innovations. The results are presented in Figure 8. Not surprisingly, patents were considered the most effective form of IP protection (average rating of 4.09), followed by licensing arrangements (average rating of 3.83),

Trade/service marks (average rating of 3.17), with the lowest rating given to registered designs (average rating of 2.35).

Figure 8: Effectiveness of different types of IP protection

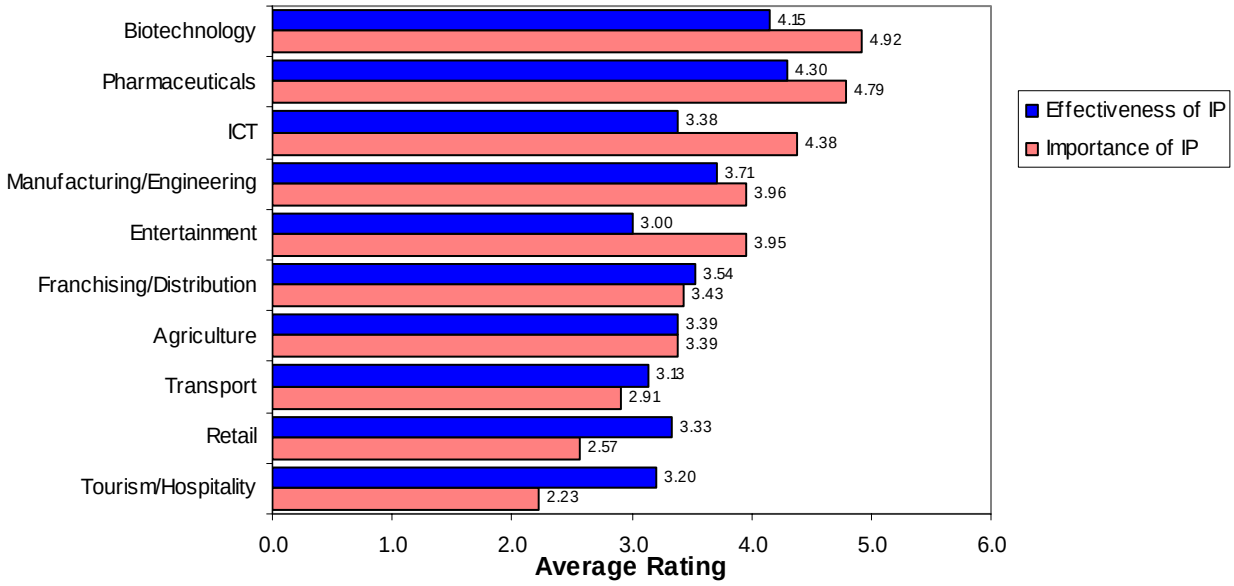


Rating scale: 1=Very Low, 5=Very High
Source: IPRIA Innovation Advisors and Innovation Partners Surveys 2003

While these results provide an interesting insight into the effectiveness of IP protection by type, it is more interesting to cut the data in a different way: by industry. Much of the anecdotal evidence presented thus far suggests that there is considerable variation in the experience of the usefulness of IP protection across industries.

The Innovation Advisor survey asked organisations to rate the relative importance of IP protection across a range of different industries and how well the existing system served the needs of SMEs in those particular industries. The results are presented in Figure 9. While the results suggest that some industries are not well-served by the IP protection system, it can be concluded that in industries where IP protection is considered to be important (such as biotechnology, pharmaceuticals and manufacturing), the IP system is actually performing very well. The entertainment industry represents an exception. Respondents rated IP protection as less important for the entertainment industry than for other industries, and also rated the IP system as not serving the needs of the entertainment industry. This lower rating in relation to the importance of IP is surprising, given the crucial importance of copyright and, to a lesser extent, trade marks, to the cinematograph and phonogram industries. Respondent bias might account for this unusual response; the survey was not targeted at advisors operating in the entertainment industry. In the absence of a further detailed and comprehensive survey, it is not possible to determine whether the existing IP system serves the needs of Australian SMEs. However, the study results contained in this report suggest that the existing system is quite effective across a broad range of industries.

Figure 9: Importance and effectiveness of IP protection by industry type



Rating scale: 1=Not Important, 5=Highly Important
Source: IPRIA Innovation Advisors and Innovation Partners Surveys 2003

5. CONCLUSIONS

5.1 IP Application Rates for SMEs

The study concludes that SMEs' usage of the IP system is not lower than that of large enterprises. Not surprisingly, the study found that the number of annual applications for IP was higher for large enterprises than it was for SMEs (see above, Tables 4, 5 and 6). However, the number of applications for IP per employee was the same or higher for SMEs (see above, Table 11). This study assumes that this latter number is the best measure of IP usage, and therefore concludes that SMEs' usage of the IP system is comparable to that of large enterprises.

The relative application rates per employee as between SMEs and large enterprises is similarly even (or higher for SMEs) in other countries (such as the United States – see above, Table 10).

5.2 Factors inhibiting Patenting and other forms of IP protection

The study concludes that SMEs' usage of the IP system is inhibited primarily by three factors: costs, perceived insufficiency of associated benefits and lack of information.

Costs included cost of enforcement, cost of application and the cost of diverting managerial resources to the task of IP management. Survey respondents rated cost of enforcement as the most significant barrier to IP use by SMEs (see above, Figure 1). The cost of application was rated as the second most significant barrier. The case studies and consultations clarified that it was the legal professional costs associated with applying for IP protection, rather than the application fees themselves, which were perceived as the relevant barrier. The perceived complexity of the IP system necessitated the diversion of senior managerial resources to the management of IP. This was considered a substantial cost.

The perceived insufficiency of the benefits associated with obtaining IP protection constituted another significant barrier to use. The case studies and consultations indicated that SMEs took the view that the obtaining of IP rights did little to prevent imitation, in the absence of the capacity to enforce those rights through litigation. SMEs' liquidity constraints meant that they would be reluctant to institute litigation for two reasons: their limited capacity to cover ongoing litigation costs, and uncertainty regarding the outcome of litigation.

Lack of basic awareness about the nature and function of the IP system might constitute a barrier for the smallest and newest SMEs, but basic ignorance is not a significant problem amongst SMEs in general. However, the consultations indicated that SMEs are not equipped to make strategic decisions about their use of the IP system, and hence may not be using the system to its full potential. Two concerns emerged very clearly from the consultations and the surveys: first, SMEs are not necessarily well versed in how to manage IP as part of their business; and, second, IP is often not integrated into the overall business

plans of SMEs. This finding supports findings of earlier studies, such as the *Framework Paper of the Working Group on Managing Intellectual Property for the National Innovation Summit in 2000*, which stated that the emphasis should be placed on initiatives to remove institutional impediments to the effective management of IP, rather than initiatives to alter the IP system itself.

5.3 Relationship between Exports and IP Protection

The study concludes that the perceived difficulty of enforcing IP rights in overseas jurisdictions acts as a significant deterrent to SMEs intending to export. The case studies and the consultations indicated that SMEs' lack of financial capacity to cover the duplicated legal costs associated with enforcing IP rights in another jurisdiction might result in a decision not to enter an overseas market (see below, Case Studies in Volume II, Company D).

5.4 Effectiveness of IP Protection in meeting the needs of SMEs

The study concludes that the current system is quite effective across a broad range of industries. However, it is important to consider the heterogeneity of SMEs. SMEs are not a homogeneous group with a single set of concerns. The case studies alone encompassed very small firms, for whose managers IP protection seems too complex and expensive an issue to deal with, and also larger research intensive, high technology firms with a high level of investment, a portfolio of patents, an IP manager and an advanced IP strategy. Thus, any conclusion on the adequacy of the IP system in meeting the needs of SMEs must be qualified by the consideration of the differing nature of those needs.

INTERNATIONAL COMPARISONS[3]

INTRODUCTION

One of the important objectives of commissioning this study was to compare the IP protection practices adopted by Australian SMEs with their counterparts in comparable economies. Information on the IP protection practices of companies, SMEs in particular, in the UK, Canada and the USA were collected through a literature survey and the comparisons of information relating to the rates of IP protection, factors inhibiting patenting and reasons for use of IP protection were carried out, taking into consideration the differences in methods used by different researchers.

The Methodology of International Literature on IP protection by SMEs

The international literature on IP protection by SMEs is characterised by variations in methodologies used in relation to what constitutes an SME, the sectoral breakdown, and the indicators of IP protection measured. This factor has been taken into consideration in carrying out the current comparison of the data relating to the Australian SMEs with those in overseas jurisdictions reported in the international literature.

USE OF IP PROTECTION BY SMES

International literature clearly indicates that there is a direct correlation between the size of company and the rate of IP protection undertaken. The information relating to Australian SMEs reported here conforms to this general trend.

United Kingdom

In the U.K, a survey of over 500 small businesses (with between 6 and 50 employees) reports that 74% operate without any formal use of the IP protection system[4].

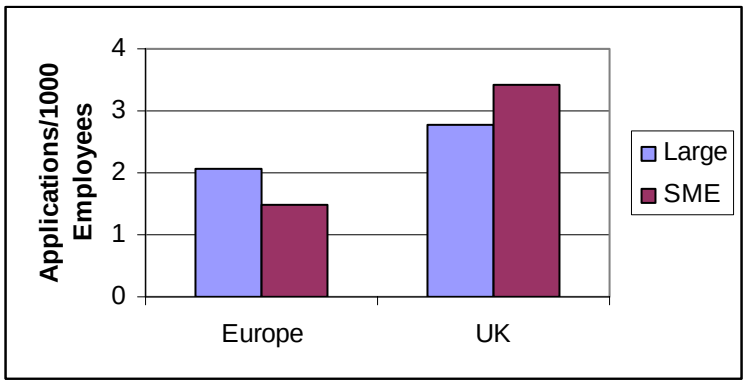
In addition to these findings a paper by the Oxford Intellectual Property Research Centre[5] observed that patenting propensity was proportional to firm size as well as sales turnover, and that economic conditions played a strong role as a determinant of the patenting activity of SMEs.

This research also provided comparisons of the use of patents in Europe and the United Kingdom by SMEs and large companies, using a normalising measure. The results demonstrate that when the data is normalised using a per 1000 employee basis, there is no

[3] The Chapter on international comparison was compiled by Dr Kamal Singhe and Richard Percy of the Australian Department of Industry Tourism and Resources (DITR).
[4] British Gas TIME Survey (2003) www.ideas21.co.uk/175
[5] Greenhalgh, Longland and Bosworth. Protecting Intellectual Property: British, European and American Patents and Trade Marks of selected UK companies 1986-1995. (2001) Oxford Intellectual Property Research Centre

significant difference in patent applications numbers by SMEs and large companies. These findings are similar to the Australian data (which also found no great difference in use levels between SMEs and large firms after normalising); although it should be noted that the UK and European data indicates a far higher absolute level of use of patents.

Patent Application Rates in U.K. and Europe



(*Oxford Intellectual Property Research Centre 2001*)

United States

Greenhalgh[5] found that patenting by U.S. based SMEs was almost directly proportional to the sales turnover, with the patenting activity of larger firms being less sensitive to sales downturns. This indicates that for smaller enterprises the level of business activity has a critical influence on their decisions to undertake intellectual property protection.

Europe

A Thomson Derwent study found that fewer than 10% of very small enterprises (with less than 5 employees) use patents as a method of protecting their intellectual property, observing that 'in order to make the best use of the patenting process requires a certain level of resources.'[6] This percentage rose gradually with company size, increasing proportionately as companies exceed 100 employees or more. This trend is similar to the Australian and other international findings.

Canada

Hanel[7] found that patenting activity in the Canadian manufacturing sector increases with firm size, and that it did so proportionately to employee numbers with little difference observed in patenting intensity once the company size was taken into account. It also showed that the use of informal methods of IP protection such as trade secrets also increased proportionally to employee numbers.

[6] Norman, A. Patenting Process: for the SME, does size matter? Thomson Derwent (2001)
[7] Hanel, P. Current Intellectual Protection Practices by Manufacturing Firms in Canada. (Universite De Sherbrooke (2001)

Percentage Use of IPR by firm size (Canada) – SMEs and Large Manufacturing Firms (1997-99)

IPR / Size	**20-49**	**50-99**	**100-499**	**500+**
Patents	21.2	25.7	36.8	50.6
Trademarks	32.8	35.5	47.8	52.4
Copyrights	9.9	11.4	17.1	24.2
Secrets	25.2	26.5	31.2	39.8
Confidentiality	39.5	44.3	58.3	67.0
At least one	65.2	69.2	80.4	87.3

(*Universite De Sherbrooke 2001*)

IP Applications by Size (Canada) – SMEs and Large Manufacturing Firms (97-99)

IP Type	% of enterprises making at least one application in any given year	
	Large (500+ employees)	SME (1-99 employees)
Patent Applications	16.9%	7.8%
Trade Mark Applications	17.5%	11.4%
Design Applications	n/a	n/a

(*Universite De Sherbrooke 2001*)

In another study, Hanel[8] notes that the use of IPRs increases with the size of the firms (measured by number of employees), and is also significantly affected by fluctuations in availability of capital, suggesting that protection of IP is a less important business priority.

THE USE OF INFORMAL IP PROTECTION

Cordes[9] observes that SMEs are more likely to use informal methods of intellectual property protection (particularly the use of trade secrets and 'first to market') than the more expensive methods offered by the formal framework. This view is largely confirmed by the available international data, although there were some notable exceptions that do not conform to this pattern, such as Hanel's[7] study of Canadian manufacturing firms. This study reports that the cost of obtaining IP protection and enforcement problems are the driving reasons behind this practice.

Coleman[10] found that in the U.K., while SMEs (companies with fewer than 250 employees) are generally well informed about the importance and use of IP protection, they are very low users, instead preferring informal methods of preventing imitation, particularly trade secrets and employee expertise or 'know-how'. The reasons cited in this research for this behaviour were that these methods have a strong record of success, are inexpensive and are within the absolute control of the company. A notable exception to this trend was found in

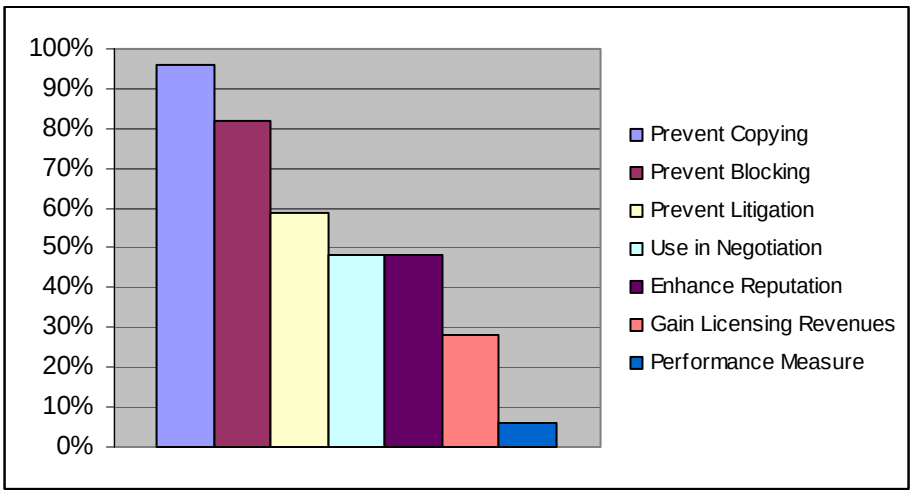
[8] Hanel, Petr. Intellectual property Rights and Management Practices: A survey of literature. CIRST (2004)
[9] Cordes, Hertzfeld & Vornortas. Small Business Research Summary: Survey of high technology firms. US Small Business Administration (2001)
[10] Coleman & Fishlock. Background and Overview of the Intellectual Property Initiative.(2000) http://info.sm.umist.ac.uk/escrip/background.htm

the biotechnology sector, which overwhelmingly favoured the use of patents as the first method of protecting intellectual property.

REASONS FOR USE

The international data regarding the reasons why SMEs choose to use IP protection shows some similarities in the reasons nominated[11] to the Australian results, but the available information is limited in scope and coverage. A U.S. National Bureau of Economic Research study[12] shows that the primary reasons for employing patents to prevent imitation, followed by the prevention of blocking and litigation. It should be noted that when considering this data, the survey does not restrict itself to SMEs, although the paper does state that the results were broadly representative of the business population and that they did not significantly vary by enterprise size. This study also references Japanese data, and suggests that patenting behaviour is common across the two national populations.

Reasons for use of Patents (US)



(*US National Bureau of Economic Research*)

Europe

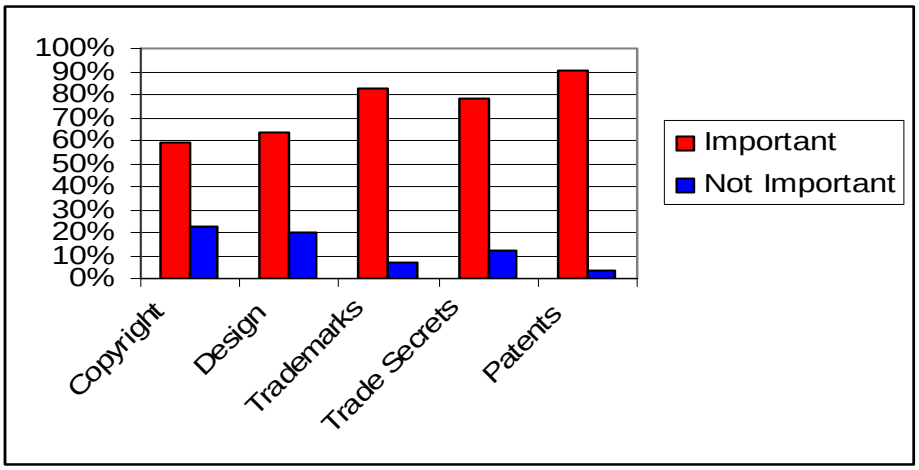
Thomson Derwent[6] found that despite the low level of use of formal IP protection, intellectual property is nonetheless considered to be 'quite[13]' important to European SMEs (although the reasons for this were not explored). The following chart shows the breakdown between those respondents who rated the various forms of IP protection as 'important' or 'quite important' against those who rated them 'not important'.

[11] Prevention of imitation, attraction of investors/licensing revenues, reputation enhancement

[12] Cohen, Nelson & Walsh. Protecting their intellectual assets: Appropriability Conditions and why US Manufacturing Firms Patent (or not). National Bureau of Economic Research (2000)

[13] The survey asked participants to rate various forms of IP protection as 'important', 'quite important' or 'not important'.

Importance of IP protection



(*Thomson Derwent 2001*)

INHIBITING FACTORS

Consistent with the Australian data, international literature confirms that cost (enforcement and application) is the single biggest inhibiting factor to the use of IP protection by SMEs.

Global

Verbauwhede[14] observes in 'IP Strategies for SMEs' that perceived costs and complexity of the IP protection system, as well as poor awareness and a lack of assistance are the most important barriers to its use by SMEs.

Europe

WIPO[15] noted that 'SMEs are generally reluctant to use the IP system often as a result of its perceived high costs and complexity as well as due to a general low awareness…'

United States

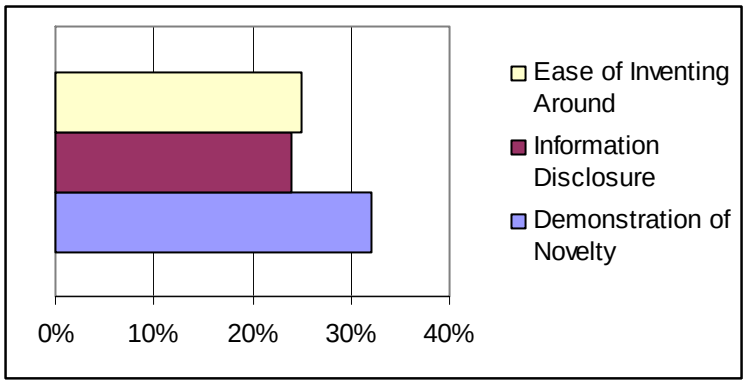
A US Small Business Administration survey[9] of high technology firms found that the high cost of obtaining protection was the most important factor that reduced the use of IP protection by those surveyed. This was followed by concerns about reliability and cost of enforcement. This finding supported that of Hanel[8] and a National Bureau of Economic Research study[16], that found that enforcement, and particularly the costs of litigation acted as a disincentive, with a common perception being held that large firms can wilfully infringe the IP rights of SMEs because of their greater capacity to litigate and drag out any

[14] Verbauwhede, L. IP Strategies for SMEs. WIPO (2003) http://www.european-patent-office.org/epidos/conf/patlib2003/pdf/pres/verbauwhede_e.pdf
[15] WIPO Survey of Intellectual Property Services of European Technology Incubators. WIPO (2002)
[16] Cohen, Nelson & Walsh. Protecting their intellectual assets: Appropriability Conditions and why US Manufacturing Firms Patent (or not). National Bureau of Economic Research (2000)

legal action so as to bankrupt smaller competitors. This survey also highlighted the fear of imitation that SMEs in the high technology sector have.

This data is expressed in the following chart. It shows that the most important reason expressed for not using patents was a belief that they could not meet the 'demonstration of novelty' requirement, cited by over 30% of survey respondents.

Reasons for Not Using Patents (US)



(*U.S. National Bureau of Economic Research 2000*)

United Kingdom

Coleman and Fishlock[17] identified cost, lack of expertise and a fear of the loss of proprietary technology as the primary reasons that UK SMEs choose not to use formal IP protection[18]. They also conclude that SMEs are generally highly innovative, and that a high level of innovation is essential to SME survival. They also found that generally U.K. based SMEs claimed to have a good awareness and understanding of IP rights, but believed that they had limited relevance to the small business sector.

Similarly, Oppenheim[19] identified scarce resources and a lack of expertise as key reasons why SMEs choose informal protection methods. He also contends that patents in particular are less relevant to the SME sector, because of its generally low expenditure on high tech R&D.

The 2001 Review of the UK Patent Office[20] identified resourcing as the key obstacle to the use of patents by the SME sector. This report also highlighted the costs of successfully defending or litigating infringement, in common with the experience of the United States, as a barrier.

The issue of cost was also identified by the Oxford Intellectual Property Research Centre[5], which argued that an SME's financial resources are the most reliable indicator of patent

[17] Coleman & Fishlock. Background and Overview of the Intellectual Property Initiative.(2000) http://info.sm.umist.ac.uk/escrip/background.htm
[18] The study did not disaggregate the data, including both cost of enforcement and of obtaining IP protection.
[19] Oppenheim, C. Patent Information Usage in British Small and Medium sized Enterprises. (2000) Thomson Derwent. http://thomsonderwent.com/ipmatters/bti/8199738
[20] Quinquennial Review of the Patent Office (UK) Stage 2 Report 2001. Department of Trade and Industry (UK). http://www.dti.gov.uk/patent_office/stage2report.pdf

use. It further found that the overall state of the economy was a powerful influence on SMEs use of IP protection, with its use being strongly curtailed by economic recession in comparison with their larger counterparts. This emphasises the problems that SMEs encounter due to their size and indicates that IP protection is perhaps not always valued as being critical to a firm's long term success or failure.

Poor understanding of the intellectual property protection system was also identified in the Time survey[4], which reported that 79% of SMEs did not understand how intellectual property protection and enforcement operated. Murphy found[21] that up to £20 billon was being wasted each year by companies across the European Community economy duplicating research that had already been conducted and published in patent data.

Canada

Hanel found that cost represented the greatest disincentive to SMEs in the manufacturing sector using IP protection, closely followed by the risk of infringement that they could not afford to police[7,18]. The fear of the loss of proprietary technology was also identified, in common with other international studies. Hanel[8] also found that small firms and 'new economy' firms (such as software development) were most likely to be dissatisfied with IPR, complaining that litigation was too expensive and that the penalties were insufficient to deter infringers.

SECTORAL BREAKDOWN

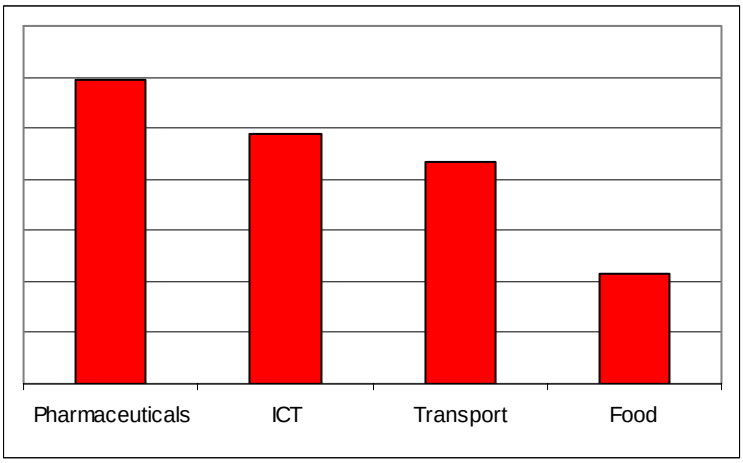
Available evidence suggests that generally, behaviour of SMEs with regard to IP protection does not differ from that of larger firms, with use of IP protection increasing proportionally to the size of the enterprise.

Thomson Derwent's[6] research found that patenting activity by SMEs is greatest in the pharmaceutical sector, with the study suggesting that this was because of a need to recoup the cost of product development.

The University of Sherbrook (Canada) undertook a detailed examination of manufacturing industries and reported that the more an industry was reliant on technology, the more likely it was that they would use formal IP protection.

[21] Murphy, A, UK Patent Office Statement, quoted in British Gas Survey, ibid.

Patent Use by Sector (Canadian Manufacturing)



University of Sherbrook 2001

These results show that making comparisons between the IP protection practices of SMEs and large firms needs to take into consideration the sector in which they operate, since SMEs are over-represented in lower technology businesses.

PERCEIVED UTILITY OF IPR SYSTEMS BY SMES

The Australian data show (vol I, p16) that SMEs were not uniformly content with the operation of the Australian IP system, with disparities appearing based on industry sector. Sectors such as pharmaceuticals and biotechnology were relatively content with the operation of the IP system, whereas others, like retail and tourism felt that the system did not adequately serve their needs.

Europe

Norman[6] found that European SMEs are not generally convinced that the current IP protection system is safe, or that it is well adapted to their needs. While they see patents as important or very important (88%) they lack confidence in the patent system, particularly with regard to enforcement of their rights when in conflict with larger companies.

Canada

This concern over enforcement is echoed by Hanel[7], where he notes that defence of IP is a serious concern for Canadian manufacturing firms.

United States

Patent enforcement is also cited by the Small Business Administration[9] as a serious problem for SMEs, which regarded it as a primary motivator for using informal methods of protecting their IP.

CONCLUSION

Use of IP Protection

When application rates are examined in the international context, it becomes clear that while some differences exist across different developed economies there are a number of striking similarities that emerge.

It is difficult to assess intensity of use of IP protection by SMEs in foreign jurisdictions since broad data has not been published. Most studies that report intensity data have mirrored the Australian findings, but this is not uniformly the case. When we consider usage rates across jurisdictions, it appears there is no great difference in usage levels when comparing large and small and medium enterprises. However, significant disparities are apparent in absolute usage levels between economies, such as the United Kingdom and European Commission, which report patent use levels by SMEs approximately nine and four times higher than their Australian counterparts.

This may suggest that usage of IPRs by Australian companies (large and SMEs) are at suboptimal levels, but this may be due to structural differences in respective economies (government activity, economic growth during the survey period, taxation etc) and would require further inquiry to determine what factors influence this result.

International data collected is often sector-specific, concentrating on a particular geographical locale or industry group (such as high technology[9] or manufacturing[7]). Greenhalgh[5] noted that when considering R&D conducted by SMEs it is important to recognise that commonly (though not universally) they do not separately account for R&D in their bottom line, which may skew the available data on their production of (and therefore protection of) intellectual property.

Inhibiting Factors

Where factors that inhibit use of Intellectual Property protection are considered in the context of SMEs, a lack of resources (particularly financial) is the single most cited obstacle. Given that SMEs are generally poor in terms of ready finances, expertise and time, this is unsurprising – however, other factors also matter, including the perceived complexity of the IP protection system, problems with enforcement and fear of imitation. Generally, SMEs were far more prolific users of 'informal' methods of protection, such as trade secrets, or emphasized other methods of staying ahead of the innovation curve, such as being 'first to market'.

The legal system underpinning the IP protection system was also cited by SMEs surveyed[22], with some of the survey group noting that larger companies with better financial resources or legal expertise would be able to draw out any litigation in order to overwhelm the smaller party. This attitude was reflected in the Australian findings, although to a generally lesser degree. This perception expressed by SMEs in the

[22] Cordes et al; British Gas TIME Survey; Cohen et al; Department of Trade and Industry Quinquennial Review (UK)

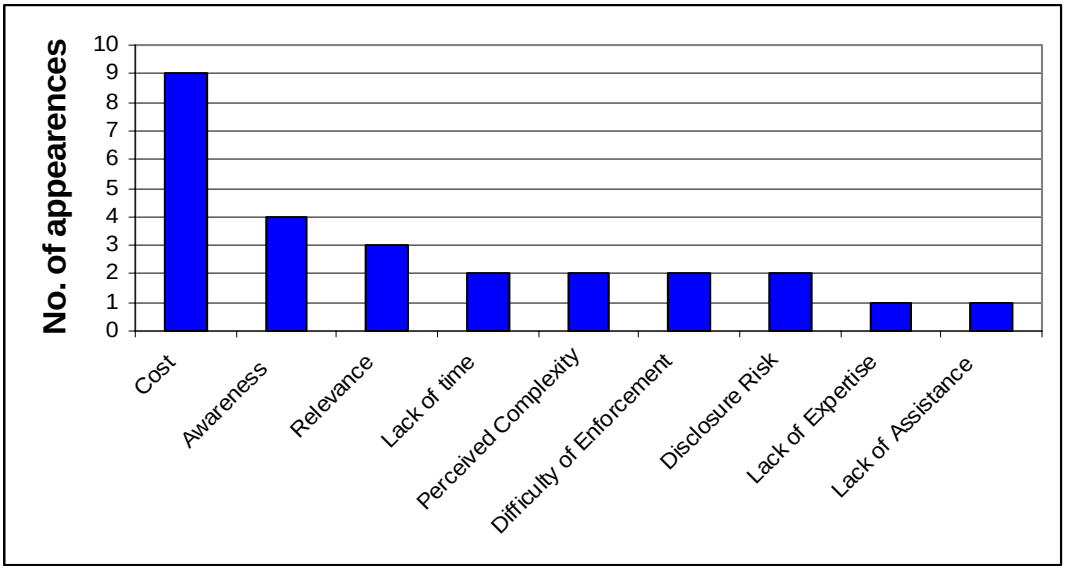
international literature was not supported by evidence, and so must be treated with some scepticism. It is reasonable to accept that this is a common *perception*, but whether it has any basis in fact is debatable.

The international studies often cited the complexity of the IP protection system, although again this appears to be a commonly held perception, and is not supported by empirical evidence. While it is difficult to assess the validity of this view, it is reasonable to suggest that because SMEs are generally resource-poor (in terms of staff and time as well as finance) they may not have substantial access to information made available by the relevant government authority.

This lack of real knowledge, combined with a generally negative view of formal IP protection, shows some commonality with the experience of Australian SMEs. If this factor is an important deterrent to SMEs using the formal IP protection system, it is reasonable to draw the conclusion that use of the system is sub-optimal, and could be improved. It should be noted, however, that Australian SMEs nominated poor awareness of the system as of only minor importance as an inhibitor, although other important factors such as uncertainty over benefits or enforcement can be regarded as having a direct relationship with knowledge of the system.

The following chart shows the frequency of appearance of factors in sixteen international studies. It shows that cost of enforcement[23] was by far the most ubiquitous factor, followed by awareness and relevance.

Inhibiting Factors (International)



This has some commonality with the factors identified by IPRIA regarding the experience of Australian SMEs. Clearly enforcement cost (real or perceived) is a serious deterrent to using IP protection, although it is interesting to note that the international data focuses on the cost factor most strongly, with other inhibitors appearing with much less frequency.

[23] It should also be noted that four of the surveys did not disaggregate data between cost of enforcement and cost of obtaining IP protection.

This may be contrasted with the Australian findings, which do not display this level of disparity in the survey results.

Utility

The international data shows that in common with the results of the Australian survey many SMEs do not regard the intellectual property protection system as being particularly well adapted to their needs or in some cases[19] relevant at all to their operations. This demonstrates a widespread perception about the shortcomings of the intellectual property system that is similar to that held by Australian SMEs, particularly with regard to the cost of enforcement. Generally Australian SMEs reported higher levels of satisfaction than their international counterparts. The international data did not provide a sectoral breakdown on how different sectors perceived IPRs effectiveness and importance, and we must therefore be cautious in drawing any conclusions regarding the similarities that emerge.

Summary

IP protection practices adopted by SMEs internationally appear to demonstrate a significant degree of commonality in SME behaviour and perceptions with regard to intellectual property protection, and shows that the obstacles that Australian SMEs face are not unique. The available international data is generally consistent with the findings of the Australian survey, particularly with regard to rates of usage of IP protection, reasons for use and factors that inhibit usage.

The international data generally agrees with the conclusions of the Australian study, that IP usage rates of SMEs are not dissimilar to larger enterprises, once the data has been normalised. However, the international studies also isolated another critical factor that affects usage by SMEs, that of the effect of economic circumstances. It has been found that SMEs are generally more vulnerable to variations in the market because they often lack capital reserves, and that protection of IP, while considered important, is nonetheless a second order priority. This is reinforced by research[5] that postulates a direct relationship between an SME's sales with their usage of IP.

FACTORS AFFECTING THE USE OF INTELLECTUAL PROPERTY (IP) PROTECTION BY SMALL MEDIUM ENTERPRISES (SMES) IN AUSTRALIA: VOLUME II

FACTORS AFFECTING THE USE OF INTELLECTUAL PROPERTY (IP) PROTECTION BY SMALL MEDIUM ENTERPRISES (SMES) IN AUSTRALIA

A Report for the Commonwealth Department of Industry, Tourism and Resources

VOLUME II (LITERATURE REVIEW AND SUPPORTING DATA)

Intellectual Property Research Institute of Australia (IPRIA)

April 2005

THE UNIVERSITY OF MELBOURNE

AUTHORS

Paul Jensen, Owen Morgan, Kimberlee Weatherall, Elizabeth Webster (**VOLUME I**)
R. Mitch Casselman, Joshua Gans, Elly Gay, Paul Jensen, Elizabeth Webster (**VOLUME II**)

ACKNOWLEDGEMENTS

We thank Danny Samson for his invaluable assistance in developing a model for the case studies. We would also like to thank Rod Crawford from IP Australia for his help with the data used for this study. Gharad Bryan provided excellent research assistance. We thank Vibeke Pedersen and Ben Methakullawat for administrative support. We would like to acknowledge the significant contributions made by Emma Caine and Katerina Gaita in the final editing of the report. All views expressed are solely those of the authors and do not necessarily represent those of the above individuals and organisations. Responsibility for all errors lies with the authors.

1. THE USE OF INTELLECTUAL PROPERTY PROTECTION BY SMES: A SURVEY OF THE ACADEMIC LITERATURE*

Small and medium enterprises (SMEs) will utilise intellectual property (IP) protection if the benefits of so doing outweigh the costs. While the academic literature sheds some light on the benefits and the costs to SMEs of IP protection, a broad study – particularly, in an Australian context, is still lacking. Redressing that gap is the purpose of the present study. Nonetheless, it is useful to review existing academic literature in this regard. The current section of this report provides that review.

The review is divided into two parts. The first part (1.3) outlines the *value* of IP protection to SMEs. Why might they rely upon it and how does it improve their profitability and commercialisation prospects? The second part (1.4) focuses on the *costs* of IP protection. How easy is it for SMEs to utilise IP protection given that it can involve protracted legal costs? Each part focuses both on economic principles and on empirical analyses of SMEs.

Before turning to consider their use of IP protection, it is instructive to note briefly the literature concerning SME innovation (as innovation is directly relevant to use of IP). This will be done in section 1.2.

1.1 General Studies of SME Innovation

Schumpeter (1942) focused on the differences between small and large enterprises in terms of their innovative activities. The 'Schumpeterian hypothesis' argues for a positive relationship between enterprise size and innovation. This hypothesis is usually related to lower capital costs of large enterprises, economies of scale and complementarities between R&D and other activities of the enterprise.

The main thrust of past studies of SME innovation is that SMEs tend to spend R&D dollars on different types of projects to larger enterprises. However, others spend amounts usually proportionate to their sales (see Scherer and Ross, 1990, p.655 and Mowery, 1983). The survey by Cohen and Levin (1989) documents this literature.

While this observation characterises inputs, some studies have examined R&D outputs; specifically patent counts. In 1974, the Federal Trade Commission in the US carried out a survey of about 450 of the largest manufacturing corporations and determined that they obtained 61 per cent of industrial patents granted in 1974. Those corporations constituted 73 per cent of company R&D expenditure and 52.4 per cent of manufacturing sales. Thus, they received patents more than in proportion to their sales but less than in proportion to their actual R&D expenditures. The same study documented fewer significant innovations from the largest enterprises (Scherer and Ross, 1990).

Along similar lines, Acs and Audretsch (1987) found that smaller enterprises generated more innovations per employee than larger enterprises, in technologically dynamic

industries. However, this was not the case in industries where advertising was important, production was capital intensive and market structure was highly concentrated.

In an international context, the US seems to be an outlier in terms of the ability of smaller enterprises to account for innovative output (Scherer and Ross, 1990). Indeed, in the United Kingdom Pavitt et. al. (1987) found that there was a low rate of small enterprise innovation prior to 1970, but that since then, smaller enterprises have begun to mirror their US counterparts. Nonetheless, the pattern in the UK still gives the innovative edge to larger enterprises. However, Pavitt et. al's work also suggested that very small and very large enterprises were responsible for a disproportionate share of innovations.

In general, the literature on enterprise size and innovation is inconclusive. Cohen and Levin (1989) note that samples are usually non-random and that good controls for industry effects are lacking. Finally, the studies are usually static and do not take into account the effect of innovation on enterprise growth.

The consensus opinion on enterprise size and innovation tends to be that held by Jewkes et. al. (1966, p.168):

> It may well be that there is no optimum size of firm but merely an optimal pattern of any industry, such a distribution of firms by size, character and outlook as to guarantee the most effective gathering together and commercially perfecting of the flow of new ideas.

This view was echoed by Nelson, Peck and Kalachek (1967), Scherer and Ross (1990) and Dorfman (1987).

1.2 The Value of IP Protection

The value of IP protection is that it assists SMEs in appropriating more of the social returns from innovation. But, if the innovator does not earn all of the social returns from innovation, who are the other claimants? First, there are ultimate consumers themselves. Competitive constraints mean that most innovators cannot achieve a monopoly, perfectly price discriminating outcome. Hence, consumers will receive some value from the innovation as they pay a price less than their own willingness to pay. Second, there are complementary asset holders, who have assets and skills that add value to the innovation. When those assets are tightly controlled by a relatively small number of enterprises, those enterprises will be able to appropriate some of the innovation’s value (Gans and Stern, 2000).

Intellectual property protection plays a key role in improving appropriability on both of these dimensions. Most importantly, it gives the inventor the power to exclude others from commercialising an invention and the inventor can earn monopoly profits rather than have those profits dissipated by imitators. That power is also valuable to smaller enterprises, who want to license or sell their intellectual property rather than take it directly to market. These enterprises can bargain with licensees or acquirers with a more valuable product,

since it is protected from competition. This is the well understood benefit from IP protection.

It has been demonstrated that securing patent protection raises imitation costs considerably. Levin et. al. (1987) conducted a wide ranging survey of the research and development policies of enterprises. To duplicate an unpatented new product, imitation costs exceeded 50 per cent of the cost of the original innovation across most industries and in some 40 per cent of the industries surveyed imitation costs were 75 per cent or more of original R&D costs. Patenting, however, significantly increased duplication costs in pharmaceuticals (by 40 per cent), chemicals (25 per cent), electronics and semiconductors (7 – 15 per cent), and machine tools (17 per cent). In very few industries, though, did patent protection prevent duplication of the product in reasonable time.

But recent research has uncovered another potential benefit to intellectual property protection, beyond its role in excluding imitative competition: *strong intellectual property protection facilitates trade in markets for ideas*. Significantly, it is the property right afforded by IP that is critical rather than its monopoly conferring powers. The following section outlines this recent research – both the economic theory and the empirical verification regarding the role IP protection plays in facilitating such trade.

1.2.1 Commercialisation Choices

When considering how to make profits from their invention, inventor entrepreneurs need to assess their commercialisation strategy. In particular, will they try and take a product to market themselves or will they 'sell the idea' to another, more capable enterprise? Commercialising in the product market involves *competing* with established enterprises while 'selling ideas' involves *contracting* with one or more of those enterprises in the market for ideas (Gans and Stern, 2003a).

There are two broad reasons why contracting might generally be preferable to competing. First, as mentioned above, established enterprises often possess assets and competencies in marketing, distribution, handling regulatory processes (something critical in biotechnology) and more detailed development resources. Entrepreneurs would have to invest in and essentially duplicate these competencies if they want to take the invention to the product market in competition with established enterprises. In contrast, contracting with them would save that very duplication, and offer an immediate benefit that can be negotiated over.

Second, contracting with established enterprises is mutually profitable for both parties as it avoids the profit reduction from competition. Even with strong intellectual property protection, older, substitutable products exist in the market place. By dealing with an incumbent, the transition to newer products can be closely coordinated. While in some cases, this might generate trade practices concerns, most licensing or acquisition agreements would not meet anti-trust concentration thresholds. Thus, the avoidance of profit reductions from competition is another benefit from contracting.

Faced with these benefits, it becomes difficult to imagine why an inventor-entrepreneur would not contract with an established enterprise. One reason might be to build an empire and keep control over the invention's progress. Another might be that the entrepreneur is more optimistic than established enterprises about the invention's value in the marketplace. However, even in these cases, it would still pay for the inventor to *attempt* to negotiate with one or more established enterprises; if only to see if there are gains from trade, despite these other differences. Nonetheless, it remains true that some smaller start-ups avoid approaching incumbents until their products are established in the market place.

There is a potentially good economic reason why inventors might avoid negotiations with an established enterprise altogether: the risk of disclosure. In order to sell an idea you have to show the potential purchaser the idea. In some situations a working model is available but in others key knowledge has to be disclosed to the potential buyer. The problem is that the disclosures themselves may undermine an inventor's ability to contract with unscrupulous buyers. Purchasers may claim they already knew the idea or otherwise fail to reach an agreement. They might then utilise that knowledge to develop competing products and harm the inventor's product market options. Thus, by giving key disclosures, inventors can weaken their own negotiating position to such an extent that it may be preferable to secretly go to the product market and bypass the ideas market altogether (Arrow, 1962).

This is not a pie in the sky problem. There are many documented cases of expropriation of intellectual property by established enterprises. Perhaps the most famous is that of Ford, which was found to have violated the intellectual property of Bob Kearns, the inventor of intermittent windshield wiper. In the 1960s, Kearns solved some long-standing difficulties with developing the wiper, fitted his car with it and drove it down to the Ford motor plant in Detroit to see if they were interested. They inspected the car, employed Kearns for a short time but eventually rejected the idea. In the meantime, Kearns secured a patent only to find out later that Ford and other car manufacturers had employed his technology in millions of vehicles. Kearns eventually won a case against Ford but only after spending twenty years in a legal quagmire. Had he known, he might never have driven the car down to Ford in the first place; let alone develop this important new technology (Seabrook, 1994).

1.2.2 Solving Disclosure Problems

The disclosure problem is not insurmountable. One option is not to disclose the idea. However, this might dilute the amount legitimate purchasers would pay to purchase the invention. To increase the value of the invention the inventor could post a bond that would act as a warranty as to its technical and perhaps even commercial viability. However, this type of assurance requires, at the very least, a well funded inventor.

A second alternative would be to use a bolder strategy. Bob Kearns could have disclosed his idea to Ford and threatened to take his invention to General Motors if they did not strike an appropriate deal. The existence of established competitors can turn the potential expropriation problem on its head; with would be expropriators/powerful becoming the expropriatee/disempowered (Anton and Yao, 1994). However, the boldness required by this strategy makes it difficult for smaller parties to employ.

Finally, the inventor could obtain sufficient intellectual property protection. Expropriation can occur because of a lack of legal recourse. Having a strong patent, or an established trade secret regime, allows inventors to disclose their innovations without fear that it could be used against them in the market should a deal not be forthcoming. It is here that intellectual property serves its additional role. Patent protection not only guards inventors from imitation in product markets but also against expropriation in ideas markets. In some cases, it opens up a new profitable opportunity for entrepreneurs. In other cases, it opens up the only profitable opportunity for them.

Therefore, while strong IP protection improves returns in both the product market and the ideas market, it makes the latter *relatively* more attractive than the former. This is because IP protection actually enables the ideas markets to work in an economically sensible fashion by insuring the inventor against expropriation. This makes IP protection doubly important and likely to encourage contracting over competition as a commercialisation strategy.

This trend is supported by a recent survey of start-up commercialisation undertaken by Gans, Hsu and Stern (2002). They found that start-up enterprises who have strong intellectual property protection (e.g., a patent) are 23 per cent more likely to pursue any type of contracting strategy (licensing, acquisition or alliance) than bringing an invention to market themselves. And this occurred while taking into account differences in the importance of incumbent complementary assets and the nature of the start-up's funding. Moreover, industries where intellectual property protection tended to be strongest (e.g., biotechnology) tended to see more contracting than those where it was weak (e.g., electronic equipment).

1.3 The Costs of IP Enforcement

While the above discussion demonstrates the consequences of weak intellectual property protection, it does not explain why IP protection might be weaker for smaller as opposed to large enterprises. For example, Scherer and Ross (1990) write:

> Small firms are at a severe disadvantage trying to claim patent rights, or enforce them against larger rivals better able to sustain the multimillion-dollar costs of a protracted patent litigation. Thus, even though they need patent protection more than well-established companies, the protection they actually receive is more fragile. (pp.629-630)

There is a growing literature on the enforcement of intellectual property rights and to determine if the above hypothesis is true or not. This section reviews that evidence.

Lanjouw and Lerner (1997, p.2) sum up the consensus view of the empirical literature on enforcement (citing Acs and Audretsch, 1988):

> There is … evidence that the cost of litigation falls most heavily on small firms. If a defendant is unable to raise capital to finance the litigation through the external capital

> markets, he may be forced to settle the dispute, no matter what the ultimate merits of its case. This asymmetry is particularly troublesome in the context of patent litigation, where studies suggest that small firms are disproportionately innovative.

However, there are several potential reasons for this: liquidity constraints, the role of preliminary injunctions, reputation effects, the use of trade secrets, the displacement of small enterprises from certain technology areas, issues in new technology areas, and the likelihood of litigious events. The following sections will review each of these in turn.

1.3.1 Liquidity constraints

The costs of trial for smaller enterprises are likely to be higher because of financing difficulties and their inability to sink counsel costs through the use of in house lawyers. Taken alone this would suggest that small enterprises are less likely to litigate. However, small enterprises may also have higher costs of settlement, as they are unlikely to be involved in valuable corporate relationships with the opposing team. Thus, it is difficult to make an unambiguous statement about the likelihood of small enterprises entering litigation. Indeed, Lanjouw and Lerner (1997) find that litigation rates are up to 16 per cent higher for individuals than for corporations, indicating that the benefits of settlement for corporations are much higher than for an individual. However, this is not supported by econometric tests, conducted subsequently, which suggest that corporate owners are more likely to be involved in litigation. The results differ because the second test controlled for the belief that corporate enterprises are more likely to litigate to avoid litigation of similar patents in the future.

Lanjouw and Lerner (1997) conclude that individually owned patents are at least as likely to be litigated as are corporate owned patents. Assuming that individual owners are likely to face higher costs for the legal services that they employ because they do not have in house lawyers, and may be financially constrained, it seems that it would be more expensive for an individual to own a patent. This fact, coupled with the uncertainty related to new technology fields to be discussed below (and therefore increased likelihood of litigation), suggests that “enforcement issues will weigh most heavily on small enterprises and individuals who are active in emerging technologies.”

1.3.2 Preliminary injunctions

A preliminary injunction [or interlocutory injunction], if granted to a plaintiff, prohibits the defendant in a claim from making use of intellectual property during the course of court proceedings. The income of the defendant enterprises is, therefore, greatly reduced during the period of litigation. Lanjouw and Lerner (1996) hypothesise that this increase in the ‘cost’ of litigation “may be sufficient to drive a capital constrained firm to settle a dispute on unfavourable terms.” (p.1) They note that this is related to the ‘long purse’ theories of predatory behaviour, according to which imperfect capital markets allow large enterprises to force financially weak enterprises from the industry (despite relatively high levels of efficiency). This is termed the *Predation Hypothesis.*

Assuming that smaller enterprises are likely to face financial constraints, they are likely to be forced to settle in litigation, thus reducing the value of any patents they hold or might wish to challenge. This effect is exacerbated by the law (in the US), which prohibits them from seeking outside funding for the litigation.

Furthermore, the existence of the preliminary injunction counters any natural bargaining advantage smaller enterprises have as a result of their financial inability to recompense larger enterprises fully for damages they incur in the litigation process. (Lanjouw and Lerner, 1997, p.15).

A related notion sees that small enterprises which may lack the financial ability to fully recompense larger enterprises for the damages they incur in the litigation process have a natural bargaining advantage. The existence of the preliminary injunction reduces this bargaining power, and therefore reduces the ability to the small enterprise to bargain an advantageous outcome (Lanjouw and Lerner, 1997, p.15).

Lanjouw and Lerner (1996) examined evidence from 252 patent lawsuits between 1990 and 1991. They determined whether a preliminary injunction was requested and used sales and employment levels to proxy for the financial resources of the enterprise. Uncertainty in the litigation process was controlled for using data on previous litigation of the patent, re-examinations of the patent in the patent office, and the number of total patents granted in the subclass. Using a probit model they found that plaintiff size had a positive and significant effect on whether a preliminary injunction was requested. Defendant size on the other hand had a negative, but insignificant effect. Further, the *difference* between plaintiff and defendant size was found to have a positive and significant effect. These results indicate that larger enterprises are likely to use preliminary injunctive relief to “prey upon weaker [enterprises] by driving up their costs.” (Lanjouw and Lerner, 1997, p.17)

In considering the implications of the above analysis, Lanjouw (1994) notes that a stricter approach to patent rights may increase R&D efforts, but at the same time may lead to the use of predatory litigation. “[J]udging whether the balance is rights is a hard problem.” (Lanjouw, 1994, p.4) Predominantly the predation hypothesis reduces the value of patents to small enterprises, and therefore decreases the likelihood that they will become involved in areas where patents are likely to be heavily contested.

1.3.3 Reputation effects

Lanjouw and Schankerman (2001) suggest that enterprises working in crowded areas, and which are likely to be involved in a large number of patent litigations benefit from a reputation as an aggressive litigator. They found some evidence for this based on the number of citations that a patent had after it had been litigated. These findings suggest that if the benefits of litigating one patent spill over to the protection of others through the reputation effect, then enforcement considerations would make the same patent worth more in the hands of a larger enterprise, which presumably has more patents.[i]

1.3.4 Trade secrets

Lerner (1995b) analyses IPR litigation involving trade secrets and finds that cases litigated by smaller enterprises disproportionately involved trade secrets. This suggests that trade secrets are more important to smaller enterprises. It also implies that trade secrets are employed because the costs of patenting are relatively high.

Related to this, Cohen, Nelson and Walsh (1996) surveyed the reasons why enterprises do *not* choose to patent innovations. They found a correlation between enterprise size and whether enforcement costs and application costs are of concern. These results are supported by earlier work by Koen (1991). Together these works suggest, again, that the value of patents is lower for smaller enterprises.

1.3.5 Displacement of small enterprises

Lanjouw and Lerner (1997) suggest that when the expected benefit of recourse to the courts is low (or the costs are high), infringement will be tolerated, thereby reducing the value of the patent. This may illicit one of three responses: (1) patents will be less likely to be maintained; (2) patents will be less likely to be taken out in the first place; or (3) smaller enterprises will avoid innovating in areas where others are present to reduce the likelihood of litigation.[ii]

Lerner (1995a) uses data on patents in the biotechnology field to assess the areas where enterprises are concentrating their R&D efforts. Litigation costs are proxied by the enterprise's previous experience in patent litigation and by its level of paid in capital.[iii] Lerner (1995a, p.22) finds that enterprises with high litigation costs (this could be interpreted to mean small enterprises) are less likely to patent in subclasses with previous awards to other enterprises. When they do patent in subclasses with previous patents, they tend to choose less crowded sub classes. Further, enterprises with high litigation costs are less likely to patent in subclasses where low litigation cost (large) enterprises have previously been awarded patents. This evidence indicates that high legal costs may displace the R&D efforts of small enterprises.

1.3.6 New Technology Areas

Lanjouw and Schankerman (1997) argue, on the basis of Cooter and Rubenfelds (1989) model of the economics of litigation, that the probability of litigation will increase as expectations regarding the likelihood of plaintiff success diverge.[iv] These expectations are likely to differ markedly in new technology fields such as biotechnology and IT. To the extent that these areas are more heavily populated by smaller enterprise, they are more likely to be involved in litigation. Further, individuals are less likely to have previous litigation experience. As a result, there is more likely to be asymmetric information in disputes involving individuals. This contention is borne out in empirical analysis of the biotechnology industry. The implication is that this will reduce the incentive for small enterprises to enter these new areas. Assuming that small, capital constrained enterprises are the leading source of innovations in new fields, this argument suggests that development will be retarded (Lanjouw and Schankerman, 1997, p.2).

1.3.7 The likelihood of a litigious 'event'

Again, based on Cooter and Rubenfeld (1989), it can be argued that the likelihood of a litigious situation occurring will be determined by the chance that the 'event' giving rise to it is observed. Lanjouw and Schankerman (1997) provide some anecdotal evidence in support of this hypothesis based on the prevalence of litigation in the drug industry. They also express the concern that individual patentees (small operators) and enterprises with less experience (small novice enterprises) are less likely to observe the event and the likelihood of them litigating should, therefore, be lower. However, Lanjouw and Schankerman (1997 and 2001) appear to provide no evidence to support these concerns.

1.4 Conclusion

The foregoing study of SMEs and their innovative behaviour suggest that SMEs face particular constraints with respect to their ability to commercialise innovations and that these constraints arise, in part, from issues related to the value and costs of intellectual property protection for SMEs.

The Value of IP to SMEs

Do SMEs value IP protection as much as larger enterprises? From a basic economics perspective, IP protection is valuable to SMEs for two reasons. First, when SMEs bring products to market, IP protection can prevent other, larger enterprises with greater resources from launching products that are close substitutes. This gives SMEs 'breathing room' from would-be imitators and allows them to establish a foothold in the market place.

Second, IP protection gives SMEs greater comfort during licensing and acquisition negotiations with larger enterprises. For SMEs in particular, the route to higher profitability is often by collaborating with larger enterprises – as opposed to competing directly against them. This is particularly the case for Australian SMEs.[v] For Australian SMEs, successful commercialisation depends upon negotiating the international market place. In many cases, overseas enterprises will have greater experience, brand reputation and other assets to complete the final stages of commercialisation. However, in negotiating with such enterprises, Australian SMEs are at risk from potential expropriation of their ideas. Patent protection can prevent such expropriation and hence, foster favourable collaborative agreements.

Thus, the value of IP for SMEs can be high relative to that for larger enterprises. Moreover, for Australian enterprises this value is greater given the vagaries of the international economic environment. However, the relatively high value of IP protection of SMEs is, in part, negated by the incentives for larger enterprises to patent closely substitutable technologies pre-emptively.

The Cost of IP Protection

Ultimately, IP protection is only as good as the desire of SMEs to protect it in the courts. To be credible, SMEs must be willing to sue possible infringers. For Australian SMEs, this means having access to US and European legal sources – a particularly costly endeavour.

Studies of IP enforcement by smaller enterprises confirm these higher costs. SMEs face more litigation but are less able to fight court battles successfully. No study yet exists of the success, or otherwise, of Australian enterprises. However, at a first glance, the costs of enforcement for them appear to be formidable.

---

*Isolated parts of this survey, in particular parts of Sections I and III, are drawn directly from Gans and Stern (2003b) and Gans (2003). (Thanks to Gharad Bryan for excellent research assistance.)

[i] This work is also discussed in Lanjouw and Schankerman (1997) and draws upon the theoretical work of Waterson (1990).
[ii] The authors state "In particular, if the threat of litigation is an important concern, one would expect that small firms would tailor their, R & D programs so as to avoid conflict, especially with large firms that have lower legal costs and that would be likely to actively pursue infringements." (p.21)
[iii] The second reflects the idea that smaller firms will face higher costs of litigation.
[iv] Lanjouw and Lerner (1997) provide a theoretical model which outlines this contention.
[v] See Joshua S. Gans, "Driving the Hard Bargain for Australian R&D," *Prometheus*, Vol.16, No.1, March, 1998, pp.47-56; and Joshua S. Gans, "Does Australia Really Need to Encourage its Innovators to Commercialize In-House?" *Policy*, Vol.13, No.4, 1998, pp.36-40.

2. PATENTING BY TECHNOLOGY AND INDUSTRY, LARGE AND SMALL AND MEDIUM ENTERPRISES

Table 17: Ratio of rates between large enterprises and SMEs, by technology area and industry, 1989 - 2002

	A	B	C	D	E	F
	Agriculture, Forestry and Fishing	Mining	Manufacturing	Electricity, Gas and Water Supply	Construction	Wholesale Trade
Electrical devices - electrical engineering						
Audiovisual technology			0.0	1.6	0.0	
Telecommunications				2.0	0.0	
Information technology			0.0	1.5	0.0	
Semiconductors			0.0	2.9	0.2	
Optics				1.0	0.0	
Analysis, measurement, control			0.0	1.6		
Medical engineering						
Organic fine chemical				1.0		
Macromolecular chemistry			0.0	0.6		
Pharmaceuticals, cosmetics			0.0	0.6		
Biotechnology				0.8		
Materials, metallurgy				0.2		
Agriculture, food			0.0	0.5	0.0	3.5
General processes			0.0	0.7		
Surfaces, coatings			0.3	1.6	1.3	2.8
Material processing			0.1	0.7	0.0	
Thermal techniques						
Basic chemical processing, petrol			0.0	4.8	0.0	4.5
Environment, pollution			0.1	0.7	0.0	
Mechanical tools			0.7	2.7	0.8	2.5
Engines, pumps, turbines		3.5	0.0	1.5	0.0	5.4
Mechanical elements			0.1	2.0	0.0	
Handling, printing			0.0	1.5	0.1	5.7
Agriculture/food machinery		10.0	0.1	1.0	0.0	9.0
Transport				3.6	0.0	7.6
Nuclear engineering			0.3	3.7	1.0	
Space technology, weapons						
Consumer goods & equipment			0.0	0.2		
Civil engineering, building, mining			0.0	2.2	1.8	4.0
Total			0.1	2.2	0.0	6.2

Note: A figure greater than one means the percentage of patents in the specific technology-industry is greater than 100 per cent higher for large enterprises compared with medium size enterprises. A figure less than minus one means that the respective per cent is 100 per cent higher for medium enterprises. Figures between -1 and 1 are suppressed.
Source: IBISWorld data base, IP Australia Complete applications

Table 17 cont…

	G	H	I	J	K	L
	Retail Trade	Accommodation, Cafes and Restaurants	Transport and Storage	Communication Services	Finance and Insurance	Property and Business Services
Electrical devices - electrical engineering						
Audiovisual technology	0.7			1.0	0.2	0.3
Telecommunications	4.0				0.0	0.0
Information technology	0.1				0.0	0.1
Semiconductors	0.5			0.5	0.0	2.3
Optics					0.0	
Analysis, measurement, control	1.0				0.0	0.0
Medical engineering						
Organic fine chemical	1.6					3.5
Macromolecular chemistry	1.0				0.0	
Pharmaceuticals, cosmetics	0.0					0.0
Biotechnology	0.3					0.0
Materials, metallurgy	0.1	0.0				0.0
Agriculture, food	7.0				0.0	0.0
General processes	2.2					
Surfaces, coatings	6.7				0.0	0.0
Material processing					0.0	
Thermal techniques						
Basic chemical processing, petrol	1.5					
Environment, pollution	5.5					
Mechanical tools				0.0		
Engines, pumps, turbines	1.3					0.0
Mechanical elements						0.0
Handling, printing	4.7			1.0		0.0
Agriculture/food machinery	7.3	4.5		0.6	0.0	0.0
Transport	1.7					0.0
Nuclear engineering	2.7			0.8	0.0	2.5
Space technology, weapons						
Consumer goods & equipment	0.0					
Civil engineering, building, mining	1.3	2.6		3.5	0.0	0.2
Total	1.3	2.9		0.4	0.0	0.0

Source: IBISWorld data base, IP Australia Complete applications

Table 17 cont…

	M	N	O	P	Q	Total
	Government Administration and Defence	Education	Health and Community Services	Cultural and Recreational Services	Personal and Other Services	
Electrical devices - electrical engineering						
Audiovisual technology	2.6		0.1		0	
Telecommunications	14.8	0.0	0.0		0	
Information technology	1.9		0.0		0	
Semiconductors	3.7		0.0		0.714286	1
Optics	0.3		0.0		0	
Analysis, measurement, control	0.9		0.0	0.0		
Medical engineering						
Organic fine chemical	3.5		0.0	2.3		3.5
Macromolecular chemistry	0.7		0.0	1.0		
Pharmaceuticals, cosmetics	0.1		0.0			
Biotechnology	1.1		0.0	0.2		
Materials, metallurgy	0.5		0.0	2.9		
Agriculture, food	0.3		0.0			
General processes	0.3		0.1			
Surfaces, coatings	1.2	5.5	0.0	0.0		
Material processing	0.5		0.0			
Thermal techniques						
Basic chemical processing, petrol	2.6		0.0			
Environment, pollution	0.8		0.0			
Mechanical tools	0.7		0.0			
Engines, pumps, turbines	0.8		0.0			
Mechanical elements	0.3		0.0			
Handling, printing	12.6	1.0		2.5		1
Agriculture/food machinery	3.4		0.0	1.0	0.5	
Transport	1.5	3.5	0.0			
Nuclear engineering	29.5		0.0	4.5	9	
Space technology, weapons						
Consumer goods & equipment	1.0		0.0			
Civil engineering, building, mining	2.2		1.3	1.4	0.636364	
Total	4.1	1.8	0.1			1.8

Source: IBISWorld data base, IP Australia Complete patent applications

3. ESTIMATING THE NUMBER OF SME IP APPLICANTS

IP Australia collects data on limited company characteristics but not size or industry. In order to classify applicants by size and industry in this report, the names of the companies from the patent, trade mark and design applications were matched across to 2 enterprise data bases. The first data base, IBISWorld, includes data on employees, turnover, profits, assets and industry, *inter alia*. This data base includes the largest 2,000 to 3,000 companies (and their subsidiaries) in Australia. Financial information is only included for the Australian parent, or the highest Australian accounting unit, in the case of foreign owned companies. About 80 per cent of the IBISWorld companies meet the ABS definition of 'large'.

Companies classified as large by IBISWorld, were removed from the AOD database to provide an SME AOD data base. Only industry classification is available for the latter database. There is no financial data for SMEs.

As shown in Figure 10, about 40 per cent of Australian company patent applications matched across to IBISWorld companies. These are complete standard applications or PCT applications that have entered the national phase. A patent application is deemed 'Australian' if the application originated in Australia or the designated country of the owner was Australia. A further 20 per cent of Australian company patent applicants matched across to the SME AOD data base. The remaining 40 per cent of applicants remain unmatched. The percentage distribution of technology classes of these unmatched applicants indicates that they are similar to the matched SME applicants.

The AOD database gives multiple industry classifications for companies, unlike the IBISWorld database, which only gives the main industry. In order to make the data bases comparable, the AOD industries were prioritised as follows: if an industry had a manufacturing classification, it was deemed to be mainly manufacturing (its other classifications, often business services and wholesale trade, were ignored). The order of priority for all companies was: manufacturing; mining; agriculture, forestry and fishing; property and business services; communication services; health and community services; education; finance and insurance; transport and storage; electricity gas and water; construction; government and defence; accommodation, cafes and restaurants; personal and other services; cultural and recreational services, wholesale trade and retail trade.

Figure 11 and Figure 12 present the same matching information for trade marks and designs respectively. About 80 per cent of trade mark applications are taken out in a company name. IP Australia does not separate companies from individual applicants. Therefore, an applicant has been designated as an 'individual' if the first word in the name was a male or female name. Of these designated individuals, just over half were matched to either IBISWorld or the AOD SME listings. Just fewer than 50 per cent of design applications are taken out by companies and of these about 60 per cent were matched across to either IBISWorld or SME AOD companies.

Figure 10: Percentage of patent applicants matching to IBISWorld and AOD, Australia, 1989-2002.

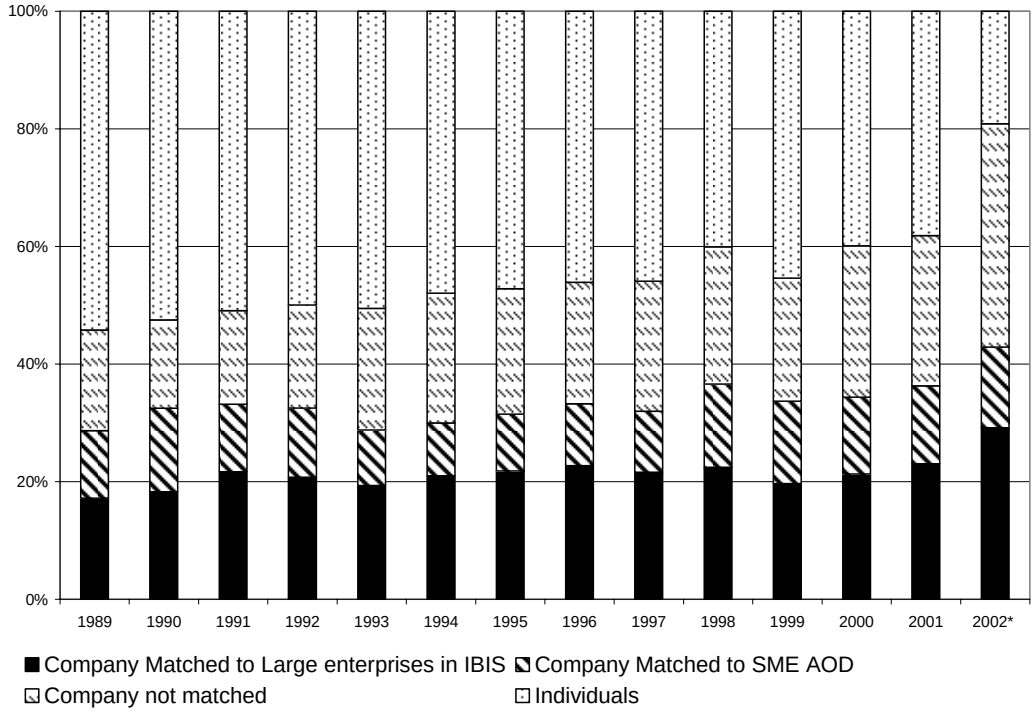


Figure 11: Percentage of trade mark applicants matching to IBISWorld and AOD, Australia, 1989-2002.

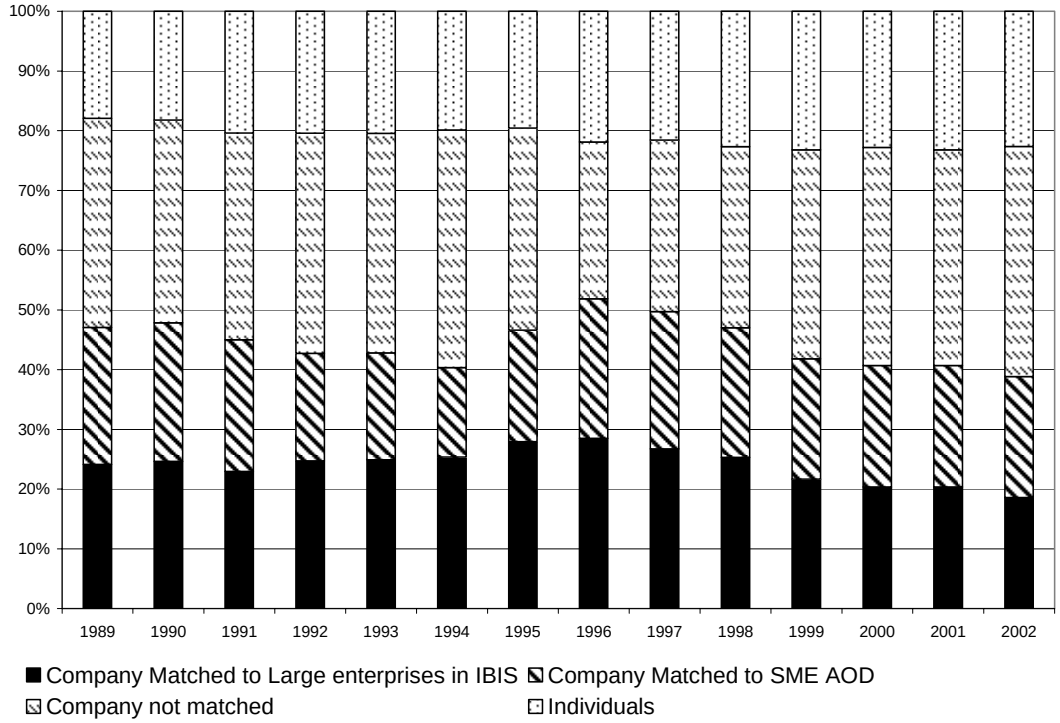
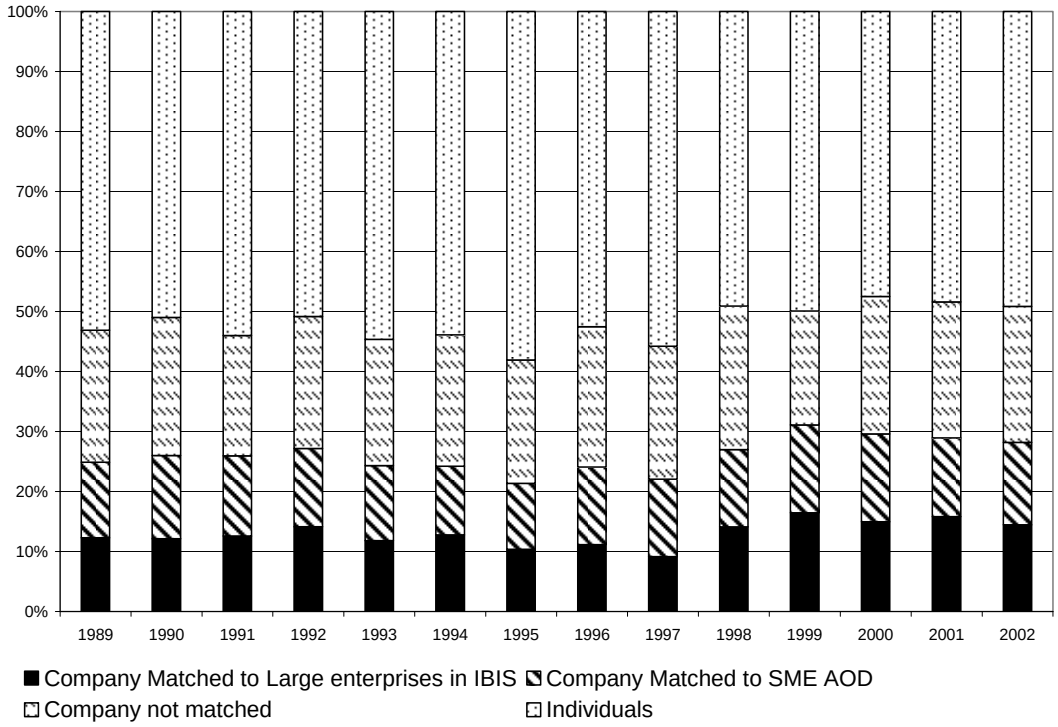


Figure 12: Percentage of design applicants matching to IBISWorld and AOD, Australia, 1989-2002.



4. INDUSTRY AND GOVERNMENT CONSULTATIONS

The following industry and government bodies were consulted in writing this report. IPRIA thanks them for their input:

AUSBIOTECH

AusBiotech, formerly the Australian Biotechnology Association, is the national body of companies and individuals dedicated to the development and prosperity of the Australian biotechnology industry. It is the peak body for the Australian Biotechnology industry.

AUSTRADE

The Australian Trade Commission (Austrade) is the Federal Government agency that helps Australian enterprises win overseas business for their products and services by reducing the time, cost and risk involved in selecting, entering and developing international markets. In particular, Austrade offers practical advice, market intelligence and ongoing support (including financial) to Australian businesses seeking to develop international markets. Austrade provides advice and guidance on overseas investment and joint venture opportunities, and helps put Australian businesses in contact with potential overseas investors. Almost 100 per cent of their clients are SMEs, since larger enterprises often have the international connections necessary to undertake exporting.

AUSTRALIAN INDUSTRY GROUP (AIG)

The Australian Industry Group is an independent, representative body created to help Australian industry be more competitive, representing the engineering, construction, printing, information technology, food processing, packaging, automotive, rubber, aviation, chemicals and other related service industries. AiG's membership reflects the typical structure of the manufacturing sector: of the 10,000 members, approximately 10 per cent are large enterprises, 30 per cent are medium enterprises and 60 per cent are small enterprises.

AUSTRALIAN INDUSTRY INNOVATIONXCHANGE NETWORK

InnovationXchange was formed in association with the AiG to act as a one stop exchange linking industry to sources of innovation. It provides information, events, networking and communications focused on promoting and improving access to the variety of innovation resources in Australia.

AUSTRALIAN INSTITUTE OF COMMERCIALISATION (AIC)

The Australian Institute for Commercialisation is a national, not-for-profit company that delivers programs to improve commercialisation of Australia's research investment. The company commenced operations in July 2002 as a " Smart State" initiative by the

Queensland government, and has received support from all States, the Northern Territory and a number of universities and research institutions.

AUSTRALIAN VENTURE CAPITAL ASSOCIATION

AVCAL is an association of Australian Venture Capitalists. AVCAL's mission is to create a world-best environment in Australia for venture capital and entrepreneurship.

CPA AUSTRALIA SMALL BUSINESS CENTRE OF EXCELLENCE

CPA Australia is Australia's premier organisation for finance, accounting and business professionals. The Small Business Centre of Excellence is a committee of the Certified Public Accountants of Australia. This committee is focused on providing technical expertise in small business issues to its members as well as advising the broader public on policy issues related to small business.

INNOVIC

Innovic is an independent, non-profit organization, partly funded by government. Innovic is a provider of early stage innovation services, with the primary objective of promoting and supporting the practical development of innovation, to educate and assist early stage innovators and small businesses, and to help them develop, and commercialise viable new products and new technologies. 100 per cent of Innovic’s clients are SMEs, operating across the range of industry sectors. Innovic’s services are used by over 1,600 clients each year, and they have some 20,000 innovators in their databases.

iLAB: HIGH TECHNOLOGY INCUBATOR IN QUEENSLAND

iLab is Queensland’s technology incubator. Its purpose is to facilitate the development of high technology industries in Queensland by bringing investors and entrepreneurs together, and to nurture start-up IT or technology businesses over their first two years. iLab provides business support and mentoring and assistance to secure access to the world's best venture capital, legal, financial and marketing activities and expertise, as well as access to board and meeting rooms, and practical office equipment. It is presently dealing with 15-16 small businesses, and has dealt with approximately 80 businesses in its 3 years of operation. It is an example of an incubator that deals with a range of forms of technology.

INSTITUTE OF PATENT AND TRADE MARK ATTORNEYS OF AUSTRALIA (IPTA)

IPTA is the representative body for Australian patent and trade mark attorneys. Patent and Trade Mark Attorneys are the specialist legal advisers in relation to patent, design and trade mark applications and registrations. IPTA’s members are heavily involved in advising inventors, including many innovative SMEs.

LICENSING EXECUTIVES SOCIETY (LES)

LES is an association of 28 individual societies, each composed of individual members who are engaged in the profession of licensing and other aspects of transferring or profiting from intellectual property. LES is business-oriented for the most part, and its nearly 7,500 individual members include management representatives from companies both large and small, scientists, engineers, academics, government officials, lawyers and patent and trade mark attorneys.

TRITON FOUNDATION

The Triton Foundation is a national, not-for-profit initiative with a focus on private inventors (and small-to-medium sized enterprises) with good, but under-exposed products. The Foundation provides advice, educational and coaching assistance and help with some services, as required, through the commercialisation process. The Foundation's stated aim is to "[p]romote a culture of innovation and entrepreneurship in Australia, particularly among our youth, by visibly helping our inventors commercialise."

5. SURVEY DESIGN AND RESPONSE RATES

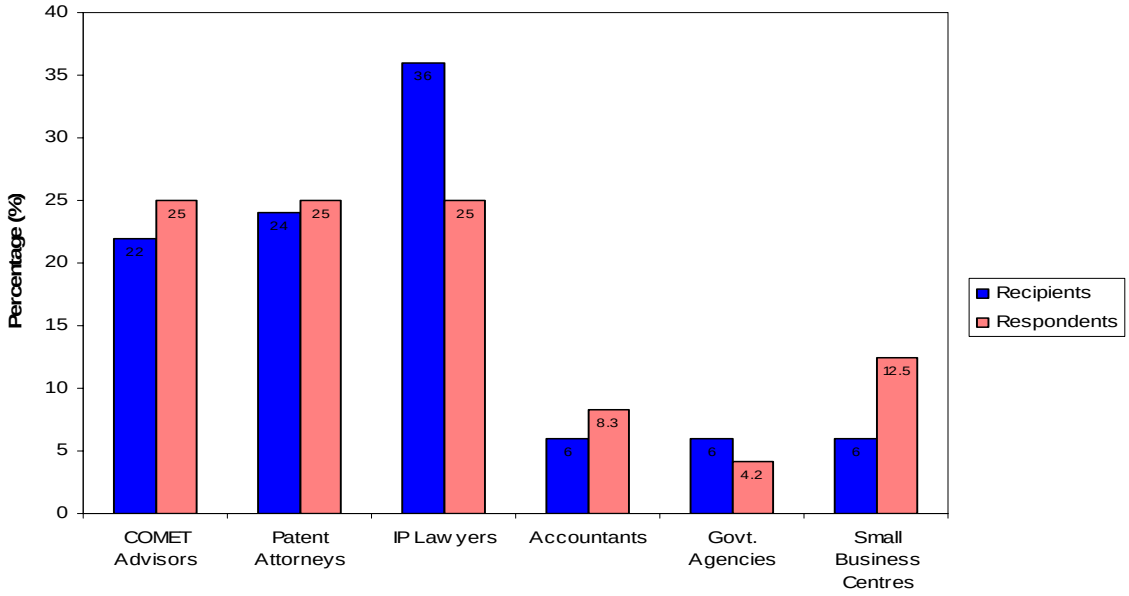
Two surveys, each of 50 organisations, were designed and distributed in order to collect information on the factors affecting the use of IP protection by Australian SMEs. One survey was tailored for organisations referred to as "Innovation Advisors" – organisations that provide information and advice to enterprises that are undertaking innovative activities and are considering using the IP system. This includes organisations such as IP lawyers, patent and trade mark attorneys and COMET business advisors. The other survey was tailored for "Innovation Partners" – organisations that play a more active role in the innovation and commercialisation process. This includes organisations such as venture capitalists, business angels and high-tech incubators.

In both the Advisor and the Partner surveys, the samples were not drawn randomly, since effort was made to identify organisations (or individuals within the organisations) that specifically dealt with SMEs. The surveys were sent out on Monday 27th October 2003, with a return date of Friday 7th November 2003. In order to increase the response rate, reminder calls and e-mails were sent to the recipients. Of the 100 surveys sent out, 51 responses were received (24 Innovation Advisor surveys 27 and Innovation Partner surveys). However, two of the responses to the Innovation Partner survey had to be removed from the data set because of issues relating to non-compliance: one respondent returned the survey stating that he did not feel that he was in a position to answer questions specifically about SMEs, and one survey was returned with mostly unanswered questions. This left a total response rate of 49 per cent.

While the overall responses rate is an important factor in all surveys, it is also important to consider the distribution of the responses – the breakdown by organisation type of the responses received. If the responses received are predominantly from one organisation type, then the results may be biased. This point is particularly salient when the sample size is very small.

The distribution of recipients and respondents for the two surveys is presented in Figure 13 and Figure 14. Each chart illustrates the proportion of survey recipients and responses received by organisation type. For example, in the Innovation Advisors' Survey, 11 surveys (22 per cent) were sent to COMET business advisors and 6 responses were received. This represents 25 per cent of the total number of responses from the Innovation Advisors' survey. Analysis of the chart suggests that the responses received were fairly uniformly distributed across the range of organisations surveyed. This suggests that there are no bias issues in the data set. The only exception to this is the IP lawyers, who were under-represented in the survey respondents. This group constituted 36 per cent of the total number of Innovation Advisor organisations surveyed, yet they only represented 25 per cent of the total respondents.

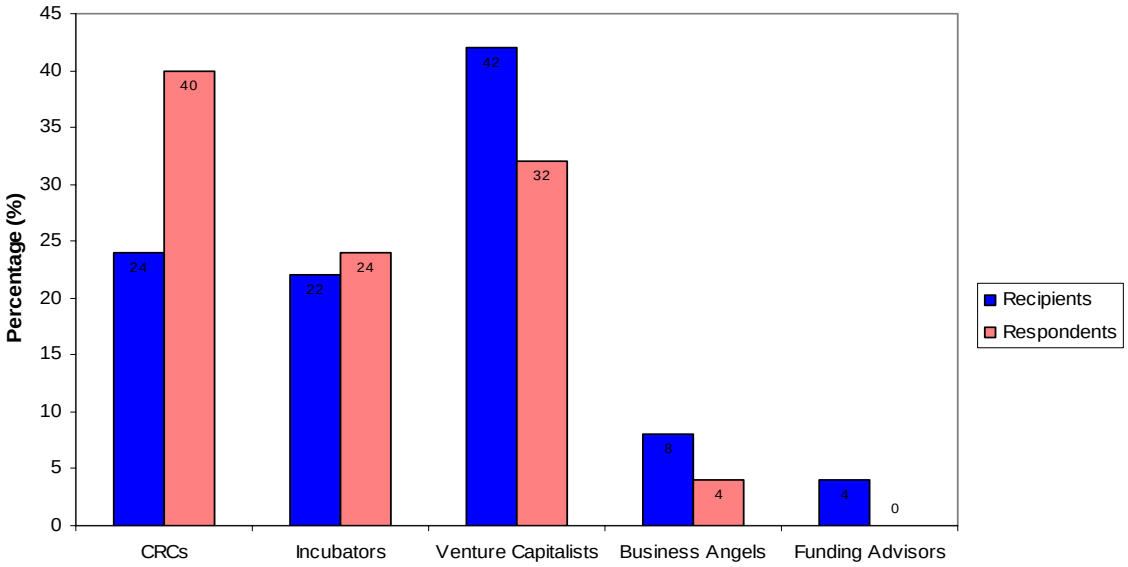
Figure 13: Recipients and respondents to the innovation advisors survey



Source: IPRIA Innovation Advisors Survey 2003

In the Innovation Partners survey the distribution of recipients and respondents is uniform. Once again, this suggests that there is no statistical bias in the sample of survey responses.

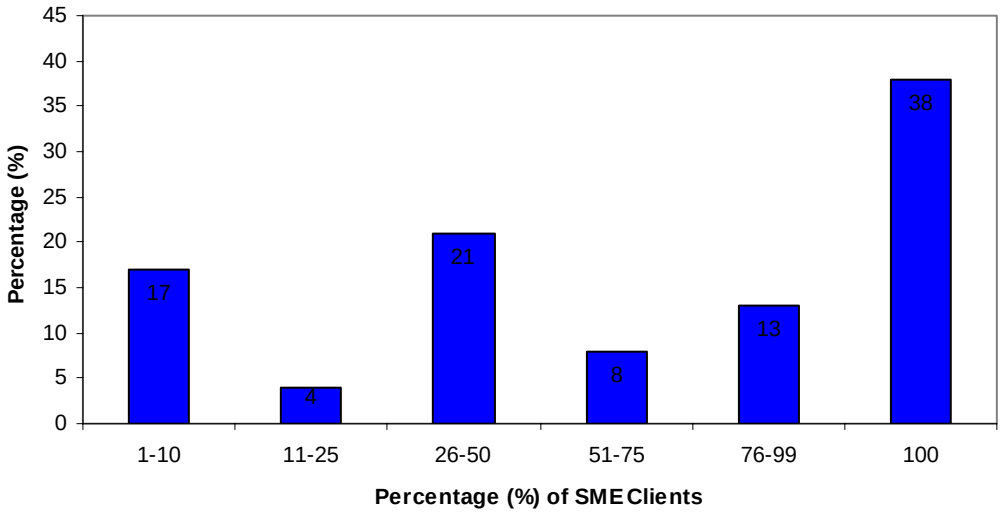
Figure 14: Recipients and respondents to the innovation partners' survey



Source: IPRIA Innovation Partners Survey 2003

Recipients of the Innovation Advisor survey were asked to identify the proportion of their clients in the last year that were SMEs. The results are encouraging given the effort expended in identifying a sample of organisations that dealt with SMEs. In particular, Figure 15 indicates that almost 40 per cent of the total number of respondents dealt exclusively with SME clients in the last year. Furthermore, more than 50 per cent of the survey respondents indicated that three-quarters of their clients were SMEs. This indicates that the results of the survey are relevant to the analysis of the factors affecting the use of IP by SMEs.

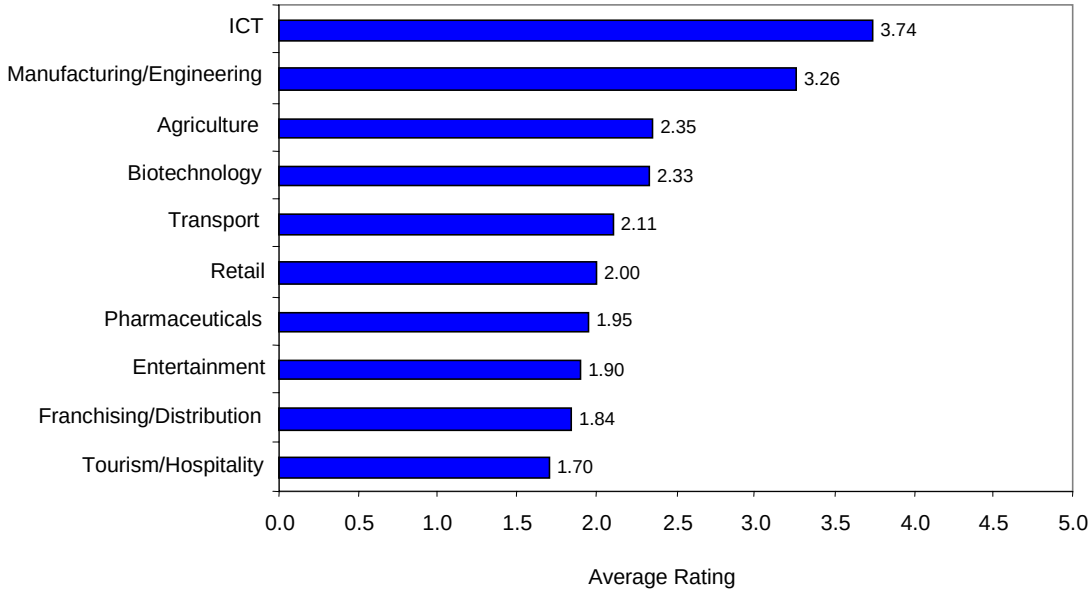
Figure 15: Breakdown of innovation advisors' SME clients



Source: IPRIA Innovation Advisors Survey 2003

The Innovation Advisors' clients come from a wide range of industries, as illustrated in Figure 16. The most common clients for Advisors responding to the survey were in the information, communications & technology (ICT) and manufacturing/engineering industries.

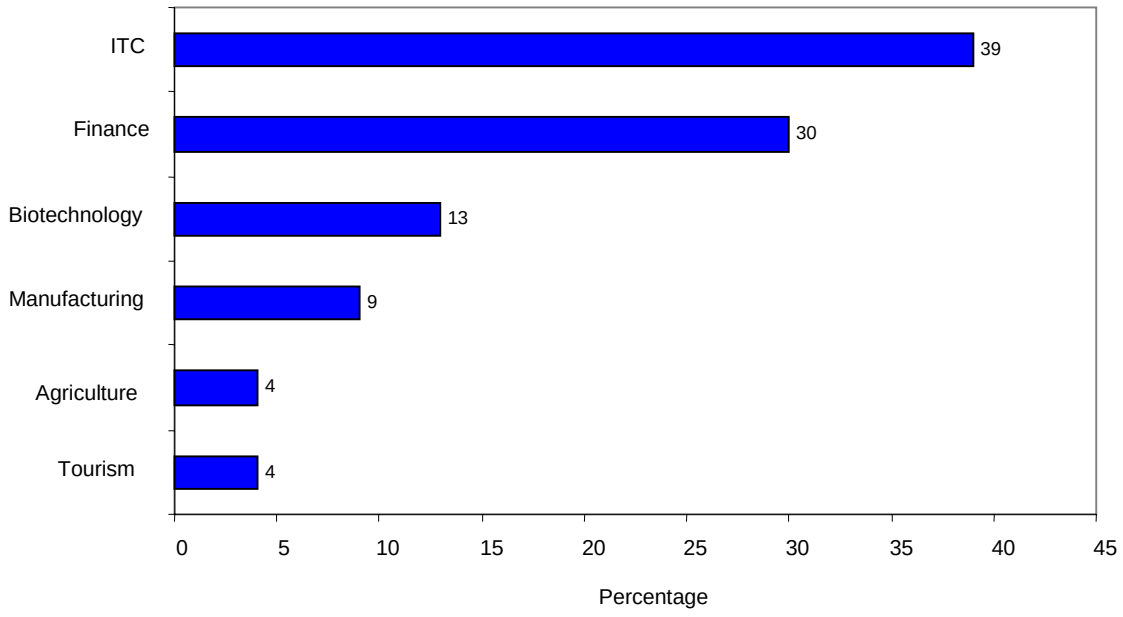
Figure 16: Breakdown of innovation advisors' SME clients by industry



Rating Scale: 1=None, 5=Mostly
Source: IPRIA Innovation Advisors Survey 2003

Recipients of the Innovation Partners survey were asked to identify the industry that their organisation is in. A summary of the responses to this question is presented in Figure 17. This chart shows that 39 per cent of the respondents are in the information technology & communications industry, 30 per cent are in the finance industry, and 13 per cent are in the biotechnology industry.

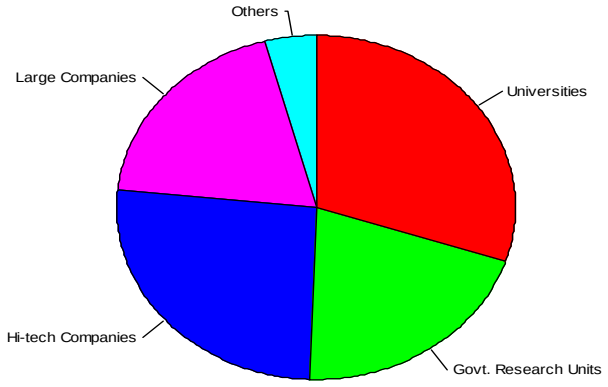
Figure 17: Breakdown of innovation partners by industry



Source: IPRIA Innovation Partners Survey 2003

Innovation Partners were also asked to identify the organisations, with which they collaborate – the breakdown of this is presented in Figure 18. The main feature of the pie chart is that the innovation partners collaborate in research with four major groups: universities, large companies, small hi-tech companies, and government research units.

Figure 18: Breakdown of partner organisations



Source: IPRIA Innovation Partners Survey 2003

Standard statistical procedure for designing surveys is to use a large sample randomly drawn from a population. This provides some guarantee that the responses received will also be random and will therefore, will not be biased. In this survey, however, a different approach has been adopted. A small (non-random) sample has been used.

As already mentioned, one of the inherent problems with small-sample surveys relates to the distribution of responses. The larger the sample size, the greater the likelihood that the sample will reflect the characteristics of the population. A small sample size, therefore, may not be representative of the population. The evidence presented here on the number and types of organisations that responded to the survey suggests that this is not a problem here, since the respondents appear to be evenly dispersed across the range of organisations and industries.

6. CASE STUDIES

Case Study 1: Company A
Furniture and Lighting Designers
Friday 24 October 2003

1. Company Background

Company A is a micro company consisting of a wife and husband team. Both are designers. They established Company A about 10 years ago, starting with very basic furniture making equipment. They have since expanded and now design furniture, lighting and upholstery for large organisations including many hotels around Australia.

The philosophy behind Company A is to create truly original, lasting designs using high quality materials. Company A is often commissioned to design products for projects, such as the furniture and lighting for a new hotel. To date, Company A has no export business but this is a possibility in the future. If exporting does occur, the owners intend to register certain designs in the countries to which they will export. Exactly which designs will be registered is unclear at this stage and the cost may well prove to be a barrier.

2. Use of Intellectual Property

Company A has two registered designs. Both of these are lighting designs. It has no other forms of intellectual property protection except for potential copyright protection over some pieces of their original furniture and upholstery. Company A has not used its registered designs or copyright in any way to date. In addition, it takes no steps to monitor whether its designs are being copied.

The first registered design for which Company A applied was granted by IP Australia in June 2001. The more recent registered design was granted in June 2003.

3. IP Strategy

In respect of their furniture designs, Company A's tactic to date has been to ensure that a photograph of its design appears in a magazine, such as Vogue, as soon as possible after completion. This method of publication with a date attached to it has been seen by the owners as the most important way for Company A to protect itself from any subsequent designers or imitators who may produce the same product at a later date. They did not view this mechanism in terms of 'copyright' but rather as a 'common sense' means of capturing the date of the creation to prove its originality. The owners were unaware of the potential for copyright protection to lapse where the design has been applied industrially.

The business strategy adopted by Company A in relation to IP is to protect, through the formal IP system, only those designs which it believes are at risk of being copied. Due to the high level of craftsmanship required to replicate most of its products, only a small handful of designs are considered to be susceptible to copying. The lighting designs are more easily copied and tend to be sold in larger quantities (unlike, for example, a dining table). Thus the strategy has been to protect lighting designs only.

Specific circumstances arose which led to the registration of the two designs that have formal protection. The first registered design was for a product that required a very expensive tool (approximately $7,000). Company A wanted to ensure it had a return on this outlay so it needed to ensure that it had a monopoly on making this particular light fitting.

The main motivation behind the more recent registered design was a genuine fear that a design Company A had been commissioned to produce might be copied. An architectural firm commissioned Company A to design a light fitting for a hotel based on one of its previous designs. Company A was requested, by the architectural firm that was working on the hotel project, to make a longer shaped light fitting using the same material and design it had used for the previous light fitting.

A suitable fitting was developed and a prototype made. This process took around 5-6 months and costs of about $2,000 - 3,000 in material were incurred.

The prototype was shown to the architectural firm and to the hotel. The hotel requested that it keep the prototype in order to show it to all the relevant people. It was represented to the owners of Company A that the hotel would be engaging Company A to supply the light fittings that it had designed. A quote was given for the cost of supplying 480 light fittings. This quote was under the budget that the hotel had specified for this project. An invoice was presented to the hotel for the cost of developing the prototype. The hotel refused to pay ($2,000) on the basis that Company A would be provided with the work to supply the 480 light fittings. The invoice was reduced to $500 and was paid. The prototype was still in the possession of the hotel.

After many months, the owners of Company A became concerned that the hotel would copy their design. They applied for and were granted a registered design. After the grant of the registration, the owners discovered that the hotel had engaged another lighting contractor to produce their design. The successful lighting contractor even rang the owners of Company A when he was trying to copy their design to ask how certain effects were achieved as he was having difficulty copying it! There was no concern that any law was being broken in copying the design or that his actions were unethical. Presumably this was because he knew that it was highly unlikely that a company as small as Company A would have the ability to pursue him for infringement.

The owners believe that the finished product is an exact copy of their prototype. However, they have been unable to take any action to prevent their design from being infringed because they do not have the funds to engage a lawyer and pursue the imitator or the hotel

for infringement of their registered design. There is a strong feeling of powerlessness against imitators that are much larger in terms of size and wealth than Company A.

4. Benefits of using the IP system

In our discussions with the owners of Company A, it was clear that having a design formally registered has the main advantage of offering 'peace of mind' that legally, no one was able to copy their designs. Despite their recent experience with imitation, the owners still believed it was beneficial to have a registered design in the event that financial circumstances change and they are able to afford to pursue any imitators in the future.

Another benefit for Company A of using the IP system to protect designs formally is that it is one way of proving ownership of an original idea. The owners of Company A were also concerned about the protection of their artistic integrity and acknowledgement of design or idea as being 'theirs'. The owners of Company A were, in some ways, less concerned with losing money from their designs being copied than the moral inequity of having created an original design and then having someone else pass it off as their own work. They have a very strong sense of 'ownership' of their designs, as they are highly artistic. The registered design system at least provides formal acknowledgement of the 'ownership' of an original design.

5. Barriers to using the IP system

The cost of enforcement of their registered design was the primary impediment to using the IP system. The owners of Company A were unable to protect their registered design from imitation because they were unable to afford lawyers to advise, write letters of demand and, if necessary, pursue the infringer in court.

The owners of Company A also noted that there was a general lack of knowledge about intellectual property protection amongst small enterprises. They commented that most other small businesses like themselves believe that registration is more difficult, expensive and time-consuming than it actually is. Industry associations and other external organisations are rarely considered to be useful in the boutique furniture and lighting design industries. In addition, there are insufficient 'self-help' publications and avenues in the area of IP law and enforcement – it is really an area where legal advice is required.

Discussions with Company A also indicated that small enterprises are concerned that large enterprises with deep pockets retain all the power in business dealings with enterprises such as Company A. This fear of taking on a large enterprise prevents small enterprises from making full use of the intellectual property system to enforce their rights.

6. Success or failure of the IP system in meeting Company A's needs

The IP system was not successful in meeting Company A's needs because of the high costs associated with the enforcement of intellectual property rights once granted. The owners of Company A have a registered design that has not achieved its purpose of granting a limited monopoly over the design and preventing imitation.

The owners of Company A commented that the $90 they spent in registering their design was affordable and accessible to small enterprises. Small enterprises such as Company A can afford to gain registration of their designs and are able to make the applications themselves. The owners of Company A dealt directly with IP Australia and did not receive legal advice in relation to the registration.

The owners of Company A said that they would use the registered design system again even though it has not prevented the copying of their most recent registered design. The reason for this is that registration in the formal system gives them ‘peace of mind’ that their rights may be able to be pursued in the future.

Case Study 2: Company B
Water Treatment/Sterilisation Company
Tuesday 28 October 2003

1. Company Background

Company B is currently a small two-person company. It sells water sterilisation products, which it has designed and developed since its inception in 1996. The company was, at one stage, an eight-person company. It sells its products primarily in Australia although it does have a small number of overseas orders. Ideally, the export market will be expanded in the future.

Company B has invented a unique system of disinfecting water using silver colloid, which allows the water to remain disinfected for up to 30 days and possibly longer. The system can be used both domestically and in many other areas such as health, swimming pools, offices, restaurants, aquariums, brewing etc. The main benefit of the system developed by Company B is the length of time for which the water remains disinfected.

2. Use of Intellectual Property

Company B currently holds sets of patents for 4 inventions relating to water sterilisation. The most recent of these 4 inventions is patented in Australia and the United States only. The previous three patents were registered in other countries as well. The two patents with the widest registration are patented in the following countries: Australia; Canada; China; Europe; India; Indonesia; Japan; Korea (South); Malaysia; Mexico; New Zealand; Pakistan; Philippines; Singapore; South Africa; Taiwan; Thailand; USA; Vietnam.

Company B also has some trade marks in relation to product names, but it did not provide further details.

3. IP Strategy

Company B's IP strategy is to use patents as a tool for marketing and promotion rather than as a means to protect a monopoly. When a product is developed, Company B uses patent attorneys to apply for and register its patents in the countries in which it is hoped that product will be sold. There is no systematic monitoring of whether other products are infringing Company B's patents.

Currently the company has 3 more inventions drawn up ready for patent registration but does not have the funds to develop the products. Thus, these inventions will not be patented or developed until there is enough capital in the business to market and sell the product.

Trade marks are not considered part of the overall business strategy of the company. Rather, they were only applied for in order to strengthen a passing off claim made in the Federal Court. This claim was made following a potential infringement of one of Company B's patents. A former inventor and a former agent of Company B's entered into a business

arrangement with another party who had been involved in testing the product at a government health service (at the request of Company B). These parties developed and tried to sell a product that was virtually identical to a Company B product and was even called '[Name] 5K' when Company B's product was called '[Name] 5000'. Company B took legal action in the Federal Court of Australia for passing off. After spending over $200,000 in legal fees, and after months of delay, the matter was settled at a second mediation. The owner of Company B would have preferred to see the case through to a hearing, but because of the mounting cost of legal fees and the fact that the other party was close to bankruptcy, he agreed to settle at mediation. This was not seen as the ideal outcome. As part of the settlement, the rival company is not permitted to use, sell or refer to the water sanitisation product in question.

4. Benefits of using the IP system

The owner of Company B is of the view that the patent system in Australia does not protect intellectual property rights at all. The main benefit of patents is seen by the owner of Company B to be as a marketing or promotional tool to help sell the product. Being able to claim that a product is the subject of a 'worldwide patent' adds credibility and thus selling-power to the product.

There were no perceived benefits of owning a patent for the purpose of monopoly, although the owner of Company B did note that having a patent will sometimes slow an imitator down. The owner of Company B noted that secrecy, as an alternative to patenting, was not useful in his industry because once the product was taken apart by an inventor, it would be easy to reverse engineer.

5. Barriers to using the IP system

The main barrier to using the IP system successfully is the cost involved in enforcement. The owner of Company B believes that all SMEs consider the patent system to be 'irrelevant' for the purposes of actually protecting an SME owner's IP. This is because of the widespread belief that an SME is not going to be able to enforce its patent rights against an infringing party because of the high cost involved in patent litigation and the uncertainty of outcome, for example the uncertainty that their own patent will be held to be valid.

Company B does not see the IP system as a means to protect a monopoly over an invention in its area of technology because other enterprises hold the view that they can work out a way of 'getting around the patent', i.e. designing something almost identical which does not infringe the patent. Company B does not consider the fear of infringing to be a deterrent. Patents owned by small enterprises are apparently infringed on a regular basis because it is assumed that the enterprise will not have the capital to pursue an infringement claim.

Another problem for Company B in using the formal legal system to protect IP was the lengthy delays in the court process. Court action generally stalls all the other revenue-producing activities within the business, which can have serious consequences for an SME. The longer the parties wait for an outcome, the more difficult it is to run the business

effectively in the meantime. The owner of Company B believed that the courts should run cases on an expedited basis for small enterprises to help overcome this problem.

6. Success of the IP system in meeting Company B's needs

The owner of Company B did not believe that the IP system was at all successful in meeting his business needs. He felt that currently, everyone ignores patents and believes that the system doesn't work. He stated that the only time a company would sue another enterprise for infringement would be if both enterprises were successful enough to have the funds to make litigation both possible and worthwhile, which does not normally occur where SMEs are involved.

The view of the owner of Company B is that the Australian government needs to develop a climate which is respectful of a person's intellectual property to change the attitudes of would-be imitators. If the government sets the tone about the way people should behave, then the owner of Company B believes that the public will start acting more ethically and will stop "ripping off" other people's ideas.

The owner of Company B noted that in the future, he would most likely take patents out in China and the United States only. He believes that these are the only countries in which patents could be protected properly, due to the 'big brother' mentality of those governments – something that he saw as lacking in Australia.

Case Study 3: Company C
Clothing designers and retailers
Thursday 30 October 2003

1. Company Background

Company C is an Australian owned company that designs women's clothing. It sells its designs at 20 retail outlets in Queensland, New South Wales and Victoria. Company C currently employs around 75 full-time staff and 60 casual/part-time staff. In 1995, it opened its first stores in Melbourne. Company C has no export business and has no plans to export in the near future.

Company C was created to fill a certain gap in the Australian market only. Around 95 per cent of Company C's garments are made locally (the actual making of the garments is outsourced to various factories, which supply much of the clothing industry) with only 5 per cent being imported from overseas. Company C has stayed with local production for three reasons:

- to support the factories that it has been working with for well over 10 years;
- to ensure the quality and fit and to supply customers with the latest styling and design first in the marketplace; and
- to help eliminate the exploitation of home working machinists in Australia. Company C would not have any influence over the conditions of machinists in countries like China.

Most textiles are imported because the local industry does not offer the products needed for fast up-to-date fashion.

2. Use of Intellectual Property

Company C has registered trade marks protecting its brand name "Company C" in Class 25 for clothing and Class 42 for retail of clothing and clothing accessories.

For protection of its designs, Company C relies solely on copyright law. It has no registered designs.

3. IP Strategy

Responsibility:
The three directors of Company C are responsible for making all IP related decisions.

IP Strategy:
The strategy of Company C in terms of its IP has been to sue all imitators who do not respond to its letters of demand. Legal proceedings have never reached the stage of a hearing as they have always been settled prior to hearing.

Since its beginning in 1995, Company C has taken action against 13 different imitators selling identical garments (at cheaper prices). These imitators have ranged from large retail

chain suppliers, to very small clothing imitators. Company C only takes action where the imitation is identical in terms of fit, style and size. Responses to letters of demand have been varied. In each case (except for one case which is still afoot), there was eventually a successful resolution involving the removal of the offending garments from sale by the imitator as well as an undertaking not to imitate in the future. In certain cases there has also been compensation paid and/or reimbursement of legal costs to Company C as part of a confidential settlement.

The future strategy of Company C is to continue with its aggressive enforcement of copyright in its designs by continuing to issue letters of demand to imitators and if unsuccessful, issuing court proceedings. This only applies to copying within Australia because Company C is not involved in the overseas market and does not intend to export in the near future. The rationale behind this strategy is simply to 'stem the flow' of imitators. To date, it has appeared to be successful.

There is no one employed specifically to search for imitators. Retail shop assistants will generally report any infringing items that they find in other stores. More recently, a garment maker approached Company C with a garment he had been asked to copy by another clothing wholesaler or retailer. The owner of Company C noted that in the past, the culture of the clothing industry was to ignore copying and this incident would have gone unreported. However, it is now the case that imitators will most likely be pursued. Thus, people such as the garment maker warn those who want to copy that it is probably too risky.

A paper trail of the designs is also kept by Company C so that it can prove that its design was first in time. The information kept shows dates of the design, production and first sale in the stores.

4. Benefits of using the IP system

The benefit of using the legal system to put pressure on imitators to stop infringing designs is well demonstrated in this case study. In each of the 13 cases of direct copying of Company C's garments, legal action was taken (using lawyers) in the form of letters of demand and, in about half of those cases, proceedings were subsequently issued. In every case, a successful result was obtained.

In this case study, the IP system itself can be seen as successful in that the copyright in the designs was protected by the owner of that copyright. It is also important in the fashion industry that copyright vests automatically and does not require registration. This is because of the high turnover of styles in a business such as Company C's. Company C produces 100 new styles per month and it would be unworkable to be required to register these before protection is granted. The time delay would also have an impact on this industry, which is based on new styles being released as soon as possible to keep up to date with the trends.

5. Barriers to using the IP system

According to this case study, the main problem with the IP system as it relates to fashion design law is that there has been no test case setting out clearly when an imitator will or will not be unlawfully infringing the copyright of another designer. The lack of a test case is due to all these matters being resolved in out-of-court settlements rather than by a court. This creates some degree of uncertainty for both designers and imitators.

The other barrier noted by the owner of Company C was that a business smaller than his would not have been able to engage lawyers and pursue infringement the way in which he was able. Company C has invested a considerable amount of money in legal action, which a smaller enterprise would not be able to afford. For example, the current litigation being run by Company C has already cost around $80,000 in legal fees and is continuing.

Another problem encountered by Company C is the confusion between trade marks and registered business names. Company C has a registered trade mark for the brand and company name “Company C”. It discovered that a company in Sydney was operating under the name “Company C Boutique Pty Ltd”. This was a registered business name but not a trade mark. When Company C opened stores in Sydney it issued letters of demand to “Company C Boutique Pty Ltd” asking it to refrain from using the company name and label with “Company C” on it. Company C managed to prevent the boutique from using “Company C” on its clothing labels but not to cease trading as “Company C Boutique Pty Ltd”. At this point, Company C registered its trade mark in Class 42 – retail clothing services. The Sydney boutique ceased operating but for reasons unrelated to Company C’s requests and presence in the market.

6. Success or failure of the IP system in meeting Company C’s needs

Use of the formal IP law system was the only way that Company C was able to stop the problems it had with imitation. Letters of demand and issuing proceedings were both considered to be highly effective. As a result of more clothing companies taking legal action, the owner of Company C is of the opinion that the attitude towards copying in the industry has changed dramatically over the last 2-3 years. Many high profile design companies have taken legal action against imitators, which is sending a strong message out to those imitators that they should not continue with their practices. There has also been quite a lot of publicity about legal action taken by various designers in the industry newspapers such as “Ragtrader”, which may have contributed to deterrence of imitation, in addition to word of mouth. The owner of Company C noted that industry associations have been largely unhelpful regarding problems of copying.

One area the owner of Company C commented upon regarding law reform was in relation to business names and trade marks. The owner noted that there should be a national register of business names to ensure that businesses are able to expand to other states without worrying about enterprises being registered with similar names in those states. Another possibility is a system where the business names register is cross-referenced with the trade marks register.

Case Study 4: Company D
Software design company
Friday 31 October 2003

1. Company Background

Company D is a small Australian software design company. It was established in 1996 and has a fluctuating workforce of anywhere between 5-20+ people (designers, programmers and graphic artists), depending on the project workload. Company D designs sport and equestrian computer games for PCs and Playstations. These games are sold both locally and overseas. The company may expand its product range to include other types of games in the future.

In the past, some of Company D's games have been developed as part of a joint venture with other software design companies overseas. Distribution arrangements are also in place with a number of distributors around the world. The only regions where Company D's games are lawfully sold at present are:

- Australia
- New Zealand
- United States
- United Kingdom
- Europe

2. Use of Intellectual Property

Company D has registered trade marks for the names of its various games. These trade marks are registered in Australia.

Company D relies on copyright for protection of the software. It has no patents.

3. IP Strategy

Responsibility:
The three principal owners and directors of Company D are responsible for its IP strategy. Two of them are experienced IP lawyers.

IP Strategy
To date, Company D's strategy has been to register trade marks in Australia for the names of its computer games and to pursue copyright infringers by issuing letters of demand. No proceedings have been instituted because all imitators have been overseas and litigation has not been considered worthwhile or practical given the difficulties in relation to cost, time and uncertainty of outcome associated with court action in foreign jurisdictions. The interviewee at Company D stated that if anyone infringed copyright in Australia, the company would most likely pursue this through the court system if necessary.

The problems that Company D has experienced with infringement overseas have all, to date, been due to former distributors or joint venturers taking Company D's products and relabelling them for sale under a different name. Company D has noticed a marked decrease in sales of its products where there are problems with piracy. Due to the fact that the problem has mainly been with distributors, Company D is looking at using larger and more reputable distributors in the future as a strategy to overcome this issue. Company D has thus identified the need to deal only with the bigger players in order to protect its IP. It maintains this strategy even though it has had a negative experience with a large multinational company in relation to one of its ideas.

This negative experience occurred when Company D met with a large multinational in the games/toy industry to suggest a new idea for a game that Company D would design and develop. The meeting was subject to confidentiality arrangements. The large company declined to engage Company D to develop its idea for a game. A few months later, the large company released the product onto the market itself. Company D did not pursue the large multinational for this incident due to the costs involved in pursuing a large company and the uncertainty of outcome, given the difficulties in proving a breach of confidentiality.

Where problems have arisen with distributors and other overseas enterprises, Company D has sometimes negotiated settlements following letters of demand. In some cases, the best outcome has been for Company D to end up with a clear position on its ownership of IP. This arises where another overseas company has potentially owned some of the IP rights in games developed by Company D. An example of this is a joint venture arrangement between Company D and an overseas company for the production of a particular game. The best outcome in this case was for Company D to ensure that the infringing company had assigned all its IP rights to Company D so that the problem would not arise in the future.

Another aspect of Company D's IP strategy to prevent piracy has been not to enter the Asian market. Although the company would have liked to export to this market, particularly the Japanese market, it has not done so because of the problems with imitation and piracy it would face in Asia.

4. Benefits of using the IP system

Company D noted that it is important for its business that it has a clear understanding of IP rights in the games it produces in order to gain the co-operation of financiers and large distributors. This is seen as a particularly important aspect of IP protection. In order to secure certain finance arrangements it has been very important for Company D to be able to show that it owns all the IP in its products, and indeed to secure those rights.

In terms of trade mark registration, Company D considered the process of registration to be relatively straightforward without using trade mark attorneys. The IP system is also valuable for protection of the names of the products Company D has developed. Where there have been instances of product infringement, the trade marked name of the game had been removed and replaced with something else.

5. Barriers to using the IP system

For Company D, the main barrier to using the IP system successfully was the difficulty of using private enforcement measures to secure IP rights in overseas jurisdictions against defendants of doubtful reputation and financial stability. Because of the high cost and uncertainty of outcome of pursuing such infringers, there is little that companies such as Company D can do about imitation overseas. This is a huge barrier to enterprises that rely on the export market for much of their revenue, as Company D does. The perception (and reality) is that copyright infringement is much easier to 'get away with' when the copyright owner is in another jurisdiction.

A suggested remedy to the problems associated with private IP enforcement is increased law enforcement and responsibility by governments for pirated copies of software. In summary, the Australian Government could bring diplomatic pressure to bear (as the US has done) to encourage foreign governments to take IP infringements seriously.

Also, an 'Australian Office of IP Enforcement' or some such body could be established to police and prosecute infringement of Australian IP overseas. This body could identify infringement of Australian IP and pressuring the relevant overseas governments about it, and perhaps even help guide Australian enterprises through the minefield of enforcement of Australian IP overseas. For example, it could provide advice on selection of good lawyers and about pitfalls etcetera. Such a system could be set up on a user pays basis, where those who successfully used the service could pay for it.

Company D sees copyright protection as the principal form of protection for software. However when Company D was originally founded, it did explore the use of patents for some of its ideas. It spent in the vicinity of $50,000 without any productive outcome, so abandoned those ideas and turned to making computer games. The patent system was seen as far too expensive for an enterprise of the size of Company D.

6. Success or failure of the IP system in meeting Company D's needs

The interviewee at Company D noted that the IP system is extremely useful for the purpose of securing finance but has weaknesses in terms of actually protecting its products from imitation in overseas markets. However, despite this fact, Company D noted that it would not be in business without the rights conferred by copyright and trade mark law. In short, if it was legal for people to sell pirated copies of games, Company D would not exist. This suggests that the current system does deter pirating to a certain degree.

Case Study 5: Company E
Biotechnology company
Wednesday 5 November 2003

1. Company Background

Company E is a research-based drug discovery company with a focus on human health. It is a small publicly listed Australian company with approximately 50 employees in Australian and overseas offices. Employee numbers are kept low by outsourcing all work that is not at the core of the business.

Company E's core business is in the early discovery process of pharmaceuticals. Thus, its product is its intellectual property, which it then licenses to large pharmaceutical companies for further testing and public sale. Company E will usually conduct pre-clinical trials to establish whether the material is safe. At times it may also conduct Phase 1 or Phase 2 testing to demonstrate that the product is safe for use on humans. It is unlikely, at this stage, that Company E would take a product right through to Phase 3 testing, which would include an efficacy trial on thousands of patients. Testing up to this level is, instead, undertaken by the large pharmaceutical companies to which the product is licensed.

2. Use of Intellectual Property

IP is the key product of Company E's business. Thus, Company E has patents on all discoveries that it intends to license and also some trade marks over its own name and certain product names.

Company E takes out patents in various countries. The decision as to where to patent a product is made on a case-by-case basis and a cost benefit analysis is undertaken, given the considerable expense of patenting worldwide. Each case depends on the nature of the discovery in question and the Company's plans for licensing the rights to the discovery. At a minimum, Company E would patent in the US only, as this is the principal pharmaceutical market. However, most often it will patent in the US, Australia, New Zealand, Japan and the key European markets. South America is seen as an emerging market and sometimes patents are applied for in South American countries as well.

3. IP Strategy

Responsibility:
The company's Research Director is largely responsible for IP strategy and management in consultation with a wider team. The Research Director estimates that around 20 per cent of his working time would be taken up by IP issues. This includes both strategy and management of existing IP. Lawyers and patent attorneys are used for all patent applications and sometimes for 'patentability' advice (i.e. advice as to whether a particular discovery is patentable) or other specialist advice.

Patent Strategy:
Company E's strategy is to maintain a strong focus on patenting and securing IP rights especially where external bodies (e.g. universities or other research institutes) are involved in the development of new products.

When a new product is being investigated and developed, the first stage of Company E's IP strategy is to maintain strict secrecy. It has clear written confidentiality agreements with all third parties as to secrecy and where IP rights will reside.

Once a product is discovered, there will be meetings held to discuss whether (and where) the product should be patented. The following questions are generally asked:

- Can we patent this product?
- Why do we want to patent this product?
- If we can patent this product, what could we use the patent for? (i.e. how do we want to exploit this commercially?)

In answering these questions, Company E determines which countries to file patent applications in. The 'zero risk' but most costly option is to patent the product in all countries. Generally, however, Company E adopts a more modest approach and patents only in several key countries. Parallel importation laws are also taken into account as they may prevent the need to patent in certain countries. Depending on the stage of development a large pharmaceutical company who licenses Company E's IP might influence patenting strategy. For example, a licensee might require that patents be filed, at its cost, in a more extensive range of countries than considered necessary by Company E.

Company E noted that its strategy in relation to where and what to patent is often fluid. For instance, between the time of the provisional patent and final grant of patent, its strategy may change. This is because a new version of the product may have been tested and proven to be more useful so patenting efforts will then be focused on that product instead.

Company E also noted that at times, depending on the product involved, a decision will be made to use secrecy rather than a patent to protect a product. This decision is rare and usually only applies to research tools, not to pharmaceutical products. Secrecy can be used where, for example, a method is developed to discover a drug. Due to the difficulties of proving that someone else used the same method to produce a certain result, the patent is not seen as adequate for the protection of the method (because prosecution would be extremely difficult). Thus, on a case-by-case basis, Company E will make a decision as to whether to keep the product secret.

To summarise, Company E's IP strategy in relation to patents is to take a very serious, robust approach to patenting a new discovery in the first instance and to make it clear to the market that it is locking out areas of patent space. After aggressively applying for patents in the initial stages, Company E will then review its strategy when the provisional patent is about to expire, to determine how to proceed with that particular product. In terms of infringement, if there was a clear example of infringement of one of its patents by a competitor and this could not be resolved through negotiation, Company E would use litigation. This has not occurred to date. Company E is of the view that it is not in the long-

term interests of large pharmaceutical companies to destroy smaller R&D biotech companies or to disrespect IP ownership. Thus, business relations in the field are typified by licensing arrangements or, in some cases, attempts to buy the smaller companies out if the pharmaceutical company wants to use and commercialise a product that is patented by the smaller company.

Trade mark Strategy:
Trade marks are not considered to be as prominent a feature of Company E's IP strategy as patents are, for obvious reasons. However, where a particularly marketable name is devised for a drug it will be trade marked. It will then be included as part of the IP package to be licensed to a large pharmaceutical company along with the patents. Sometimes, a drug will simply be given a codename and thus not trade marked. Where there is an actual product developed, for example a diagnostic kit (rather than a pharmaceutical formula which requires further testing), a trade mark will usually be registered for that product. Company E has found that trade marked names for particular drugs can be useful at the stage of negotiations with large pharmaceuticals in relation to licensing agreements.

4. Benefits of using the IP system

Without the patent system, Company E could not operate its business. It is reliant on patenting in order to license its discoveries to larger enterprises that have the resources to commercialise the product.

Company E sees the Patent Cooperation Treaty (PCT) system as a positive development, which has simplified the procedure for international patent applications. This is a very useful streamlining process for pharmaceutical patent applications in multiple countries, as it has introduced one system for all PCT countries until the final stages of patenting.

Another positive comment about the IP system was that the quality of Australian legal advice on IP issues is very high.

5. Barriers to using the IP system

For Company E cost is a perennial issue, especially in the global patent system. Company E noted that costs were also increased with the 'cost-stacking' procedure involved when applying for patents internationally (i.e. a company needs to have local lawyers, who then liaise with lawyers in each of the overseas jurisdictions). This greatly increases legal fees as Company E is charged by more than one law firm for each item of correspondence between the enterprises.

Another comment made by Company E in relation to costs was that there is no standardised amount charged for patent applications worldwide (i.e. there are large discrepancies between costs in different countries). There are also discrepancies between different overseas countries in terms of how they deal with pharmaceutical patents.

Another concern to Company E is whether or not the patent will be granted and whether it would withstand a challenge of validity. To date, none of its patents have been legally challenged and Company E has not been involved in any litigation. The uncertainty of

validity is not sufficient to cause Company E to change its patenting strategy, as patents are vital to its business. Generally, the initial examination will alert the enterprise to whether there will be problems with obtaining the patent and its strategy can then be reviewed if necessary.

In relation to time, Company E noted that the length of time it takes to apply for a patent is not a pressing issue. In the biotech industry (compared to the clothing industry for example), product development times are measured in years, so quick turnaround on patent applications is not as vital. Time delays were not seen as a real barrier. Overly lengthy examinations prior to grant can be problematic, however.

6. Success or Failure of the IP system in meeting Company E's needs

Company E has demonstrated success in using the IP system to meet its needs. Without the patent system, Company E noted that it would be futile to engage in commercial research.

Company E felt that the current patent term (20 years) coupled to Supplementary Protection procedures was generally sufficient and protected both the interests of R&D enterprises as well as the broader public interest of having access to new pharmaceuticals at a reasonable price.

One issue that Company E has in relation to full protection of its IP is related to the way academic institutions and granting authorities deal with IP. Often, these institutions did not recognise the value of secrecy instead of patent applications and due to the pressures placed upon them to show scientific progress were eager to publish information in academic journals. Company E has tried to deal with this problem by enforcing strict contractual agreements prior to undertaking research with such institutions.

Case Study 6: Company F
Clothing Design Company
Thursday 6 November 2003

1. Company Background

Company F is a designer women's clothing company with around 20 employees. It is an Australian company that has been in operation for just over four years. It began with wholesale sales in Australia only. Around nine months ago it started a fast-growing export business. The company now has agents in various countries around the world and has developed a wholesale export business to the United States, United Kingdom, Japan and New Zealand. It has a smaller market in Hong Kong, Singapore and Dubai. Currently, Company F is exploring the possibility of expansion into the European market and in the future may also consider retail sales.

2. Use of Intellectual Property

Company F owns copyright in its designs but has more recently started using the Australian registered design system to protect its key, repeat designs. No designs have been registered internationally to date. Designs which have not been registered will be protected by copyright law only.

Company F has a registered trade mark over its company name, which is also its label. This trade mark is registered in Australia, Europe and all countries to which it currently exports (listed above).

3. IP Strategy

Responsibility:
The CEO is responsible for all issues relating to IP. Company F also uses external lawyers for general advice, design registrations and the pursuit of imitators.

Design Protection Strategy:
Because Company F is a designer fashion label, it encounters many problems with imitation. Imitators include both small and large enterprises that produce cheaper versions of its garments. Employees and other supporters of the label report instances of infringement, which are then investigated by the Company. Often, the infringers will have changed some aspects of the design slightly and are thus, much more difficult to pursue. In 70-80 per cent of cases of imitation, Company F will consult its lawyers about potential action and strategy. All examples of imitation that are known to the company have occurred in Australia.

After unsuccessful attempts to protect copyright in its designs, Company F recently adopted a strategy of protecting certain designs by using the registered design system. Previously, it had tried issuing letters of demand to pursue infringers under copyright law.

This proved to be fruitless and no settlements were reached. A cost-benefit analysis was undertaken in deciding whether to issue proceedings against imitators and it was decided that legal action was not worth the risk in terms of the cost and the uncertainty of outcome.

Given the failure of the copyright system to protect Company F's designs, its lawyers recommended using the registered design system. To date, this strategy has been much more successful in protecting certain garments from imitation. The strategy adopted is to register only those designs that the Company thinks will be around for more than one season. In the fashion industry, most designs are produced for one season only, so it is only the key designs, which are predicted to be in demand for between nine to eighteen months, which will be registered. Company F currently has around nine different registered designs.

Trade mark Strategy:
Company F has not had any problems with trade mark infringement. However, if this did occur, Company F would protect its trade mark in the label and company name aggressively. The rationale behind this strategy is that Company F has built up a reputation both nationally and internationally around that trade mark, which it would not want tainted.

Company F would defend its trade mark at all costs.

4. Benefits of using the IP system

The registered design system has proven to work well for Company F. Although it experienced frustration and stress with the use of copyright law, it has not encountered these problems with design law. Company F found that the design registration process was relatively simple, easy and fast.

In addition, where registered designs have been infringed, Company F has had speedy and satisfactory resolutions to its letters of demand. Out of 6 cases of registered design infringement in the last 9-12 months, all cases have resulted in the offending items being removed from sale and in two cases, compensation has also been paid. It is estimated that this compensation would have covered the cost of legal fees involved in pursuing the infringers. The Company did not, however, recoup the $50,000 – $60,000 previously spent on legal fees when trying to pursue imitators under copyright law.

5. Barriers to using the IP system

The difficulty of relying on the registered design system is that in order to register its designs, Company F must not have shown the design anywhere, including to potential buyers. This requires the Company to make a decision about which designs will be 'perennials' and which will only be seasonal without first gauging market reaction to the designs. If its decisions about what items will be ongoing styles are incorrect, then the Company will potentially have best selling, repeat-season designs that are not protected by the registered design system.

Another main barrier to using the IP system for Company F is the amount of time that it takes to pursue imitators if court action is taken. It was considered that the designers' time should be focused on designing and promoting their label rather than on litigation. Due to

the small nature of the company and the need to be designing constantly in order to keep up with the trends, Company F cannot afford to take any 'time out' to pursue infringers. Because it is relatively young, the Company has decided to concentrate on growing its business and on innovating, rather than focusing time and energy on paperwork and litigation.

In addition to the issue of time, the cost of litigating is a major barrier to enforcing IP rights in registered designs or copyright. Company F would only consider litigation as a last resort if there was high degree of certainty of outcome and if the infringement occurred in Australia. Litigating overseas it considered to be highly unlikely because of the difficulties of legal action in an overseas jurisdiction, including the costs involved. Again, on most cost-benefit analyses, litigation would not be worth pursuing.

Company F does not believe that litigation would result in deterrence of imitators in the future, so it would not invest in litigation for the potential outcome of deterrence. There are also issues related to the negative publicity that the label and company image would receive if litigation were pursued. An exception to this might be where positive publicity for the label could be gained by pursuing, for example, a large multinational who could be seen as ripping off the 'little guy'. Company F would only consider pursuing such a company if it felt it could reach a settlement and its case was watertight in terms of identical copying.

6. Success or failure of the IP system in meeting Company F's needs

For Company F, the IP system has been successful to a certain extent since it began using the registered design system. One measure of its success is the flexibility of the system to give protection by a different means (i.e. registered designs) where the more traditional means of protection (i.e. copyright) fails.

However, the IP system has not been successful in preventing imitation or even deterring imitators. The copyright system has proved to be particularly unhelpful in terms of protecting intellectual property in clothing designs. There are also limitations with the use of the registered design system due to the requirement not to have disclosed the designs prior to registration.

The system could be seen as failing to provide a suitable enforcement mechanism for IP rights. A common concern is that private enforcement measures are not always viable given the high cost and time required for a very uncertain outcome.

Case Study 7: Company G
Sonar Technology Company
Thursday 6 November 2003

1. Company Background

Company G is a small Australian R&D company which specialises in developing surveillance equipment (hardware and accompanying software) using sonar technology. It was incorporated in 1995 and currently has 15 employees. It began as a small private company with three inventors working from home. In 2000, the controlling interest in Company G was sold to investors and was soon after floated on the stock exchange. In 2002 Company G was taken over by another publicly listed company and was then de-listed. It is now a wholly owned subsidiary of a company that employs approximately 6 people.

Company G has recently completed its first product, which is now ready for sale. Building on several years of prior work and experience, this product has taken 10 engineers about 12 months to develop and has cost approximately $1 million (not including hardware). In addition to local sales, the principal markets for this product will be Asia and the Middle East.

2. Use of Intellectual Property

The Company currently has no patents or registered designs.

Copyright law protects the software that Company G has developed for use with its hardware.

Company G has some registered trade marks over product names but not for its company name.

3. IP Strategy

Responsibility:
The Chief Operating Officer is responsible for IP strategy at Company G. He makes recommendations to the Board, which then makes the final decision on how to proceed with IP strategy. Patent and trade mark attorneys have been used for the registration of provisional patents and trade marks.

Patent Strategy:
In the past, Company G's practice was to submit an application for a provisional patent and then to submit an amended provisional patent towards the end of the 12-month provisional patent period in order to achieve a further 12 months of provisional patent protection. All but 1 of 10 provisional patent applications made by Company G were made in Australia only (due to cost). The single international application was made in the USA and the UK.

Whilst the provisional patents were still valid, the company was sold to investors. It is believed that the provisional patent applications were made largely for the purpose of attracting investors. Even if this was not the main reason behind the applications, they were at least useful for this purpose.

When the company was bought by investors, its IP strategy was reviewed. It was necessary to make a decision as to whether any of the provisional patents were worth taking to the final patent stage given the considerable cost involved in that process. The estimate given to the board for the cost of this process was $100,000 for each patent (with coverage in Australia, USA and Europe).

Apart from the high costs involved, a factor considered in making this decision was the risk that someone would infringe the patent and thereby remove Company G's monopoly (in practical terms). It was noted that patents do not prevent other parties from using the techniques or technology disclosed but simply provide the legal grounds for taking action against an infringer. The value of owning a patent was thus evaluated by the board in terms of Company G's ability:

- to determine whether its IP had been copied;
- to take private legal proceedings against that infringer; and
- to predict the outcome of any court proceedings.

Another issue that was taken into account was the requirement of disclosure when applying for a patent. This was seen as providing a simple and convenient method for any infringers to replicate Company G's product. Company G would then need to have the funds to pursue the imitators through the legal system. In addition, there was some concern that the patents developed by Company G may not withstand challenges to validity given that they are generally small innovations or advances on already existing technology.

These considerations were balanced against the fact that patents have value in demonstrating to investors or the Stock Exchange that Company G possesses unique IP.

After weighing up all factors, Company G adopted a strategy of **not** using the Australian or overseas patent systems to protect its IP. The preferred approach is to stay ahead of the market and to keep all knowledge of IP confidential using clear non-disclosure agreements with employees and contractors. At present, Company G has no real competitors as it is creating a market that has not previously been explored. If faced with imitation, Company G would simply compete with the imitators. In addition, Company G has the option of pursuing software infringers under copyright law (but again, this is considered to be highly costly and unlikely to occur unless the imitator was in Australia). The exception to the rule of not applying for patents would be if Company G decided to license a product (including its IP) to a customer. This has not occurred to date.

Trade mark Strategy:
Trade marks have been registered for various product names in Australia only. They are considered to be useful to protect the specific names that describe Company G's products.

4. Benefits of using the IP system

Company G sees the main benefit of using the IP system as its value when seeking investment or funding. Investors are keen to buy into a company where there is some identifiable IP that has been verified as original and worthy of protection by an independent third party such as IP Australia.

5. Barriers to using the IP system

Company G does not consider the IP system to be useful in terms of actually protecting its IP because of the high costs of both patent applications and enforcement of IP rights. This includes the monetary cost and the cost to the company in terms of time spent involved in applications and litigation. It is estimated that around 2 weeks of an engineer's time would be spent preparing materials for a provisional patent application.

According to Company G, the uncertainty of outcome in litigation is also a major barrier to any enterprise that decides to pursue an infringer. It is a source of frustration that experts, such as lawyers, are unable to guarantee what a court's decision may be. The fact that a patent may be successfully challenged for its validity is also a deterrent to using the system. In short, the risk of patent litigation is seen as too high to justify pursuing an infringer. Even where court action is successful, the interviewee at Company G believes that there is a general perception that the law in this area is not taken seriously and people in the high tech industry often ignore it.

6. Success or failure of the IP system in meeting Company G's needs

The IP system has not met Company G's needs in that the patent system was seen as inaccessible due to time, cost and lack of external enforcement measures. However, this has not affected the Company's ability to grow and continue to develop products to date.

The interviewee at Company G noted that a specialist small claims tribunal (where legal representation was disallowed) for cases involving infringement of IP rights would be a useful forum to resolve disputes. Such a forum would be accessible in terms of costs and would create a more balanced playing field in disputes where small and large enterprises were involved. It would also provide a quick solution in comparison to Federal Court action, which can take many months to resolve.

Case Study 8: Company H
Biotechnology Company
Wednesday 12 November 2003

1. Company Background

Company H is a research-oriented biotechnology enterprise that specialises in chemical compounds for the pharmaceutical industry. It is a small Australian enterprise that is publicly listed on the ASX. Company H specialises in early stage research and innovation. Most of its work is done in a laboratory setting, with trial work being done at the pre-human testing phase.

2. Use of Intellectual Property

Company H is primarily in the business of inventing new pharmaceutical compounds and developing them to the point of demonstrating that they can be converted to practice. Promising inventions are patented with the aim of subsequently developing international partnerships to commercialise fully and to distribute the resulting products. To date, the enterprise has been very successful at licensing one of its initial products, with a substantial licensing deal that involved up front payments and on-going royalties from the sale of subsequent products. While IP is critical to the success of Company H, with experience, it has also recognized the importance of patient investors and a strong management team.

Company H faced a number of interesting IP issues during the initial stages of establishing the company. The two founders of the company were working for a research organization. One of the founders left this research organization and as part of a settlement package negotiated the use of lab facilities for a period of time. This settlement also specified and defined ownership of IP surrounding particular areas of research that were to be the focus of the research at the lab facilities. When the company was initially being established, it obtained investment from an angel investor. This investor had a focus on IP and insisted that the other founder obtain a similar release from the research organization. This insistence from the angel caused a fracture in the founding team, causing one of the founders to leave the organization. At the same time, internal questions were raised in the original research organization and the release that was signed became critical to securing ownership of the key intellectual property of the company.

3. IP Strategy

Responsibility:
In all cases, the invention originates with the company's founder and research director. The company also employs a full-time intellectual property lawyer and has significant involvement with external legal counsel. The company also utilizes internal staff for the process of searching for prior art.

Patent Strategy:
The decision on whether to patent an idea goes through a number of stages. At the earliest stages of invention, secrecy is of paramount concern. In the early stages of the company, this secrecy was of such concern that any notes related to the invention were burned to prevent any distribution of the concept and communication with patent attorneys was entirely verbal. As the company gained more experience with invention and the patenting process, detailed journal and lab books were kept that documented and certified times and dates of invention. This was done in anticipation of potential issues in the United States patent process related to the 'first to invent' concept. After invention the Research Director assesses the value of the invention and its ability to be converted to practice. Inventions that pass this initial hurdle are pursued; ones that don't are shelved.

The second step of the internal patenting process is a determination within the enterprise, by the Research Director and/or his staff of whether there is prior art on this invention. This is done primarily by searching academic literature. Since secrecy is still a major concern, care is taken in the method in which the search is conducted. The search is done through on-line databases, such as those provided by the National Centre for Biotechnology Information in the US, but the search is conducted by searching for information in areas of closely related knowledge, so as not to directly enter the core concept's terminology into an electronic system. Academic literature is searched on the basis that most inventions are eventually published at a future date, once the inventor has secured their intellectual property. If a preliminary search of this literature does not reveal any prior art, then the probable field of competing inventions is narrowed.

The third stage involves a search of the US Patent office database. Similar care is taken in the method of searching. Based on these initial searches for prior art, a determination is made as to whether to proceed with patenting.

The fourth stage begins to involve of external legal counsel. A preliminary filing is prepared and submitted to the Australian Patent Office (APO). Company H always files patents in Australia first. It has found that the Australian system provides a good first step towards international protection and especially towards protection in the US, where its primary market is. The use of the APO provides the company with an early priority date and only requires it to file minimal initial information. This stage often takes up to 12 months as the submission is refined.

Since the ultimate goal of Company H is an international focus, applications under the Patent Cooperation Treaty (PCT) are almost always made. Company H saw the international review process as a useful initial review that gives it an idea of its ability to achieve successful patents in international jurisdictions.

The next stage of the process is to obtain an international patent. For Company H this process begins with a US application, as this represents the largest potential market for its products. However, it has anticipated broadening into other jurisdictions as the potential for commercialisation in these jurisdictions increases.

Finally, once an international patent is obtained, Company H works to broaden the claims of its patents and to file additional patents in closely related areas in an effort to create so called 'picket fences' around its initial patent. To date, Company H has had no issues with infringement.

Trade mark & Other IP Strategies:
Company H has trade marked the company name and logo in Australia only, however, it anticipates registering trade marks on an international basis as products begin to be commercialised and on the international market. The company also cited the ability to obtain a .com domain name as a critical step in the trade marking process. Without this domain name, the need to trade mark would be diminished substantially.

The company makes minimal use of other IP except some copyright associated with their web site.

4. Benefits of Using the IP System

Company H found a number of benefits to using the Australian patenting system. It sees the system as crucial to establishing an initial priority date as part of an overall global patenting process. This can be done at a relatively low cost of $3000 to $4000 and the initial application can be filed with a limited set of documentation. At the same time, the International Preliminary Examination Report from APO produced some 18 months later, provides valuable information on the potential success of establishing an effective international set of patents. In retrospect, the APO also provided a relatively friendly examination.

The Patent Cooperation Treaty was also seen as effective and particularly the recent international standardization of certain issues in patenting, such as patent length, has made the process of working globally much easier.

In general, the Australian system is seen as a relatively inexpensive method of obtaining a patent.

Government initiatives such as matching start grants have been highly useful. Company H also cited the government's free search service for prior art as being quite useful. However, the additional comment was made that the quality of the system had recently degraded.

5. Barriers to Using the IP System

Since IP is central to the operation of Company H, the main barrier to use was simply cost. Only those inventions that had a reasonable certainty of commercial success would be pursued with patent protection.

The availability of patient investors was also an issue for Company H. While the company was fortunate to have an early angel investor, it was subsequently discovered that this investor was not particularly patient, and did not appreciate the cost of obtaining international patent protection. A subsequent venture capital investor bought out the initial

angel investor. However, Company H commented that there is still only a limited subset of Australian venture capital firms that have an intellectual property focus and that appreciate the long development process of biotechnology products.

6. Success/Failure of the IP system in meeting Company H's needs

Company H faced a number of key issues in being able to use the IP system successfully. While these did not particularly represent barriers to use, they have substantial impact on whether the use has the potential to generate economic gains from its inventions.

One of the key issues raised by Company H was that the Australian IP system was very slow in the initial stages of the process. In particular, there is a six-month window where Company H does not know if it will have a priority date for a patent. Furthermore, there is no way of tracking or understanding what the status of its application is during this process. This was stated as a major issue with the process.

A second issue with the Australian IP system raised by Company H was that the quality of the review process, which Company H considered quite poor. While this has some advantages, the general feeling was that getting through the Australian patent review process was a necessary step, but that this did not provide a strong indication of whether the patent could be established in the tougher US, European and Japanese jurisdictions. The patent office often missed significant prior art and there was generally felt to be a lack of expertise amongst some of the reviewers. It was also felt that the Australian patent office had very low standards with relation to drafting of the patents. This included a high tolerance of ambiguous wording, failure to segregate claims, and weak standards on a requirement for conversion to practice. It was Company H's opinion that the patent office should insist on drafting standards that were more rigorous and based on the USPTO practice.

This problem is compounded by the limited availability of high quality IP legal advisors within Australia. Company H has experienced a number of significant problems arising from this situation. It initially used a local IP firm and received poor advice. The initial advice was that Company H had no hope of patenting the invention and it was advised against doing so. It subsequently moved to a second firm that was located out of state. This initially seemed fine, as long as the patent work was taking place within Australia. However, when Company H got to the point of filing within the US, serious problems arose that jeopardized its ability to obtain a US patent. These issues related to the fact that too many claims were made within a single patent, the drafting was ambiguous and tended to be done in a European style that was not acceptable within the US. Company H had expected that the advice it received may be limited from a technological perspective, due to the specialisation of the technology, but was surprised that the quality of the legal drafting was also an issue. This weakness in legal advice has potentially jeopardized their ability to obtain a US patent and has highlighted a need to have strong linkages to US patent attorneys. This is an additional cost factor, particularly when work is required to redraft the original Australian applications.

Company H also experienced similar problems when it acquired some intellectual property from another researcher. It took over this IP under the assumption that potential rewards would be shared with the original inventor who had run out of funds to pursue the patenting process further. They spent roughly $40,000 pursuing international patents only to learn that there were substantial issues with the intellectual property. These issues related both to the rights of the inventor to the intellectual property (there were claims from a prior employer) and the prior art of the patent. Neither of these issues had been recognized by the Australian patent attorney representing the inventor.

The company suggested that the program for training patent attorneys in Australia was not rigorous enough. The lack of a requirement to obtain full legal qualifications meant that quality suffered. It also cited a general lack of experience, particularly in relation to international patent issues.

Company H also noted that its ultimate success in commercialising an invention relied on the ability to find suitable partners to aid in the later stages of commercialisation. To do this, it often relies on the services of international technology brokers and investment firms that are primarily located in the US. To accomplish this, Company H needed to move beyond just the development and securing of intellectual property. Ultimate success relied upon strong management to exploit the value of its IP assets.

Case Study 9: Company I
Biotechnology Company
Wednesday 12 November 2003

1. Company Background

Company I is a micro-business in the biotechnology industry. The operations of the company are run by the Director of Business Development. Any research that is conducted is done on a subcontract basis. None of the research staff works directly for the company. However, a number of key researchers, including the company founder, are involved in the governance of the company. Much of the research that takes place is done in conjunction with a local university. The key focus of the company is on the commercialisation of pharmaceutical products for the medical industry. The primary area of commercialisation relates to oncology pharmaceuticals.

2. Use of Intellectual Property

One of the key issues in biotechnology is developing and managing IP assets to obtain value from them. There is a great deal of research and development and innovation that takes place, but few researchers have the management experience to negotiate licensing deals or to develop ideas into commercial products. Patents, and the monopoly rights that come along with them, are particularly important in biotechnology, where the time to market is long. Company I finds that it is a fairly straightforward process to create IP assets, but much more difficult to manage those assets and extract value from them. To Company I, a patent is one step in a commercial strategy.

3. IP Strategy

Responsibility:
The prime responsibility for the decision to patent rests with the founder of the company. Prior to this decision, the Director of Business Development will consult key technical staff and make recommendations on those areas with the most commercial potential. The company also undertakes a significant amount of work in conjunction with a local university. In many cases, the patents are owned by the local university but exclusive licensing rights are obtained by Company I. These licensing rights include the rights to improve the technology and this is often where the company's own patents are sourced.

Patent Strategy:
Once a promising innovation is identified, Company I begins a search for prior patents in this area. This is done by accessing a number of free databases and by searching both US and European patent offices. Company I never relies on attorneys to search for prior art, as this can be a costly process. The company often engages specialist firms who focus on the search for prior art. This is usually cost effective because these firms have subscriptions to

specialised databases and they can amortize the cost of these subscriptions across many clients.

The patent strategy for Company I differs depending on the innovation. In some cases, it files for a provisional patent first, and conduct thorough searches for prior art later. It is usually preferable to do a search first, but when there is a sense that it has a patentable invention, the search may be conducted at a later date in order to minimise costs. In some cases, the data in the prior art databases is 18 months behind, so waiting for 12 months limits the gap in the accessible data. Company I often files a quick provisional patent, just to establish an early filing date.

In other cases, where the value of the invention needs to be improved, the company may choose to delay filing. This happens in cases where it believes that it will need longer than 12 months to generate the additional data to improve the patent. Decisions surrounding this issue are often made in conjunction with the company's patent attorneys. The patent attorney is often critical in providing advice on what extra work is required to improve the value of the patent.

Company I will almost always file a Patent Cooperation Treaty (PCT) application to pursue its patents internationally. It also finds that the international preliminary examination document that is produced can be used successfully as a commercial document.

Company I scans for potential infringement against its patents even when it has not been granted the actual patent in a particular jurisdiction. Since a potential infringing enterprise cannot be liable for infringement prior to Company I's patent award date, Company I's strategy is to inform these potential infringers, which places a burdens them with having to incorporate Company I's patents into their patent filings as prior art.

Once Company I has obtained an initial patent, it works to broaden and protect its patent by strengthening the areas around it.

One strategy that Company I pursues after obtaining a patent is to monitor reviews of patents conducted in similar areas of technology to its existing patent. In some cases, international reviewers fail to acknowledge its patent as prior art. In these cases, Company I will send a note to the international reviewer making them aware of its prior art.

In commercialising its patents, Company I takes two defined strategies. First, it licenses its patents straight away, in order to generate short-term cash flow. Second, it conducts product driven projects in an effort to create long-term profit from new commercial products. It attempts to segregate these two strategies and where possible license in areas that it feels fall outside its core potential to develop commercial products. In both cases, it often relies upon US firms to source potential licensors and product development partners.

Trade Mark & Other IP Strategies:
To date, Company I has not pursued any trade mark protection. It did note that it was able to get access to a .com domain name and is planning a branding strategy around this name.

Confidentiality agreements and trade secrets were used quite frequently by Company I. It noted that it has in the past licensed trade secrets.

4. Benefits of Using the IP System

For Company I, the Australian IP system is an excellent vehicle to establish a provisional patent for a relatively low cost of $2500 to $3000. One particular example that proved successful for Company I was a case where quickly accessing the Australian IP system resulted in a successful defence against other inventors at a later date. In this case, Company I was in the process of preparing documentation for a patent. It was waiting for the results from some testing. This data became available on a Wednesday and it filed for an Australian patent on a Friday. The researcher involved made a presentation at an international conference the following week. Two other international patents were filed for the same invention within a short time after Company I's filing within Australia. However, the fact that it had established an early filing date, coupled with the fact that the two other international inventors attended the same conference at which the Australian inventor presented, led to Company I being able to secure the international patents.

The process of obtaining a patent is fairly straightforward and Company I focuses on the use of high quality patent attorneys. It found quality of patent attorneys to be good, but that there tends to be a shortage of them. In order to succeed with US patents, it has necessary been for Company I to have US patent attorneys.

In general Company I has found its interactions with the Australian Patent Office (APO) to be excellent. It has also benefited from the internationalisation of the patent system through the General Agreement on Tariffs and Trade (GATT).

5. Barriers to Using the IP System

While not a barrier to using the IP system, Company I felt that the Australian international preliminary examination was not nearly as thorough as the same examination in the United States or Europe.

Company I felt that many companies faced funding issues. There were constraints on capital. In particular companies faced shortages of off-balance sheet financing. As well, it was felt that while many small companies in various industries innovate, they are not aware that patenting these innovations can create a monopoly situation with competitors.

6. Success/Failure of the IP system in meeting Company I's needs

The success or failure of Company I is related to its ability to extract value from its IP assets. Company I felt generally that there was a lot of excellent innovation taking place through research grant systems such as Australian Research Council (ARC) Linkage grants, but that there were very few skilled individuals who both understood the technologies being developed and had the management skills to commercialise the technology. A focus on providing science graduates with business training would help to alleviate this issue.

One of the key issues identified in commercialising Australian R&D that originates in public research organizations is the accessibility of the research. In the United States, the Bayh-Dole Act mandates public research organizations to report on the results of their research, which allows external parties to access that research through central organizations. However, in Australia, this is not the case and external parties need to contact individual researchers in order to find areas of potential commercialisation. As well, public researchers have a tendency to publish their results, eliminating the ability to patent. One of the reasons for this is that university promotion systems favour publishing over patenting. Also, academics do not necessarily see the value of patenting research. As well, some of the commercialisation groups within universities are more interested in their own involvement in the commercialisation process rather than on ensuring that the Australian economy benefits from increasing innovation. The key is to ensure that everyone involved in innovation at public research organizations has incentives that are aligned.

Company I felt that it was critical to manage its legal counsel properly; otherwise costs for patenting would escalate. Company I noted that a government program to provide advice to small business on how to navigate the IP system cost effectively may be beneficial to increasing the usage of the system.

Company I encountered a very difficult situation that nearly resulted in the failure of its key patent. This situation occurred as it was pursing the internationalisation of its patent in the United States. The initial review of its patent by the United States Patent and Trade Mark Office (USPTO) resulted in a complete rejection of its application. Company I felt that the only way to overcome this strong rejection was to conduct a face-to-face meeting with the USPTO. This was expected to be an expensive solution, costing in the area of $20,000. Company I benefited greatly by being able to secure a COMET grant from AusIndustry to help fund this meeting. After travelling to the US, the key researchers met with their US patent attorneys and worked out several strategies for dealing with the USPTO. The meeting took place between the researchers, the US patent attorneys, the reviewer at the USPTO and the reviewer’s supervisor. After some discussion, the reviewer’s supervisor understood the key inventive steps in Company I’s invention, even though the reviewer himself did not. The supervisor apologized for the failure to comprehend the invention and all of Company I’s claims were recognized. This was the best possible outcome to the strategies which Company I had formulated. Had Company I not been persistent and willing to undertake the face-to-face meeting, it is likely that it would not have obtained its main platform patent in the US and the value of its IP would have been significantly impaired.

Case Study 10: Company J
Industrial Products Company
Tuesday 18 November 2003

1. Company Background

Company J is a medium sized company involved in the design of products for the power generation industry. The company was established approximately 10 years ago as a spin-off from a public research organisation, and has in excess of 100 employees. It is an unlisted company with a small number of major industrial shareholders. The key focus of the company is on research and development of new products and new technologies for the power generation industry It strives to develop environmentally friendly and highly efficient systems for the creation and distribution of power. The founders initially licensed this technology from the public research organization, but these original patents were subsequently assigned to Company J. The company has not sold or exported any products; nor has it yet entered any major licensing deals, although it anticipates that this will occur in the not too distant future.

2. Use of Intellectual Property

The company sees itself primarily as a generator of intellectual property. Its commercial objectives centre on the development of cutting edge technology, the obtaining of Australian and overseas patents over such technology, and the subsequent licensing of these patents. The company has over 200 patents to date and is a sophisticated user of the IP system, both in Australia and internationally. Imitation has not been an issue for Company J. There are a limited number of companies producing its type of products and any product that is on the market can easily be evaluated for potential infringement.

3. IP Strategy

Responsibility:
The prime responsibility for IP strategy, and in particular the decision to patent, rests with an IP advisory committee that reports to the Chief Executive Officer (CEO). The committee consists of the CEO, the Chief Technology Officer (CTO), the Chief Engineer, the internal IP legal counsel, and an external IP expert. The committee meets on a quarterly basis for one half day to review in some detail potential technologies for patenting, to review the progress of patent applications and to discuss the company's overall strategy regarding patenting. The decisions of this committee are subsequently reported to the Board of Directors. Identification of technologies suitable for presentation to the committee is the responsibility of the CTO and internal IP counsel.

IP Strategy as part of the overall business strategy
Company J has a unique method of structuring the relationship between its researchers and management and its external IP legal counsel. It has hired an internal IP legal counsel, who

is actually an independent patent attorney who works on a part-time basis for the firm. This strong, but independent linkage positions the internal IP counsel to make difficult decisions within the company, but also allows him to keep control of external legal counsel costs. Strategic decisions regarding patents can be made independent of their impact on billable hours.

Patent Strategy:
Company J has a sophisticated international patenting strategy designed to maximize the commercial licensing potential of its inventions. It sees itself primarily as a source of innovation and does not anticipate becoming a manufacturer of the products it designs. As such, its export strategy is to export technology in the form of licensing agreements. It requires a strong patent portfolio in order to achieve success in this area.

Company J employs a large number of researchers working in a variety of specialised technologies. One of the key processes in its overall patent strategy is a document that it calls an "IP Technology Report". This is an internal form that is available on its intranet. It is used by the researchers to identify a potential technology for patenting. It consists of a series of ten simple questions and should take no longer than half an hour to complete. A researcher completes these questions and forwards the document to the CTO and internal IP legal counsel. The questions asked on the report are oriented towards a preliminary look at the major areas involved in a patent application. Some examples of questions asked are: what is the invention? What are its advantages? What is the technology most similar to it? What are the potential applications of the invention? And, who are the main contributors? Company J has created a culture that ensures that these reports are generated for all potentially valuable inventions. This culture developed over time through a number of presentations made to staff about the importance of IP. This internal process has also been successful due to the streamlining of the process and the minimal the demand on researcher time at this initial stage.

These IP reports then form the basis for subsequent stages in the internal patenting process. All reports are reviewed by the CTO and internal IP legal counsel. About 20-25 per cent of these reports are investigated further; the reports are expanded and presented to the IP committee. About 10-15 per cent of all the reports are patented. The decision to proceed past each of these stages rests on a number of key criteria. The primary criterion is the potential commercial value of the invention. The range of applicability of the invention is also critical. If the invention relates to all potential products in Company J's industry or if it relates to the specific core technology for Company J, then it is seen as a key area to patent. However, the ability to detect potential infringers is also a key criterion that may override the relevance of the invention. For example, if the invention relates to the process of developing a component in the end technology and there are multiple potential processes of doing this, then it is not likely that a patent will be pursued. Company J also tends to pursue patents that reinforce and expand existing areas of technology. Company J described this strategy using a metaphor of leaves on the forest floor. If a new leaf (or new patent) overlaps an existing leaf, it still has significant value. If one patent is invalidated, the other will provide effective coverage. Similarly, the goal is to cover up as much of the forest

floor as possible. The gaps in the forest floor represent areas for competitors to move, so the gaps should be as small as possible and in areas of difficult terrain.

Company J's patent strategy proactively deals with potential problem areas. For example, it was felt that most patent attorneys do not often deal with the issue of who is the actual inventor of a technology, despite the fact that in any patent litigation this is the first line of attack. The process that Company J has established deals with this issue early on. The IP report that is initially generated asks the inventors to document the contributors as well as each of their individual contributions. Company J is even cautious about the wording: the inventors are identified as contributors rather than inventors until the final application drafting is complete. Company J also obtains assignments done from each of the contributors at the stage of provisional patent application and again at the stage of final drafting to ensure that any turnover in staff has limited impact on the progress of patenting.

Company J always files provisional patents in Australia. It also always has an international search conducted. It does this even if it is certain that there is no prior art in existence, as it is a useful commercial document to establish credibility. In the past, it has discontinued patent applications based on the results of an international search. It almost always files a Patent Cooperation Treaty (PCT) application and always opts for an international preliminary examination. It has the international preliminary examination conducted even though it noted that the European and US patent offices do not find this examination very persuasive.

Company J has a sophisticated strategy for choosing the international jurisdictions in which it seeks patent protection. It has identified about 30 countries that are important to them and have prioritised these countries into four categories. The countries are prioritised based on the size of the potential market or the fact that key competitors exist in those countries. Company J considers Australia, Canada, France, Germany, Italy, Japan, the United States and the United Kingdom to be priority 1 countries and pursues patent protection in all these countries for all patents. It also pursues patents in 3 category 2 countries, 1 category 3 country and 1 category 4 country. So, for any significant patent, it files for patents in a minimum of 13 countries. For patents that are deemed to be less critical, it might only file in the 8 priority 1 countries. The category 2, 3 and 4 countries are applied on a rolling basis in order to ensure that the company has at least some patent protection in each jurisdiction and that the total number of patents in any given category is roughly consistent for each country. It also has a system for tracking the status of any given national filing, so that if a particular license negotiation is occurring it might make a last minute change to that filing. Company J has found that this strategy has been effective in license negotiation, as it enables it to say it has patent protection in a relatively minor market (e.g. Pakistan) even though it may only have a minor percentage of its overall inventions patented in that jurisdiction. This international strategy enables Company J to maximize its negotiating power for licensing deals while minimizing the overall costs.

Trade Mark & Other IP Strategies:
The company makes extensive use of confidentiality and trade secrets. In order to be able to interview this company confidentiality agreements needed to be signed. As well, the

reception area of the company had posted signs prohibiting the use of cameras or recording equipment on the premises and notifying all visitors that any discussions related to the company's technology were to be considered to have been made in confidence. Trade secrets are used primarily in areas where the technology is an intermediate step in a process rather than the end product. To date, Company J has not licensed these trade secrets. However, it did indicate that these trade secrets often form part of a supply agreement with companies that are engaged in the process of supplying various components and prototypes of its power systems.

The company has made limited use of both trade marks and copyright. They are aware of both of these aspects of the IP system, but have not come to the point of using them, other than to register the company's logo.

4. Benefits of Using the IP System

Company J's use of the IP system is fundamental to its commercial strategies and is thus instrumental to the survival of the company. The future business of the company lies in licensing cutting edge technology.

In addition, the company noted that it has very few tangible assets, so its patent portfolio is the main way of demonstrating their worth as an enterprise. For Company J, the award of a patent in a particular area increases, by orders of magnitude, its credibility and its ability to obtain financing.

To date, Company J's interactions with patent offices, both nationally and internationally have been very positive. It has had very few issues arise. It believes that this is a result of its IP strategy as well as a policy of providing complete information to their patent attorneys. This enables its attorneys to understand both the strengths and weaknesses of a particular invention and draft appropriate applications.

5. Barriers to Using the IP System

Company J has never used innovation patents and does not find them useful for its particular industry.

For company J, the prime barrier to the use of the IP system is cost. Pursuing an international patenting strategy is very expensive. The costs are high because of the professional legal fees involved, not the cost of the government imposed filing fees. The company relies on an Australian legal counsel and its international relationships with overseas IP counsel. International legal costs can escalate quickly, especially when rates are typically in excess of $US 400 per hour. These however are necessary costs for a company in Company J's position. Company J seeks to overcome the most significant costs, and maximize the "bang for its buck" using the international patenting strategy and rotating system outlined above.

The cost of finding and educating legal counsel on a company's unique technology can also be a barrier to use of the IP system. This goes beyond the choice of legal firm to the specific lawyers involved. In order for patent attorneys to be able to appreciate fully a

particular area of technology, it is often necessary for them to proceed through an extensive learning curve, often six months or more in duration. The cost of doing this means that holding on to qualified counsel is critical, but also it stresses the importance of finding counsel who are not just competent lawyers, but extremely intelligent individuals who are capable of learning at a fast rate. In the past, Company J's work has been passed to junior colleagues at its chosen legal firm and these lawyers often do not have the skill to draft effective international patents.

A legal issue of prime importance to Company J is the specific wording of section 119 of the Patents Act. Section 119 provides protection for an innovator from an infringement action where the product was made or the process used before the priority date of a claim in a third party's patent. Section 119 protects only the actual user of the IP before the priority date of the third party patent – it does not allow the prior user to assign or license others to make the product or use the process. This poses a difficulty for companies, particularly smaller research-oriented companies like Company J, which, realistically, are not going to be undertaking full commercialisation and manufacturing themselves, but rather, are built around a business model of advanced research and development of technology with a view to licensing the whole technology in the future. The Company J's representative pointed out that legislation in other jurisdictions, for example the United Kingdom, is worded differently and, in particular, allows a prior user to "assign that right…to any person who acquires that part of the business in the course of which the act was done or the preparations were made." (*Patents Act* 1977 (UK), s 64) According to Company J, section 119 is a barrier which actually acts as an incentive for the firm to relocate its research to another country.

6. Success/Failure of the IP system in meeting Company J's needs

In general, the company has found the IP system to be beneficial. Any barriers to the use of the system have been overcome by good management practices and the support of patient investors.

Company J felt that the success of the patenting system could be improved via public education. It is important that the public is aware of the value of IP. This is particularly important for scientists and engineers and it was felt that intellectual property training should be a mandatory component of tertiary education programs in these fields.

7. REFERENCES

ABS Business Operations and Industry Performance, 2000-2001, cat. 8140.0.

Acs, Z. and D. Audretsch (1987), "Innovation, Market Structure and Firm Size," *Review of Economics and Statistics*, 69, p.568.

Acs, Z. and D. Audretsch (1988), "Innovation in Large and Small Firms: An Empirical Analysis," *American Economic Review*, 78 (4), pp.678-690.

Adams, J. (1990), "Fundamental Stocks of Knowledge and Productivity Growth," *Journal of Political Economy*, 98 (4), pp. 673-702.

Advisory Council on Intellectual Property (2001), "Extension of the jurisdiction of patent, trade mark and design matters to the Federal Magistrates Service", Issues Paper

Advisory Council on Intellectual Property, "Should the jurisdiction of the Federal Magistrates Service be extended to include patent, trade mark and design matters", Discussion Paper

Aghion, P. and J. Tirole (1994), "The Management of Innovation," *Quarterly Journal of Economics*, 109 (4), pp.1185-1210.

Allison, J. and M. Lemley (1998), "Empirical Evidence on the Validity of Litigated Patents", *American Intellectual Property Law Association Quarterly Journal*, 26, p.185

Anand, B. and A. Galetovic (1999), "Weak Property Rights and Hold-up in R&D," *Working Paper*, No.99-007, Harvard Business School.

Anton, J.J. and D.A. Yao (1994), "Expropriation and Inventions: Appropriable Rents in the Absence of Property Rights," *American Economic Review*, 84 (1), pp.190-209.

Arrow, K.J. (1962), "Economic Welfare and the Allocation of Resources for Invention," in *The Rate and Direction of Inventive Activity*, Princeton University Press: Princeton, pp.609-625.

Bresnahan, T., M. Trajtenberg and S. Stern (1997), "Market Segmentation and the Sources of Rents from Innovation: Personal Computers in the Late 1980s," *Rand Journal of Economics*, 28 (0), pp.S17-44.

CHI Research, Inc (2003), "Small Serial Innovators: The Small Firm Contribution to Technical Change", Study for the SBA Office of Advocacy.

Cockburn, I. and R. Henderson (1994), "Racing to Invest? The Dynamics of Competition in Ethical Drug Discovery," *Journal of Economics and Management Strategy*, 3 (3), pp.481-519.

Cockburn, I. and Z. Griliches (1988), "Industry Effects and Appropriability Measures in the Stock Market's Valuation of R&D and Patents," *American Economic Review*, 78 (2), pp.419-23.

Cohen, L. and R. Noll (1993), *The Technology Pork Barrel*, Brooking Institution: Washington (DC).

Cohen, W. and D. Levinthal (1990), "Absorptive Capacity: A New Perspective on Learning and Innovation," *Administrative Science Quarterly*, 35(1), pp. 128-152.

Cohen, W. M., Nelson, R. R. and Walsh, J. P. (2000) Protection their intellectual assets: Appropriability conditions and why US manufacturing firms patent (or not), In NBER Working Paper Series, Vol. 7552 National Bureau of Economic Research.

Cohen, W., R.R. Nelson and J.P. Walsh (1996), "Appropriability Conditions and Why Firms Patent and Why They Do Not in the American Manufacturing Sector." (1996) *Unpublished Working Paper* Carnegie Mellon University.

Cohen, W., R.R. Nelson and J.P. Walsh (2000), "Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)," *Working Paper*, No.7552, NBER.

Cohen, W.M. and R.C. Levin (1989), "Innovation and Market Structure," in R. Schmalensee and R. Willig (eds.), *Handbook of Industrial Organization*, Vol.2, North-Holland: Amsterdam.

Cooter, R. and D. Rubenfield (1989), "Economic Analysis of Legal Disputes and Their Resolution," *Journal of Economic Literature*, 27, p.1067.

Crepon, B., E. Duguet and J. Mairesse (1998). "Research, Innovation and Productivity: An Econometric Analysis at the Firm Level," *Economics of Innovation & New Technology*, 7 (2), pp.115-58.

David, P. and B.H. Hall (2000), "Heart of Darkness: Modelling Public-Private Funding Interactions Inside the R&D Black Box," *Working Paper*, No. 7538, NBER.

Dorfman, N.S. (1987), *Innovation and Market Structure: Lessons from the Computer and Semiconductor Industries*, Ballinger: Cambridge (MA).

Drummond, the Hon. Justice (2000), "Are the Courts Down Under Properly Handling Patent Disputes?", *Intellectual Property Forum*, 42, 10-31.

European Union, "Access to research and innovation, and better use of patents by SMEs", available at <http://europa.eu.int/comm/enterprise/enterprise_policy/best-directory/en/research/index.htm>

Gans, J.S. (2003), "The Value of IP Protection in Markets for Ideas," *Australian Intellectual Property Law Bulletin*, (forthcoming).

Gans, J.S. and S. Stern (2000), "Incumbency and R&D Incentives: Licensing the Gale of Creative Destruction," *Journal of Economics and Management Strategy*, 9 (4), pp.485-511.

Gans, J.S. and S. Stern (2003a), "The Product Market and the 'Market for Ideas': Commercialisation Strategies for Technology Entrepreneurs," *Research Policy*, Vol.32, No.2, February, pp.333-350.

Gans, J.S. and S. Stern (2003b), "When Does Funding Research by Small Firms Bear Fruit? Evidence from the SBIR Program," *Economics of Innovation and New Technology*, Vol.12, No.4, pp.361-384.

Gans, J. S. and S. Stern (2003c), "Assessing Australia's Innovative Capacity in the 21st Century", IPRIA Working Paper.

Gans, J.S., D. Hsu and S. Stern (2000), "When Does Start-Up Innovation Spur the Gale of Creative Destruction?" *Working Paper*, No.7851, NBER.

General Accounting Office (1995), *Federal Research: Interim Report on the Small Business Innovation Research Program.*

Geroski, P., S. Machin and J. Van Reenen (1993), "The Profitability of Innovating Firms," *Rand Journal of Economics*, 24 (2), pp.198-211.

Geroski, P.A. (1994). *Market Structure, Corporate Performance and Innovative Activity*.. Oxford University Press.

Gilbert, R. and D. Newbery (1982), "Pre-emptive Patenting and the Persistence of Monopoly," *American Economic Review*, 72 (3), pp.514-526.

Gompers, P.A. and J. Lerner (1998), "What Drives Venture Capital Fundraising?" *Brookings Papers on Economic Activity: Microeconomics*, pp.149-192.

Gompers, P.A. and J. Lerner (2001), *The Money of Invention*, Harvard Business School Press.

Greenhalgh, C.; Longland, M.; and Bosworth, D.; "Protecting Intellectual Property: British, European and American Patents and Trade Marks of Selected UK Companies 1986-1995", Oxford Intellectual Property Research Centre, January 2001.

Griliches, Z (1986), "Productivity, R&D, and the Basic Research at the Firm Level in the 1970's" *American Economic Review*, 76 (1), pp.141-54.

Griliches, Z. (1998), *R&D and Productivity*, University of Chicago Press: Chicago.

Griliches, Z., B.H. Hall and A. Pakes (1991). "R&D, Patents, and Market Value Revisited: Is There a Second (Technological Opportunity) Factor*?," Economics of Innovation & New Technology*, 1 (3), pp.183-201.

Hall, B.H. (1988), "The Effect of Takeover Activity on Corporate Research and Development, Corporate Takeovers: Causes and consequences," A.J. Auerbach, ed, NBER Project Report series, University of Chicago Press, pp.69-96.

Hall, B.H. (1992), "Investment and Research and Development at the Firm Level: Does the Source of Financing Matter?," *Working Paper*, No.4096, NBER.

Hall, B.H. and J. van Reenen (2000), "How Effective are Fiscal Incentives for R&D? A Review of the Evidence," *Research Policy*, 29 (4-5), pp.449-469.

Hao, K.Y. and A.B. Jaffe (1993), "Effect of Liquidity on Firms' R&D Spending," *Economics of Innovation & New Technology*, 2 (4), pp.275-82.

Hellmann, T. (1998a), "The Allocation of Control Rights in Venture Capital Contracts," *RAND Journal of Economics*, 29 (1), pp.57-76.

Hellmann, T. (1998b), "A Theory of Corporate Venture Investing," *mimeo*., Stanford.

Hellmann, T. and M. Puri (1998), "The Interaction Between Product Market and Financing Strategy: The Role of Venture Capital," *mimeo*., Stanford.

Henderson, R. (1993), "Underinvestment and Incompetence as Responses to Radical Innovation: Evidence from the Photolithographic Alignment Equipment Industry," *RAND Journal of Economics*, 24 (2), pp.248-270.

Himmelberg, C.P. and B. Petersen (1994), "R&D and Internal Finance: A Panel Study of Small Firms in High-Tech Industries," *Review of Economics & Statistics*, 76 (1), pp.38-51.

Holmstrom, B. (1989), "Agency Costs and Innovation," *Journal of Economic Behaviour and Organization*, 12 (2), pp.305-327.

Hsu, D. (2000), "Do Venture Capitalists Affect Commercialisation Strategies at Start-ups?" *mimeo*., MIT.

Hubbard, R.G. (1998), "Capital-Market Imperfections and Investment," *Journal of Economic Literature*, 36 (1), pp.192-225.

Iverson, E. (2003), *Norwegian SMEs and the IPR-System: Exploration and Analysis*, World Intellectual Property Organization, ISBN: 92-805-1128-3

Jewkes, J., D. Sawers and R. Stillerman (1969), *The Sources of Invention*, 2nd ed., Norton: New York.

Kamien, M.I. and N.L. Schwartz (1982), *Market Structure and Innovation*, Cambridge University Press: Cambridge.

Klenow, P.J. (1996), "Industry Innovation: Where and Why," *Carnegie-Rochester Conference Series on Public Policy*, 44 (0), pp.125-50.

Klette, T. J., J. Moen and Z. Griliches (1999), "Do Subsidies to Commercial R&D Reduce Market Failures? Microeconomic Evaluation Studies," *Working Paper*, NBER.

Koen, M.S. (1991), "Survey of Small Business Use of Intellectual Property Protection: Report of a Survey of Conducted by MO-SCI Corporation for the Small Business Administration," *Washington Small Business Administration*

Kortum, S. and J. Lerner (1998), "Does Venture Capital Spur Innovation," *Working Paper*, No.6846, NBER.

Kremer, M. (1998), "Patent Buyouts: A Mechanism for Encouraging Innovation," *Quarterly Journal of Economics*, 113 (4), pp.1137-67.

Lanjouw, J. (1994), "Economic Consequences of a Changing Litigation Environment: The Case of Patents," *Working Paper*, No.4835, NBER.

Lanjouw, J.O. and J. Lerner (1996), "Preliminary Injunctive Relief: Theory and Evidence from Patent Litigation," *Working Paper* No. 5689, NBER.

Lanjouw, J.O. and M. Schankerman (1997), "Stylized Facts of Patent Litigation: Value, Scope and Ownership," *Working Paper*, No.6297, NBER.

Lanjouw, J.O. and M. Schankerman (2001), "Characteristics of Patent Litigation: A Window on Competition," *RAND Journal of Economics* 32(1), p.129.

Lerner, J. (1995a), "Patenting in the Shadow of Competitors," *Journal of Law and Economics*, 38, p.463.

Lerner, J. (1995b), "The Importance of Trade Secrecy: Evidence From Civil Litigation,", *mimeo*.

Lerner, J. (1996), "The Government as Venture Capitalist: The Long-Run Impact of the SBIR Program," *Working Paper*, No. 5753, NBER.

Lerner, J. (1997), "An Empirical Analysis of a Technology Race," *RAND Journal of Economics*, 28 (3), pp.228-247.

Lerner, J. and R. Merges (1998), "The Control of Technology Alliances: An Empirical Analysis of the Biotechnology Industry," *Journal of Industrial Economics*, Vol. 46 (2), pp. 125-156..

Levin, R. C., Klevorick, A. K., Nelson, R. R. and Winter, S. G. (1987), Appropriating the Returns from Industrial Research and Development, Brookings Papers on Economic Activity, 3, 783-820.

Levin, R., et. al. (1987), "Appropriating the Returns from Industrial Research and Development," *Brookings Papers on Economic Activity*, 3, pp.783-831.

Mansfield, E. (1995), *Innovation, technology and the economy: Selected essays of Edwin Mansfield*, Edward Elgar: London.

Mowery, D.C. (1983), "Industrial Research and Firm Size, Survival and Growth in American Manufacturing, 1921-1946," *Journal of Economic History*, 43, pp.953-979.

National Science Foundation, Division of Science Resources Studies, "Will Small Business Become the Nation's Leading Employer of Graduates with Bachelor's Degrees in Science and Engineering?" NSF 99-322, Project Officers: John Tsapogas and Lawrence M. Rausch; Mary Collins, Westat (Arlington, VA 1999).

Nelson, R.R. (1959), "The Simple Economics of Basic Scientific Research," *Journal of Political Economy*, pp.297-306.

Nelson, R.R., M.J. Peck and E.D. Kalachek (1967), *Technology, Economic Growth and Public Policy*, Brookings Institution: Washington.

OECD (2000), "Enhancing the Competitiveness of SMEs through Innovation", Issues Paper for the OECD Conference, "Enhancing the Competitiveness of SMEs in the Global Economy: Strategies and Policies".

OECD (1998), "National Innovation Systems: Analytical Findings", OECD/DSTI/STP/TIP [Working Group on Innovation and Technology Policy] (98)6/REV1; OLIS: 30 OCT. 1998

Oppenheim, C. for Derwent Information (2000), *Dismantling the Barriers: Pan-European Survey on the Use of Patents and Patent Information by Small to Medium Enterprises (SMEs)*

Patel, P. (2000), "IPR Policies and Innovation Indicators: Draft Report prepared for the Benchmarking Workshop on IPRs: TREND CHART project", available at <http://trendchart.cordis.lu/Reports/Documents/TCW3statinputfinal.pdf>

Pavitt, K., M. Robson and J. Townsend (1987), "The Size Distribution of Innovating Firms in the UK: 1945-1983," *Journal of Industrial Economics*, 35, pp.302-304.

Rasmusen, E. (1988), "Entry for Buyout," *Journal of Industrial Economics*, 36 (3), pp.281-299.

Rausch, L. (1998), "Venture Capital Investment Trends in the United States and Europe," NSF 99-303.

Reinganum, J.F. (1989), "On the Timing of Innovation," in R. Schmalansee and R. Willig (eds.), *Handbook of Industrial Organization*, Vol.1, Elsevier: Amsterdam, pp.849-908.

Romer, P. (1990), "Endogenous Technological Change," *Journal of Political Economy*, 98 (October), pp.S71-S102.

Rosenberg, N. (1974), "Science, Invention, and Economic Growth," *Economic Journal*, 84 (333), pp.90-108.

Scherer, F.M. (1965), "Firm Size, Market Structure, Opportunity, and the Output of Patented Inventions," *American Economic Review*, 55, pp.1097-1125.

Scherer, F.M. (1992), "Schumpeter and Plausible Capitalism," *Journal of Economic Literature*, 30, pp.1416-1433.

Scherer, F.M. and D. Ross (1990), *Industrial Market Structure and Economic Performance*, 3rd ed., Houghton-Mifflin: New York.

Schmookler, J. (1966), *Invention and Economic Growth*, Harvard University Press: Cambridge (MA).

Schumpeter, J.A. (1942), *Capitalism, Socialism and Democracy*, Harper: New York.

Seabrook, J. (1994), "The Flash of Genius," *The New Yorker*, Jan 11, pp. 38-52.

Stiglitz, J.E. and A. Weiss (1981), "Credit Rationing in Markets with Imperfect Information," *American Economic Review*, 71 (3), pp.393-410.

Stuart, T., H. Hong and R. Hybels (1999), "Interorganizational Endorsements and the Performance of Entrepreneurial Ventures," *Administrative Science Quarterly*, 44, pp.315-349.

Teece, D.J. (1987), "Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing, and Public Policy," in D.J. Teece (ed.), *The Competitive Challenge: Strategies for Industrial Innovation and Renewal*, Ballinger: Cambridge (MA), pp.185-220.

Toole, A. (1999), "The Contribution of Public Science to Industrial Innovation: An Application to the Pharmaceutical Industry," *Discussion Paper*, No.98-6, Stanford Institute for Economic Policy Research.

Wallsten, S. (1998), "Rethinking the Small Business Innovation Research Program," in *Investing in Innovation*, L. Branscomb and J. Keller (eds.), MIT Press: Cambridge (MA).

Wallsten, S. (2000), "The Effects of Government-Industry R&D Programs on Private R&D: The Case of the Small Business Innovation Research Program," *Rand Journal of Economics*, 31(1), pp.82-100.

Waterson, M. (1990), "The Economics of Product Patents," *American Economic Review* 90.

WIPO (2002a), "An Overview of the Objectives, Strategies and Activities of the Small and Medium-Sized Enterprises (SMEs) Division of WIPO", WIPO/IP/DDK/02/1(b).

WIPO (2002b), "Support for SMEs in using the Intellectual Property System: Experiences of Other Regions", WIPO/IP/RIO/02/3

WIPO (2003), "Best Practices for Assisting SMEs to use the IP System", available at http://wipo.int/sme/en/best_practices/index.htm

Working Group on Managing Intellectual Property for the National Innovation Summit, Framework Paper (10 December 1999)