THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

JOINT COMMITTEE OF PUBLIC ACCOUNTS

REPORT 324

COMMONWEALTH SUPPORT FOR PRIVATE SECTOR INVESTMENT IN RESEARCH AND DEVELOPMENT

VOLUME 2 OF A REPORT ON RESEARCH AND DEVELOPMENT

December 1992

The Parliament of the Commonwealth of Australia

Joint Committee of Public Accounts

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JOINT COMMITTEE OF PUBLIC ACCOUNTS

SEVENTEENTH COMMITTEE

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1 Appointed 6 March 1991
2 Discharged 6 March 1991

DUTIES OF THE COMMITTEE

Section 8(1) of the *Public Accounts Committee Act 1951* reads as follows:

Subject to subsection (2), the duties of the Committee are:

(a) to examine the accounts of the receipts and expenditure of the Commonwealth including the financial statements transmitted to the Auditor-General under sub-section (4) of section 50 of the *Audit Act 1901*;

(aa) to examine the financial affairs of authorities of the Commonwealth to which this Act applies and of inter-governmental bodies to which this Act applies;

(ab) to examine all reports of the Auditor-General (including reports of the results of efficiency audits) copies of which have been laid before the Houses of the Parliament;

(b) to report to both Houses of the Parliament, with such comment as it thinks fit, any items or matters in those accounts, statements and reports, or any circumstances connected with them, to which the Committee is of the opinion that the attention of the Parliament should be directed;

(c) to report to both Houses of the Parliament, any alteration which the Committee thinks desirable in the form of the public accounts *or in the method of keeping them, or in the mode of receipt*, control, issue or payment of public moneys; and

(d) to inquire into any question in connexion with the public accounts which is referred to it by either House of the Parliament, and to report to that House upon that question,

and include such other duties as are assigned to the Committee by Joint Standing Orders approved by both Houses of the Parliament.

TERMS OF REFERENCE

The terms of reference for the Inquiry were:

(1) to review public sector performed research and development, excluding that performed exclusively by the tertiary education sector, with reference to:

- its role in contributing to Australian development;
- the adequacy of current funding levels; and
- cost-effectiveness of the use of those funds; and

(2) to review Commonwealth support for private sector investment in research and development, with reference to the efficiency and cost-effectiveness of current programs.

PREFACE

This Report is the second volume dealing with the Committee's examination of research and development (R & D) in Australia. Volume 1, the Committee's Report 318, was tabled in June 1992 and covered some of the general issues relating to R & D and the Government's support for R & D in the public sector. This volume deals with the Inquiry's second term of reference and reviews 'Commonwealth support for private sector investment in research and development, with reference to the efficiency and cost-effectiveness of current programs'.

The bottom line of the Committee's Inquiry is the nation's high current accounts deficit which signals the need for Australia to reduce its imports and improve its export performance. If it is to replace imports and increase export sales, Australia must upgrade its competitiveness on world markets in the most effective way possible This involves concentrating on value adding and producing sophisticated manufactured goods, which represent the fastest growing sector of the global economy. With its well-developed capacity for research, Australia should be in a good position to achieve improved performance but this has not proved to be the case.

One of the common characteristics of the Australian industrial scene has been the failure to take useful research through to its commercialisation and export. The Government has instituted a variety of schemes to support private sector R & D, which are designed to combat the factors that appear to inhibit the successful commercialisation of research. These schemes address issues that include the shortage of capital and the taxation burden, inadequate skills in managing a business and marketing products domestically and overseas, the protection of intellectual property, and the need for firms to grow in order to compete successfully by forming networks and strategic alliances.

The Committee's Report examines the current status of private sector investment in R & D against the background of what is known about the ideal conditions for innovation. It assesses the Government's programs which serve to support private sector R & D and recommends ways in which they can be improved. It was enabled to do this with the assistance of many organisations, individuals and businesses which provided information. The Committee thanks these persons and bodies for their contributions.

I would like to place on the record my appreciation of the particular efforts of my colleagues, Mr D Kerr, MP, and Mr P Shack, MP, in helping to bring this Inquiry to a fruitful conclusion. I acknowledge as well Professor D Aitkin and Mr R Block, who commented on a draft of the Report, and Mr P Baxter who supplied a draft of Chapter 3. The staff of the Committee's secretariat provided capable assistance at all times, particularly Mrs L Brennan, Ms S Casburn, Mrs L Hendy, Dr S Hnatiuk and Ms F Taylor.

Hon G F Punch, MP
Chairman

TABLE OF CONTENTS

Chapter		Page
	Preface	vii
	Executive Summary	xv
	Recommendations	xviii
	Abbreviations	xxvi
1.	**Introduction**	
	The Context and Conduct of the Inquiry	1
	Volume 1 of the Committee's Report on Research and Development	3
	- Guidelines for the Support of R & D	3
	- Commercialisation	4
	- Other Issues	5
	The Structure of Volume 2 of the Report	5
2.	**Converting Research To Economic Benefit**	
	Introduction	7
	The Process of Innovation	7
	- Models of Innovation	8
	- Funding	9
	- A Stable Business Environment	10
	- Size, Alliances and Competition	11
	- Management Attributes and Skills	13
	- Other Factors	16
	Private Sector Investment in Research and Development	17
	- Levels of Expenditure	17
	- Expenditure by Industry	20
	Support for Private Sector Investment in Research and Development	20
	Conclusion: Criteria for Assessing the Commonwealth's Support for Private Sector Research and Development	29

3. **Taxation And Capital**

- Introduction 31
- Taxation Concession for Research and Development 31
  - Evaluation 34
  - Comment 37
    - Effectiveness of the Concession 37
    - Administration of the Concession 39
    - Joint Research and Development Projects 41
    - The Need for Greater Support for Commercialisation 42
    - Other Issues 43
- Capital 44
  - Evaluation of Past and Current Programs 49
  - Comment 52
    - Impact of Taxation 52
    - Pooled Development Funds 53
    - Australian Technology Group 53
    - Investment by Superannuation Funds in Research and Development 54
    - Tax Exempt Savings Accounts 56

4. **Grants**

- Introduction 57
- Generic Technology Grants Scheme 58
  - Evaluation 59
- Discretionary Grants Scheme 60
  - Evaluation 60
- Advanced Manufacturing Technology Development Program .. 61
- Comment 61
- National Teaching Company Scheme 64
  - Evaluation 65
- International Science and Technology Collaboration Program 67
- Support for Commercialising Medical Research 69
- Collaborative Research Program 70
- The Repayable Grant 70

5. The Protection Of Intellectual Property

The Nature of Intellectual Property Rights 73
- Industrial Property 74
- Copyright 75
- Circuit Layouts 76
- Plant Variety Rights 76

The Benefits and Costs of Intellectual Property Protection ... 77
- Benefits 77
- Costs 79

The Scope of Patent Protection 80

The Adequacy of Current Protection 81
- Is Protection Too Broad in Some Circumstances? 82
- Is the Time Taken to Process Reasonable? 82
- Can Inventions be Adequately Described? 83
- Ownership of Intellectual Property in Collaborative Arrangements 83
- International Considerations 84
- The Enforcement of Intellectual Property Rights 86
- The Cost and Complexity of Seeking Property Rights .. 87
- The Difficulty of Obtaining Patents 89
- The Administration and Formulation of Intellectual Property Rights 90
- Determining the Value of Intellectual Property 92
- Access to Advice and Information 92
- Taxation Issues 93
- Is the Period of Protection Adequate? 94

6. Management And Marketing Assistance

Introduction 97

Education 97

National Industry Extension Service 102
- Evaluation 103
- Comment 107

Marketing Assistance 108

Other Programs 110
- Small and Medium Enterprise Development Program . 110
- Metal Based Engineering Program 111

Overlap Between Programs 111

7. **Procurement**

- Government Purchasing 113
- National Procurement Development Program 116
  - Reactions to the Program 117
  - Evaluation 118
    - Evaluation by the Industry Commission 119
  - Comment 121
- Performance Bond Guarantees 124

8. **Offsets And Partnerships For Development**

- Introduction 127
- Previous Joint Committee of Public Accounts Reviews of the Offsets Program 127
- Defence Offsets 129
- Civil Offsets 131
  - The Achievements and Deficiencies of the Civil Offsets Program 132
  - The New Arrangements 133
- Partnerships for Development Program 134
  - The Impact of the Programs on Research and Development 137
  - Program Deficiencies 139

9. **Other Programs**

- Introduction 143
- Regulation 143
- Standards 145
- Bounties 147
- Pharmaceutical Industry 148
  - Evaluation 149
- Space Industry 151
  - Evaluation 151
- Cooperative Research Centres 153
  - Responses to the Program 155

10. Concluding Comments

- Introduction 159
- Should Private Sector Research and Development Receive Government Support? 159
- Should the Assistance Provided be Targeted or Non-Directed? 161
  - Current Programs 164
- What Criteria Should be Employed When Targeting Assistance? 165
- Is Sufficient Assistance Being Provided? 166
- Is Assistance Being Provided as Efficiently as Possible? 167
  - Do Firms that Could Benefit from Assistance Know of its Availability? 167
  - Multiple Assistance 170
  - Lack of Feedback to Unsuccessful Applicants for Support 172
- Assessing Programs Against Desirable Attributes 172
- The Role of the Industry Research and Development Board .. 174
- Linkages 175
  - Networking 176
  - Other Arrangements 179
- Changing the Culture 180

APPENDICES

A. Submissions Received 183

B. Public Hearings, Inspections, Briefings and Witnesses to the Inquiry . 187

EXECUTIVE SUMMARY

1. The Joint Committee of Public Accounts Report 324 deals with the second part of the terms of reference for its Inquiry into Research and Development (R & D): a review of Commonwealth support of private sector investment in R & D, with particular reference to the efficiency and cost-effectiveness of current programs The review was carried out in the light of what is known of the requirements for the successful commercialisation of research - that is, the conversion of technological developments to export sales and import replacement for Australia.

2. Innovation in Australia is characterised by a creditable level of creative and technical success in terms of R & D; the success rate for the commercialisation of that R & D is much less impressive. Significant impediments to commercialisation exist in the taxation regime, the availability of capital, the small size of Australian firms, insufficiently well-developed management and marketing skills, and inadequate recognition at the corporate level of the need for innovation as a means of developing and maintaining a competitive position.

3. The 150% tax concession is a vital element in the Government's support for R & D, which should be continued indefinitely (recommendation 1). Its extension to the costs associated with market analysis and the development of market entry strategies would assist the process of commercialisation (recommendation 8) The commercialisation of R & D would also be advantaged by:

- clarification of the joint responsibilities of the Industry Research and Development Board (IRDB) and the Commissioner for Taxation in administering the tax concession with respect to the eligibility of claims for pilot plant and equipment and research carried out overseas (recommendations 3-5); and

- the removal of anomalies that hinder the transfer of intellectual property in the course of its commercialisation (recommendations 9 and 10).

Given the importance of increasing the size of the organisations working on R & D and its commercialisation, the tax treatment for syndicates and collaborative ventures needs careful monitoring and adjustment so that innovation is stimulated (recommendations 6 and 7).

4. While large Australian firms have ready access to capital on international markets, small and medium-sized innovative firms face greater difficulties in raising finance. Greater incentives to invest in R & D and its commercialisation is needed, by, for example, modifying the requirements for investing in Pooled Development Funds, bringing pressure to bear on the superannuation funds and removing impediments presented by the prudent man rule (recommendations 11, 14-17) Tax

commercialisation are a means of accessing funds from the small investor (recommendation 18). With the launch of the Australian Technology Group (ATG) into the market for the provision of investment funds for R & D and its commercialisation, the Committee sees the need for the ATG to limit its investments to certain industries and focus on forming joint ventures (recommendations 12 and 13).

5. Forming networks and strategic alliances provides firms with access to services and markets that, on their own, would be unavailable to them and helps to spread the risks to which they are exposed. Given the small size of many Australian firms and the advantages that size can confer, 'growing' firms could provide significant economic benefit. Further networking should therefore be supported (recommendations 25 and 26).

6. The Australian business scene is generally characterised by an absence of adequate skills in management and marketing and a general lack of understanding of the nature of innovation. These topics are covered in courses and research in some tertiary institutions but there are deficiencies in the courses available and only a small volume of research is being conducted. Learning by experience on the job is an effective but sometimes dangerous way of acquiring skills. The need for assistance in developing management and marketing skills should be brought to the attention of companies and made readily available to them (recommendations 23 and 24). Furthermore, programs such as the National Industry Extension Service, which have proved effective should receive additional support (recommendation 44). Austrade's programs contribute to the development of exporting ability but have not been considered in detail in this Report.

7. An important element in commercialising new technologies is establishing their credibility through trialing and demonstration. In the National Procurement Development Program (NPDP), the Government recognised the potential it had in assisting this process by linking government departments with specific requirements and firms with appropriate technologies to test. Although the NPDP has experienced problems, it is important that it continue or be replaced with a program that serves the same role (recommendations 45 and 46).

8. A further means of support for R & D is the Government's requirement in the Defence Offsets and Partnerships for Development Programs that overseas suppliers to State and Commonwealth Governments undertake various activities, including R & D, that will benefit local industry. Shortcomings have been identified in the administration of both programs, which should be rigorously evaluated (recommendations 47, 49 and 50). Fuller disclosure of information relating to the Defence Offsets Program is also needed (recommendation 48).

9. An element in the successful commercialisation of R & D is the protection of intellectual property, which is presently administered by three separate departments Overlap between the laws dealing with the different categories of intellectual property and the absence of a clear and coordinated policy direction in this field is counter-productive to the efficient functioning of the system of protection

(recommendation 21). Additional problems have been identified with the complexity, cost and time taken to process patent applications. An independent review of the Patents Office and the establishment of an advisory committee of users would assist in reducing these problems (recommendations 19 and 20).

10. In considering the range of government programs that support R & D and its commercialisation, the Committee concluded that they provided appropriate coverage for most of aspects of innovation, although greater efforts are needed to commercialise medical research (recommendations 42 and 43). The Committee also noted a number of problems common to the programs:

- a lack of adequate information about the relative effectiveness of different forms of support, and the need for research on the topic which would form the basis for informed decisions about the further development of support (recommendations 2, 28, 30, 33 and 37);
- uncertainty among firms interested in applying for assistance, which results from the confusing number and variety of current programs, and the need for a single source of information about them (recommendation 29);
- the administration of assistance, for example, the changing criteria for awarding grants, and the absence of information about failed applications and the amount of assistance provided under different schemes to individual applicants (recommendations 31 and 32); and
- the potential for overlap between programs (recommendation 30).

11. In the light of some of the problems identified, the Committee considers the effectiveness of the Board would be greatly increased if its mission and objectives were more clearly defined (recommendations 34 and 35). The Committee believes that the IRDB and other government agencies charged with assisting innovation should support areas in which Australia has a competitive advantage and tailor the assistance provided to the specific needs of firms and industries (recommendation 36). This should be carried out within the context of national production and export goals set as a result of extensive community consultation, and a system of public reward to those who contribute in an outstanding manner to the commercialisation of R & D in Australia (recommendations 40 and 41).

RECOMMENDATIONS

The Committee has made a number of recommendations which are listed below, cross-referenced to their locations in the text.

The Committee recommends that:

Taxation

1. The tax incentive be continued indefinitely. (paragraph 3.29)

2. *Consideration of and action on the current Bureau of Industry Economics* review of the 150% taxation concession be a priority activity for the Industry Research and Development Board, which should:

   - take into account the outcome of the current Australian National Audit Office efficiency audit of the administration of the scheme;

   - determine from the review and audit reports whether evidence exists to support the provision of the concession on incremental expenditure only; and

   - consider whether further action needs to be taken to remove any distortion caused by the dividend imputation provisions and, if so, what form this action might take. (paragraph 3.29)

3. Section 73B of the *Income Tax Assessment Act 1936* should be amended to give the Industry Research and Development Board the power to determine the eligibility of plant and equipment purchased for research and development purposes, subject to the concession for eligibility being retained only for plant and equipment which is used solely for research and development purposes or only for that period in which it is used solely for research and development purposes. (paragraph 3.35)

4. The enabling legislation be amended to remove any doubt that the concession applies to research and development which is mainly undertaken in Australia, as currently interpreted by the Australian Taxation Office. (paragraph 3.35)

5. The Australian Taxation Office and Industry Research and Development Board continue to work in close consultation on matters of legislative interpretation, particularly as it relates to the commercialisation of research

and development and the determination of whether the research and development is undertaken by companies on their own behalf. (paragraph 3.35)

6. The Industry Research and Development Board, in consultation with the Australian Taxation Office, continue to monitor the operation of the syndication and collaborative research elements of the tax concession to ensure that every opportunity is provided for joint research efforts that will bring net benefits to Australia. (paragraph 3.39)

7. The Industry Research and Development Board and Australian Taxation Office continue to discourage use of the tax concession legislation for artificial tax minimisation schemes which do not result in a net benefit to the nation. (paragraph 3.39)

8. Market analysis and development of market entry strategies be allowed as eligible supporting activities under the tax concession legislation, up to a limit of 10% of total eligible research and development expenditure in the relevant project. (paragraph 3.41)

9. The Industry Research and Development Board, in consultation with the Australian Taxation Office, examine the potential for distortion of investment and commercialisation decisions created by subsection 73B(27A), in conjunction with other parts of the Income Tax Assessment Act. (paragraph 3.44)

10. Action be taken to remove any anomalies, without creating a loophole for unintended tax minimisation schemes. (paragraph 3.44)

Capital

11. The Department of Industry, Technology and Commerce reconsider the existing requirements for the operation of Pooled Development Funds to determine whether they should be modified to make the Pooled Development Funds concept more attractive to the market. (paragraph 3.74)

12. The initial focus of the Australian Technology Group be upon a limited number of industry sectors and technologies, particularly in areas where there is a domestic market as well as an international market to ease the commercialisation process. (paragraph 3.76)

13. The Australian Technology Group give initial focus to forming joint ventures with established major corporations as a means of developing credibility and wider investor confidence. (paragraph 3.76)

14. The Government require superannuation funds to report details of their holdings in certain types of investments, including investments in new asset classes such as development and venture capital. (paragraph 3.78)

15. The Insurance and Superannuation Commissioner develop a standardised reporting system for use by superannuation funds in reporting on their investments. (paragraph 3.78)

16. The information provided to the Insurance and Superannuation Commissioner be reported to the Parliament. (paragraph 3.78)

17. The Government review the prudent man rule with a view to removing any impediments to the investment of superannuation funds in research and its development and commercialisation. (paragraph 3.81)

18. The Government examine the possibility of introducing a tax exempt savings program with a requirement for a substantial component of the savings accumulated to be invested into Australian research and its development and commercialisation. (paragraph 3.84)

Intellectual Property

19. The Government establish an independent body to review the costing structure of the Patents Office and determine whether there is any scope to achieve greater efficiencies and streamline the process. (paragraph 5.59)

20. The Department of Industry, Technology and Commerce:

- set up an advisory committee of users to monitor the costing structures of the Patents Office on an ongoing basis and provide feedback on their needs and the services provided; and
- consider whether programs supporting research and development should be extended to giving assistance towards the cost of patents where those costs may deter the commercialisation of research and development, especially on an international basis. (paragraph 5.59)

21. The Law Reform Commission review:

- the Government's policy for protecting intellectual property;
- the appropriateness of the present legal framework for protecting intellectual property; and
- the administration of intellectual property protection by three departments. (paragraph 5.65)

22. The Government consider amendments to the taxation legislation to allow the depreciation of world-wide patents that add to work in Australia, but do not provide income, as a means of encouraging Australian companies to operate on the world market. (paragraph 5.73)

Management Training

23. Companies receiving grants for research and development be:

    . examined by the granting body to ascertain whether they require management training; and

    . assisted to obtain this training. (paragraph 6.11)

24. Innovative companies be assisted to obtain management advice of a high order from experienced managers. (paragraph 6.11)

Networking

25 Increased funding be provided for networking so that the number of networks supported can be increased, training of network facilitators pursued and information disseminated about networks. (paragraph 10.59)

26. The Australian Technology Group concentrate its activities on forging alliances and building networks for Australian researchers, companies and industries. (paragraph 10.62)

Information and Research

27. The Industry Commission take steps to ensure that its work is prosecuted with careful attention to the acquisition of adequate data and the use of appropriate methodologies. (paragraph 7.33)

28. The Government provide additional funds for research into the process of innovation, the effect of government assistance on private sector investment in innovative activities, and the efficacy of different forms of support for private sector investment in research and the development and commercialisation of this research. (paragraph 10.13)

29. Agencies providing support for research and its development and commercialisation give priority to producing a single compendium of information about all available forms of support. (paragraph 10.27)

30. A review body be established by the agencies that provide support for research and its development and commercialisation to ensure on an ongoing basis that:

- overlap between programs is minimised;
- any gaps in the support provided are identified and rectified; and
- information flows readily from agency to agency. (paragraph 10.32)

31. Agencies that provide support for research and its development and commercialisation give high priority to establishing and maintaining a centralised record of the assistance provided to individual firms. (paragraph 10.37)

32. Agencies providing assistance for research and its development and commercialisation provide reasons for their lack of success to failed applicants. (paragraph 10.39)

33. The Bureau of Industry Economics examine the programs that provide firms with targeted assistance for research, development and commercialisation with a view to:

- assessing the extent to which the programs support the company and industry attributes needed for successful international commercialisation of research;
- establishing how effective the programs have been in bringing products onto the domestic and overseas markets; and
- indicating any changes that should be made to the Government's suite of programs to improve their performance. (paragraph 10.42)

Industry Research and Development Board

34. A review be carried out of the role and operation of the Industry Research and Development Board, with a view to recommending how it might play a more central and effective role in the commercialisation of Australian research. (paragraph 10.47)

35. The mission of the Board and the objectives of its programs be revised and very clearly specified. (paragraph 10.47)

Policy

36. Agencies, which provide grants for research and its development and commercialisation, continue to concentrate support for areas in which Australia has a competitive advantage, and tailor the assistance provided to the particular needs of industries and firms. (paragraph 10.19)

37. Agencies awarding grants for research and its development and commercialisation review the merits of requiring at least part repayment of grants by firms that gain financial benefit from receiving them. (paragraph 4.50)

38. The Government provide a performance bond guarantee facility for sales in Australia of technology and related products, as recommended by the Task Force on the Commercialisation of Research. (paragraph 7.40)

39. The Government increase the role played by organisations representing engineers and technologists in providing advice to the Government and assisting in framing policy relating to innovation. (paragraph 10.65)

40. The Government consult widely with all sections of the community to establish concrete targets for increased production and exports of value-added goods and services. (paragraph 10.71)

Rewards for Commercialisation

41. The Government institute a system of public reward for individuals and organisations that contribute in an outstanding manner to promoting Australia's success in commercialising its research and development. (paragraph 10.67)

Commercialising Medical Research

42. The National Health and Medical Research Council and the Industry Research and Development Board cooperate to produce a program to further stimulate the commercialisation of medical research. (paragraph 4.44)

43. The Business Regulation Review Unit and the National Health and Medical Research Council consult on an ongoing basis with interested parties to identify regulatory barriers to the commercialisation of medical research and recommend on ways of minimising them. (paragraph 9.25)

National Industry Extension Service

44. Additional funds be made available to the National Industry Extension Service so that it can supply its services to firms that have not yet used them and more extensive services can be provided to existing clients. (paragraph 6.29)

National Procurement Development Program

45. The National Procurement Development Program be continued to 1995, as agreed by the State and Commonwealth Governments. (paragraph 7.36)

46. The Industry Research and Development Board continue to modify the Program to eliminate inefficiencies in its operation. (paragraph 7.36)

Defence Offsets Program

47. The Department of Defence undertake a full scale assessment of the national significance of the Defence Offsets Program, in particular its success in meeting its objectives. (paragraph 8.6)

48. The Department of Defence produce a separate report containing details of the Defence Offsets Program, similar to that produced by the Department of Industry, Technology and Commerce on the Civil Offsets Program and the Partnerships for Development Program. (paragraph 8.13)

Partnerships for Development

49. The Department of Industry, Technology and Commerce expedite its evaluation of the Partnerships for Development Program. (paragraph 8.39)

50. When evaluating the Program, the Department identify the success of the Program in meeting Program objectives and examine the Program's deficiencies, particularly the need for:

    - improved guidelines to make the requirements of the Program clearer to firms;

- continued standardisation of reporting requirements for partners in order to improve the quality of information prepared by them; and

- comprehensive descriptions of activities conducted during each year by participating firms. (paragraph 8.39)

ABBREVIATIONS

ABPDP	Australian Best Practice Demonstration Program
ACOP	Australian Civil Offsets Program
ADF	Australian Defence Force
AGPS	Australian Government Printing Service
AIC	Australian Investment Conferences
AIDA	Australian Industries Development Association
AIDC	Australian Industry Development Corporation
AIRDIS	Australian Industrial Research and Development Incentive Scheme
AIRG	Australian Industrial Research Group
AITC	Australian Industry and Technology Council
AMIRA	Australian Minerals Research Association
ANAO	Australian National Audit Office
ANSTO	Australian Nuclear Science and Technology Organisation
ARC	Australian Research Council
ASTEC	Australian Science and Technology Council
ATG	Australian Technology Group
ATO	Australian Taxation Office
BERD	Business Expenditure on Research and Development
BHP	Broken Hill Proprietary Limited
BIE	Bureau of Industry Economics
CLRC	Copyright Law Review Committee
CRA	CRA
CRC	Cooperative Research Centres
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAS	Department of Administrative Services
DEC	Digital Equipment Corporation
DEET	Department of Employment, Education and Training
DITAC	Department of Industry, Technology and Commerce
DPIE	Department of Primary Industry and Energy
DSTO	Defence Science and Technology Organisation
EFIC	Export Finance and Insurance Corporation
EMDG	Export Market Development Grants
EPAC	Economic Planning Advisory Council
FTA	Fixed Term Agreements
GATT	General Agreement of Tariffs and Trade
GDP	Gross Domestic Product
GIRD	Grants for Industry Research and Development
IAMP	Innovative Agricultural Marketing Program
IBD	International Business Development
IC	Industry Commission
IEA	International Energy Agency
IPAC	Industrial Property Advisory Committee
IPR	Intellectual Property Rights

IRDB	Industry Research and Development Board
ISC	Insurance and Superannuation Commission
ISTP	International Science and Technology Program
IT	Information Technology
ITES	International Trade Enhancement Scheme
JAS-ANZ	Joint Accreditation Systems of Australia and New Zealand
JCPA	Joint Committee of Public Accounts
MIC	Management and Investment Companies
MRC	Medical Research Committee
MTIA	Metal Trades Industry Association
NBEET	National Board of Employment, Education and Training
NH&MRC	National Health and Medical Research Council
NIES	National Industry Extension Service
NPDP	National Procurement Development Program
NTCS	National Teaching Company Scheme
OECD	Organisation for Economic Cooperation and Development
ORR	Office of Regulation Review
PDF	Pooled Development Funds
PDP	Partnerships for Development Program
PVR	Plant Variety Rights
R & D	Research and Development
RRA	Registered Research Agency
SIDC	Space Industry Development Centres
SMEDP	Small and Medium Enterprise Development Program
TAFE	Technical and Further Education
TASC	Centre for Technology and Social Change
TESSA	Tax Exempt Special Savings Accounts
TRIPS	Trade Related Aspects of IPR
UK	United Kingdom
USA	United States of America
WIPO	World Intellectual Property Organisation

Chapter 1

INTRODUCTION

The Context and Conduct of the Inquiry

1.1 The Joint Committee of Public Accounts commenced its Inquiry into Research and Development in September 1989. The Inquiry began in the context of national concern about falling expenditure on scientific research, the nation's long-standing failure to capture as great an economic benefit from its research as might have been expected, and Australia's growing external debt. While Australia has historically relied for its wealth on the export of its mineral resources and agricultural commodities, this pattern of economic activities is no longer appropriate as the sole support for the nation's wellbeing. There has been an increasing realisation that Australian firms must seek to add value to their exports and exploit the rapidly growing, global demand for sophisticated products. It is here that well-devised research assumes critical importance.

1.2 As it started its Inquiry, the Committee's focus was on the role of the public sector research organisations in contributing to Australian development through the better utilisation of their discoveries and expertise. In addition, the Committee was to examine the adequacy of funding to these institutions and how cost-effectively they used their funds. In response to advertising and invitations to government and non-government organisations, 50 submissions addressing these issues were received.

1.3 After the election in March 1990, the 17th Committee resolved to continue the Inquiry and to extend the terms of reference to include a review of the Commonwealth's support for private sector investment in research and development (R & D). The need to include consideration of research by the private sector was clear from the submissions provided to the Committee. The submissions pointed to the significance, for the successful exploitation of research findings, of the characteristics of the Australian private sector and the factors that influence its commercialisation of research. Among the influences on firms commercialising R & D are government measures that are designed to promote their activities both directly and indirectly.

1.4 The Committee re-advertised the Inquiry in the national press on 1 September 1990 and invited some 55 individuals, firms and organisations to provide submissions. Individuals and organisations that had lodged a submission

in response to the earlier advertisement of the Inquiry were specifically invited to take the opportunity to provide a second submission in order to update evidence already provided, or comment on issues pertaining to the new terms of reference.

1.5 Following the re-advertisement of the Inquiry, many additional submissions were received from Commonwealth departments and research agencies which had lodged earlier submissions. However, the main body of evidence was received from a much broader range of organisations and individuals, including the following:

- individuals who were, or had been, involved in the management of venture capital companies;
- individuals with experience in the management of small, innovative start-up companies;
- representatives of Australia's few large private sector R & D performers, such as Broken Hill Proprietary Ltd (BHP) and CRA;
- firms and organisations providing commercialisation services to small companies;
- councils and boards involved in the administration of grant schemes and the selection of projects for assistance, such as the Industry Research and Development Board (IRDB) and the Australian Research Council (ARC);
- industry associations; and
- academics with teaching or research expertise in relevant areas, such as research management and business administration.

1.6 Eleven public hearings and inspections were conducted in various Australian capitals between August 1990 and May 1991, and the Committee's Report on the first of the Inquiry's terms of reference, the performance of R & D by public sector research organisations, was tabled in the Parliament on 25 June 1992.[1]

1. JCPA. *Public Sector Research and Development: Volume 1 of a Report on Research and Development*, Report 318, AGPS, Canberra, June 1992.

1.7 Work then began on this volume of the Report with the realisation that some considerable time had elapsed since submissions were received and public hearings, briefings and inspections held. Accordingly, a number of organisations and individuals that had already provided the Committee with submissions relating to the Government's support for private sector investment in R & D were approached. They were invited to draw to the Committee's attention any significant developments since their earlier submissions were made. Eight substantial submissions were received.

1.8 Appendix A lists the submissions to the Inquiry. Details of the dates and locations of public hearings, inspections, and informal discussions, along with the identity of the 84 witnesses to the Inquiry, are at Appendix B.

Volume 1 of the Committee's Report on Research and Development

1.9 Before describing the scope and structure of this volume of the Committee's Report, it is important to detail some of the main findings reported in Volume 1, *Public Sector Research and Development*. Volume 1 covered both general issues relating to R & D and the performance of a number of individual research organisations. The general issues are summarised briefly here to indicate the point of view from which the Committee came as it considered the Commonwealth's support for private sector investment in R & D.

Guidelines for the Support of R & D

1.10 The Committee observed that, in the present economic circumstances, there are great pressures to cut costs and ensure the most cost-effective use of public funds. Wise management of the considerable assistance provided by the Government for R & D requires guidelines to aid decision making. The Committee promoted two such guidelines. The first is that the public sector should not be involved in fields in which the private sector can expect to conduct R & D and gain economic benefit from it in the shorter term. The primary aim of public sector research organisations should be the conduct of longer-term, basic research and research for the benefit of the community as a whole, such as that directed towards understanding the environment and the dynamics of our society. The Committee considered that it is essential that, in the current emphasis on the commercialisation of R & D, the need to continue basic research and maintain the national capacity to do so is not overlooked.

1.11 The second guideline is that priorities for spending on research should be determined in the light of criteria selected to obtain maximum benefit for the nation. The criteria should include consideration of the wider public interest as well as possible economic returns. A method of applying such criteria for priority setting has been developed by CSIRO and is being applied by a variety of organisations, in-house and within and across disciplines. It is a valuable approach and the Committee believed that it should be further developed and widely used in priority setting exercises.

1.12 For both these guidelines to be effectively used, information must be available to the decision makers. Much of the necessary information is lacking and several of the Committee's recommendations were directed towards ensuring that it is collected and accessible to those who need it.

Commercialisation

1.13 The Committee recognised that the successful commercialisation of R & D depends on, among other factors, a close linkage between the researcher and the market to which his work will eventually be delivered. One way in which this can be developed is to involve industry at an early stage of R & D, a fact that has been increasingly recognised as being essential. The various mechanisms that exist for channelling research to industry include establishing companies, partnerships and joint ventures, using licensing agreements and patents, and employing brokers. However, there is great concern at the lack of expertise in Australia in the marketing of R & D and this requires urgent redress.

1.14 Three further issues were identified as being significant in relation to the commercialisation of public sector research. The first covers the need to be aware of the costs of commercialisation when public sector research organisations are charged with commercialising their work and to provide for these needs to be met. The second issue is that of ensuring that a reasonable rate of return is obtained from the Government's investment of public funds in R & D. Third is the issue of the appropriate charging scale for research contracted from public sector organisations by outside bodies. The Committee favoured passing on the full cost of carrying out such work for the private sector but believed that other government bodies may be unable to meet these costs, unless provided with additional finds. A good case exists for such public interest projects being carried out without full cost recovery.

Other Issues

1.15 The Committee considered the factors that influence Australia's ability to maintain the nation's capacity for R & D and identified among them the need for an ensured supply of research staff for both the public and private sectors. The Committee made recommendations directed at the education system to increase the number of appropriately skilled researchers and research managers. Training such people relies, not only on the provision of training by universities for which they must be adequately staffed, but also on attracting very able students to study science and science-related subjects. Attracting able students to science will follow from raising the profile of science, and that depends in part on conveying the excitement, personal rewards and national benefit that R & D can deliver.

1.16 The Committee also reviewed the research planning mechanisms at the national, sectoral and organisational levels, and promoted the use of regular reviews at all levels of the research effort. Furthermore, the Committee believed that planning bodies must take account of as many points of view as possible and seek to coordinate the activities of the groups with which they are concerned. Some of the Committee's recommendations addressed these issues.

The Structure of Volume 2 of the Report

1.17 Chapter 2 provides an outline of the Committee's view of the significant features of the process by which research is developed and commercialised. From this outline, the points in the process are identified at which assistance or intervention can be or is already being applied. The outline of the process of research, development and commercialisation presented in this chapter represents a framework for the remainder of the Report.

1.18 Chapters 3 - 9 cover the various types of support that the Government provides to the private sector's R & D effort. Some of these are directly targeted at R & D, as in the case of certain grants and the 150% tax concession for R & D. Other forms of support, such as training in management and marketing, are not specifically for the commercialisation of research but benefit it and are therefore scrutinised.

1.19 Financial issues are dealt with in Chapter 3, which covers taxation and capital. The following three chapters focus on grants (Chapter 4), the protection of intellectual property (Chapter 5) and assistance with management and marketing (Chapter 6). Chapters 7 and 8 deal with programs designed to stimulate economic

development by linking large purchasers and large vendors with Australian firms. The programs considered relate to procurement and offsets. A variety of other programs that deserve mention are covered in Chapter 9, and Chapter 10 draws on the previous ten chapters to make some more general conclusions than is possible in the chapters devoted to individual programs.

Chapter 2

CONVERTING RESEARCH TO ECONOMIC BENEFIT

Introduction

2.1 In this chapter, the Committee provides the background to its consideration of the existing measures and future possibilities for supporting private sector R & D, which are covered in subsequent chapters of the Report. It highlights the main features that it believes to be of major significance to the nation's effort to increase the commercial utilisation of its research effort. This is the context within which the Government's present support for private sector investment in R & D can be examined.

2.2 Australia is a wealthy country whose wealth has traditionally flowed from primary industries and minerals, in which fields it is a leading exponent of the successful commercialisation of R & D. The impetus provided by these industries is no longer sufficient to assist the national economy at desired levels. The nation is seeking new industries and new adaptations for existing industries. Both require highly skilled researchers, developers and commercialisers.

2.3 Australia's wealth has allowed the development of a highly skilled national research endeavour, most of which is located in the universities and CSIRO and much of which is world class. However, its links with productive industry are not strong. In addition, the small scale of Australian manufacturing industry, its characteristically low levels of R & D and the fact that much of it is foreign-owned have all hampered the development of new industries exporting to the world. What is needed are new ways in which to bring the results of research to the market by making the market and its potential the dynamo for Australian R & D.

The Process of Innovation

2.4 Converting the results of research to economic benefit is sometimes referred to as innovation. Innovation is seen as including both the R & D that produces an invention and the successful commercialisation of that invention. The use of the term stresses that R & D is but a part of the process and equal attention must be given to financing, managing and marketing the resultant products. Dr J W Stocker, the Chief Executive of CSIRO, pointed out in an address to the

National Press Club that the elements of innovation, the R & D, ingenuity, product differentiation and clever marketing, create more than 80% of long-term economic growth. Economic initiatives must therefore be concentrated as much on managing innovation as they are about managing other variables, such as capital and labour.[1]

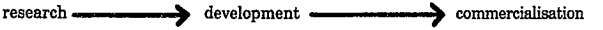
2.5 In the course of conducting this Inquiry, it became clear to the Committee that knowledge about the process by which research is successfully converted to a commercial product is still accumulating. Furthermore, the information that is available is not as widely known as it should be if advantage is to be taken of it when plans are made for the commercialisation of research results.

2.6 The Committee identified the following as the most critical points for its consideration as it reviewed the needs of the private sector in relation to the most efficient and effective use of moneys expended on research:

- models of innovation;
- the funding requirements for the different stages of innovation;
- the need for a stable business environment;
- size, alliances and competition;
- management's attributes and skills; and
- other factors, such as the nation's financial and taxation environments, labour force and transport system.

Models of Innovation

2.7 Moving from a research finding to a commercial product has often been conceptualised as a linear process of research leading to development and finally to its commercialisation. This is known as the 'pipeline model' and can be rendered diagrammatically as:

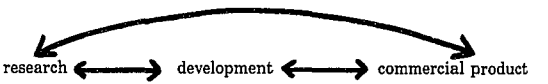


1. J Stocker. Address to the National Press Club, 11 March 1992.

2.8 It is now clear that this model represents an oversimplified and, in some respects, wrong view of how research is successfully commercialised. It does, however, represent quite well one of the characteristics of Australia's past approach to the commercialisation of its research: its tendency to rely on 'technology push' in which scientists peddled their research results to industry rather than being guided in their work by 'market pull'. The Task Force on the Commercialisation of Research, which was led by Mr R Block, made the point that:

> ... Australia cannot afford to let technology drive our business direction; rather the market must drive the direction of business growth and innovative behaviour. ... the task is [to understand] how to bring the market to bear on research rather than how to commercialise research. [2]

2.9 As the Committee acknowledged in Volume 1 of its Report, many commentators have drawn attention to the need for the early and continuing involvement in any project of researchers, developers and commercialisers throughout the entire process.[3] In this way, communication between the scientists and businesses is maximised; business will be more fully aware of the scientific possibilities in their area of operation and scientists more aware of the technological, market and financial constraints on the various research options that they might pursue. Much of Australia's mining and agricultural research has successfully relied on this 'interactive model' of commercialisation. The market driven, interactive model can be expressed as a diagram thus:



Funding

2.10 A second important point about the process of taking research to the market is the relative expense involved at each stage. The Australian Industrial Research Group (AIRG) drew the Committee's attention to the '1:10:100 rule', which illustrates that the cost of developing a research finding tends to be approximately ten times that of making the original finding, and the commercialisation stage is

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2. DITAC. *Bringing the Market to Bear on Research*, Report of the Task Force on the Commercialisation of Research, AGPS, Canberra, November 1991, p. 2.
3. JCPA. *Public Sector Research and Development: Volume 1 of a Report on Research and Development*, Report 318, AGPS, Canberra, June 1992, p. 182.

usually about ten times more expensive again.[4] The focus of funding in Australian R & D has been on the initial research with less attention being given to the need for assistance with the later stages of the commercialisation process. This situation has been characterised by Pappas Carter Evans and Koop[5] as:

> research (most) development (less) commercialisation (least)

It is important that both business and government recognise that the requirements for successful commercialisation in terms of the resources required at each stage are:

> research (least) development (more) commercialisation (most)

2.11 In the March 1991 Industry Statement, Senator Button announced that the Industry Research and Development Board (IRDB), which awards grants to companies for R & D, would focus more on the commercialisation of Australian innovations. In May 1991, Mr Kricker, the then Chairman of the IRDB, described the changing emphasis in the Board's criteria for selecting awardees:

> We have actually evolved from a mere four years ago of 'Here is some good R&D, we should support it', to ... 'Well, it is reasonable R&D but where is the business plan'. ... We are now starting to address the questions of 'Where might the venture capital come from?' ... it had become totally obvious to us that to divorce the R&D and the business growth from the venture capital was really a poor way to go.[6]

A Stable Business Environment

2.12 A further characteristic of the commercialisation process is its long time frame; a time span of five, 10 or 15 years from making a finding to translating

4. Evidence, p. 580.
5. Pappas Carter Evans and Koop. *Innovation in Australia,* a Report for the IRDB, AGPS, Canberra, July 1991, p. 17.
6. Evidence, pp. 1265-66.

it into commercial benefit is not unusual.[7] The need then is for very long-term strategic planning by companies, which is made easier when they know that the environment in which they are operating is relatively stable. The Metal Trades Industry Association expressed the view that:

> ... the importance of ... creating certainty for long term business planning, cannot be too strongly emphasised. ... It is absolutely vital that Australian industry is able to plan with certainty, knowing what schemes are available on an ongoing basis.[8]

As Pappas Carter Evans and Koop pointed out:

> ... support should be in a sustained form: one-off project funding is unlikely to generate major successes. Patient funding over the medium to long term will enable strong companies to build the cumulative experience that is essential to innovative success.[9]

2.13 In this context, the recent announcement in the 1992-93 Budget that the 150% tax concession will remain in place on an indefinite basis was welcomed as contributing to stability to the environment in which companies are planning their R & D programs.

Size, Alliances and Competition

2.14 A marketable innovation may consist of no more than a minor modification of an existing product or it may represent the realisation of a totally new idea. The most fertile source of innovations, particularly for the brand new product, is the small start-up company operating in an area of rapidly evolving technology, such as electronics. This sector of the business community is, however, least able to muster the resources to last the time needed to develop its innovations fully and to market them, particularly in overseas markets. Furthermore small and medium-sized companies often lack the necessary experience. Pappas Carter Evans and Koop surveyed 42 innovations funded by the Australian Government between 1976-86 and found that 25 failed to reach the market, with managerial inexperience at all stages of innovation being one of the important contributory factors.

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7. See, for example, the AIRG's evidence, p. 583.
8. Evidence, p. 882
9. Pappas Carter Evans and Koop. *Innovation in Australia,* a Report for the IRDB, AGPS, Canberra, July 1991, p. 25.

2.15 One way in which small companies can enhance their chances of survival and growth is to associate with larger ones and use the latter's expertise and distribution networks. Indeed, there are few large Australian companies by international standards, and medium-sized and larger Australian companies benefit, in terms of success in innovating and penetrating overseas markets, from forming alliances with other businesses. The collaboration may be with multinationals, as in the case of Invetech's sales of pathology laboratory instruments under the Leica brand name. However, finding the right partner to form successful strategic alliances is a difficult task.

2.16 The formation of industry clusters is another approach to capturing the advantages of size, including those of access to a wider range of capabilities than each company possesses on its own. The companies can then piggyback on one another, develop business with each other, design and construct technology as they collaborate together and together take advantage of government initiatives. In this way they may reach a position to build a market presence offshore. Technology parks provide sites where businesses can collocate. Several parks have been established by State Governments and the private sector, ANSTO has established a technology park at its Lucas Heights site and CSIRO is planning a number of them on the sites of some of its research laboratories. The multifunction polis might be expected to provide the same advantages. The cooperative research centres also provide a basis for clustering.

2.17 Another stimulus to growth is the presence of competition. The Committee noted the Japanese approach to R & D in which funding is provided by the government for precompetitive research and the results are then turned over to the private sector for exploitation. Competitive pressures stimulate further innovation and the products of the leading companies that emerge are likely to be suitable candidates for export markets. Two other elements have been proposed as being important in stimulating growth. Both theory and econometric studies show that, when a large number of firms make similar products in the same geographic area, they spur one another to be more innovative, especially in the sense of improving on existing products. Furthermore, other studies have indicated that the most thriving USA industries are in cities where no particular industry dominates. In such cities, more opportunities exist for firms to learn from and cooperate with their neighbours, which favours the development of radical innovations.[10]

10. Corcoran E and Wallich P. 'The rise and fall of cities', *Scientific American*, August 1991, p. 88.

2.18 In Australia the domestic market is small and competition less intense than in many other countries. However, the same discipline of market pull can be provided by a leading edge, locally controlled customer. The AIRG told the Committee that:

> ... [the] need to encourage the bigger enterprises to get bigger and to encourage interaction with lead edge customers ... [is] a major challenge for Australia in the future if it is to promote its industrial development.[11]

The ideal structure for an innovative industry is summarised in Figure 2.1.

Management Attributes and Skills

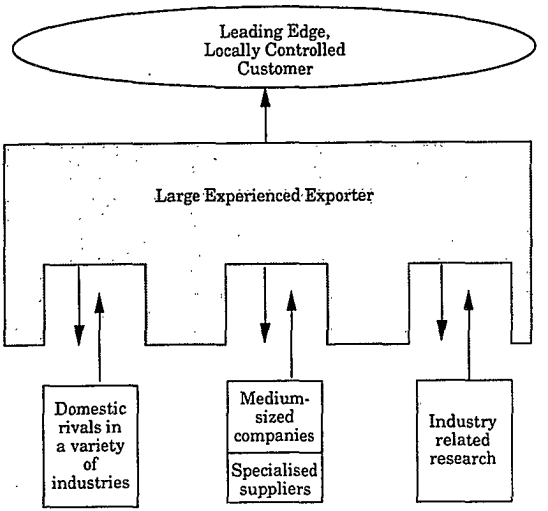
2.19 To commercialise successfully its research in overseas markets, Australian companies need not only size and strategic alliances with other firms, but also a particular outlook on the part of their managements. In some respects, management culture in Australia does not fare well on this score. Mr D Hanley, former Chairman of the IRDB and the Chairman of Memtec Ltd which supplies products for water and waste water management, commented:

> ... only companies striving for international leadership, design new and improved processes. Those which simply wish to defend an established market position tend to import technology proven elsewhere. There are very few operations in Australia striving for world leadership positions. ... [This is] Australia's most significant problem if it wishes to see financial benefit from the vast amounts of funds that are currently expended on research.[12]

2.20 In other respects, the management of many Australian companies are ill-equipped to assess the technological developments that they might incorporate into their businesses. The boards of Australian companies tend to be much more heavily dominated by accountants, economists and lawyers than the boards of companies in countries which have a greater record of successfully exploiting their

11. Evidence, p. 580.
12. D M Hanley. 'The stepping stone evolution of MEMTEC', *Science, Technology and Industrial Development*, EPAC Discussion Paper 08/91, AGPS, Canberra, p. 109.

Figure 2.1 Diagram Depicting the Ideal Structure for an Innovative Industry



Source: modified from Pappas Carter Evans and Koop, *Innovation in Australia*, a Report for the IRDB, AGPS, Canberra, July 1991, p. 29.

research. As a result, Australian boards are less attuned to scientific and technical issues and their attitudes are dominated by the short-term view of business that characterises accountants, economists and lawyers.

2.21 According to Peptide Technology Ltd, 70% of the top 100 Japanese companies have technical backgrounds, and a similar situation pertains in Germany.

> Management is receptive to technology change, innovation and technical planning for the long term. ... In Australia most of our companies are [led] by Chief Executives with a background in Accountancy, Economics or the Law. Their perspective is much more short term and parochial.

Furthermore:

> It is scandalous that there are virtually no scientists or engineers amongst the upper echelons of the senior executives of the Public Service - nor are the influential departments of Cabinet and PM or Treasury recruiting them as a matter of policy.[13]

2.22 The same short-term, risk averse perspective of Australian businesses also extends to the Australian financial sector, which is reluctant to invest substantial sums in R & D.

2.23 Another consideration is the scope of a company's R & D policy. In the light of the experiences of companies that unsuccessfully attempted to diversify their operations during the 1980s, many companies are now restricting themselves to their core businesses and undertaking R & D only in relation to their core activities. While this may be an understandable response to recent events, it reduces the options for growing into new, expanding markets. The Committee noted, however, that some larger firms have sought out new areas for research; for example, BHP, Du Pont and Mt Isa Mines have formed individual alliances with CSIRO to explore the possibilities of expanding into promising new fields.

13. Evidence, p. S1745.

Other Factors

2.24 In the sections above, the Committee has singled out for comment some of the major influences on the successful exploitation of research. Other variables are, however, equally important. For example, the extent of tariff protection and the rate of microeconomic reform to the labour force and transport industries are significant factors. The availability of capital, interest and exchange rates, the rate of inflation and taxation are also critical considerations for any business. If the necessary infrastructure is lacking and an appropriately skilled workforce is not available, new projects cannot go ahead.

2.25 Some of these factors are beyond the scope of the Committee's Inquiry. The Committee did, however, take extensive evidence on issues relating to the availability of capital for innovation and this topic is covered in Chapter 3. The tax regime, as it impacts on innovation, is also dealt with in Chapter 3, and some aspects of the education of a suitably skilled workforce was the subject of Chapter 8 in Volume 1 of the Committee's Report.

2.26 During its examination of the issues in this Inquiry, the Committee has sought to establish those areas where impediments exist to the private sector's commercialisation of research within a market driven situation. In making its recommendations, the Committee has endeavoured to seek solutions to the problems identified that are appropriate for local conditions. As Pappas Carter Evans and Koop pointed out:

> ... the Australian context represents a unique set of characteristics: a small, previously sheltered economy with large distances from world markets, few large exporters, a very high ratio of financial trade to industry output, to name some of its unique elements.[14]

Uncritical adoption of measures developed in other countries with different characteristics may be inappropriate.

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14. Pappas Carter Evans and Koop. *Innovation in Australia*, a Report for the IRDB, AGPS, Canberra, July 1991, p. 34.

2.27 Before dealing in detail with the individual elements and programs of the Commonwealth's support for private sector investment in R & D, the scene must be further set with a description of the level and focus of that investment and an overview of the types of support provided.

Private Sector Investment in Research and Development

Levels of Expenditure

2.28 The Committee surveyed Australian funding of R & D in Chapter 2 of its first Report on this Inquiry. It found that:

> Australia has relatively low levels of R & D investment by the private sector. In fact, the total spending of all Australian businesses on R & D approximates that of a medium-sized international company, such as Volvo.[15]

In Australia, the Government is the dominant source of funding for R & D.

2.29 Over the last 20 years, private sector spending on R & D has more than doubled in real terms and, over the 1980s, Australia has had the highest rate of growth in spending of all the OECD countries, particularly among small and medium-sized companies. In spite of these achievements, however, Australia remains among the OECD nations with lower expenditures as measured by the ratio of business expenditure on R & D (BERD) to gross domestic product (GDP). This point is illustrated by Figure 2.2, which shows that Australia ranks 16th out of the 19 OECD nations in terms of BERD/GDP.

2.30 Statistics released recently by the Australian Bureau of Statistics for 1990-91 showed that BERD decreased in real terms during that year by 2%. Furthermore, the ratio of BERD to GDP had remained static over the two years 1988-89 to 1990-91, and the number of business enterprises carrying out R & D had decreased by 13% since 1989-90.[16]

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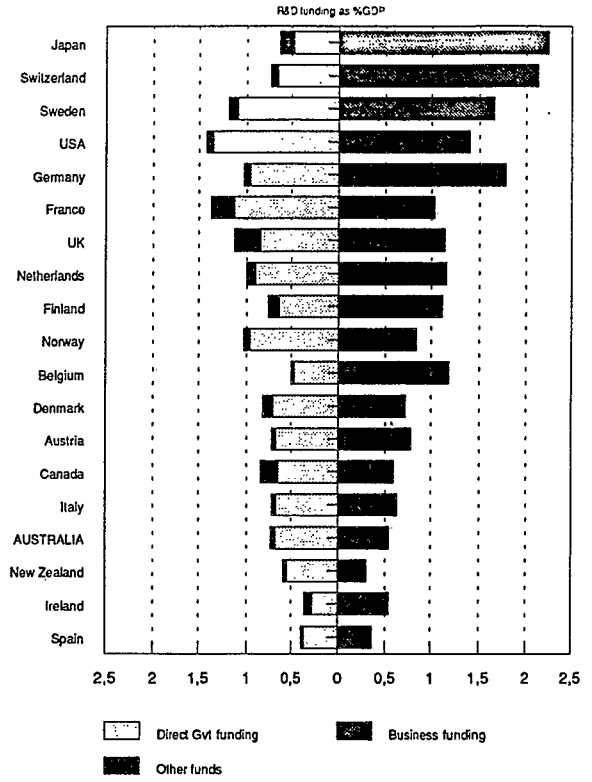
15. JCPA. *Public Sector Research and Development: Volume 1 of a Report on Research and Development*, Report 318, AGPS, Canberra, June 1992, p. 18.
16. I Castles. *Research and Experimental Development Business Enterprises, Australia 1990-91*, Australian Bureau of Statistics, Catalogue No 8104.0, 1992, pp. 1, 3.

Figure 2.2 OECD Levels of Funding for R & D as a Percentage of GDP.



Source: OECD Main Science and Technology Indicators, No 1, 1992.

2.31 A number of reasons have been advanced to account for Australia's low level of business expenditure on R & D. In the first place, the nature of Australia's industrial structure influences expenditure. A nation's manufacturing sector generally accounts for a significant proportion of its spending on R & D and Australia's manufacturing sector is only small. Furthermore, high technology industries, which are major performers of R & D, are not a significant element in Australia's industrial make up.

2.32 A second important influence on R & D investment is the characteristics of Australian firms. Australia's manufacturing firms are small and can import easily the foreign technology that they need. They tend to be oriented to the domestic market and export relatively little. The impetus to perform R & D as a means of improving competitive edge on the world market is therefore lacking.

2.33 Furthermore, Australia's larger firms, which might be expected to be able to invest considerable sums in R & D, tend to be foreign-owned. It has been argued that the overseas owners of these firms prefer to conduct what research they require in their home countries, and do no more than make adjustments to products developed overseas to suit the local market in Australia. However, a study by the Bureau of Industry Economics (BIE) suggested that the presence of foreign-controlled firms did not detract from business performance of R & D.[17] Other recent studies have noted a trend towards the globalization of R & D with multinationals selecting the locality for the conduct of their research on the basis of the local capabilities for relevant R & D in different parts of the world rather than proximity to their head offices.[18]

2.34 In addition, the larger Australian-owned firms operate in industries that lack intense pressures to perform research. Mining and transport industries are examples here.

17. BIE. 'Foreign control, exports and R&D' in Research Committee of the IRDB, *Industrial Research in Australia*, Vol. 2, Appendix 4, p. 13.
18. See, for example, Pearce R D and Singh S. *Globalizing Research and Development*, Macmillan, London, 1992.

Expenditure by Industry

2.35 In 1988-89, which is the last year for which statistics are available, Australian businesses expended $1741.7m on R & D. Sixty-five per cent of this investment in R & D was allocated to the following five product fields:

Electronics, computing and electrical appliances	$641m
Transport equipment	$175m
Chemical, petroleum and coal products	$212m
Mining	$106m
Basic metal products	$ 93m

2.36 Strong growth occurred between 1984-85 and 1988-89 in investment in pharmaceutical products, computing, metal products, telecommunications, food and scientific related equipment.[19] However, the information about selected industries shown in Figure 2.3 indicates that the proportion of Australian firms undertaking R & D is relatively low.

Support for Private Sector Investment in Research and Development

2.37 As the Committee pointed out in Chapter 2 of the first volume of its Report on this Inquiry, prior to 1985, Australia provided minimal support for industrial R & D compared with most OECD countries. Its support for R & D in the manufacturing sector was particularly low. Since then, a variety of measures have been introduced. Some of these are measures directed at support for R & D across the board, such as is provided by the 150% tax concession. Others are targeted at specific industries, types of products or innovations at a particular stage of development. As Figure 2.4 shows, the majority of the Government's funding for private sector R & D is delivered by the more general programs. In this respect, Australia differs from the other OECD nations, for which information is available, in making greater use of more general measures. Expenditure on the different elements of the Government's program for the support of private sector investment in R & D is shown in Table 2.1.

2.38 Support for investment in the rural and energy industries is provided through the matching of government funds to sums raised from levies on the produce of these industries. The research funds so raised are administered by a

19. DITAC. *Australian Science and Innovation Resources Brief 1992*, AGPS, Canberra, 1992, p. 14.

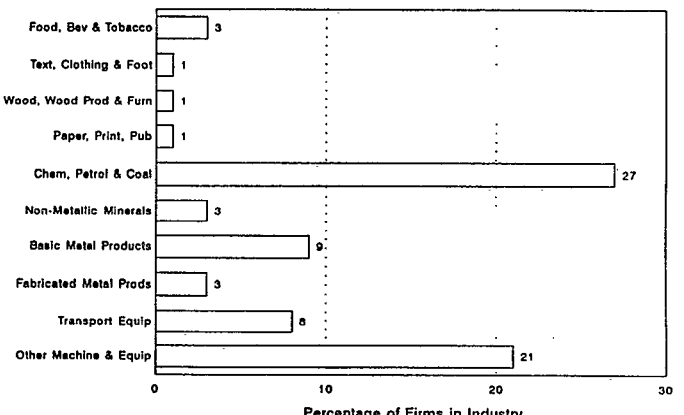
Table 2.1 Expenditure by the Government in 1991-92 on Programs Supporting Innovation

Program	$m
Australian Technology Group (DITAC): first expenditure in 1992-93	
Building Research (DITAC)	0.3
Citric Acid Bounty (DITAC)	0.7
Computer Bounty (DITAC)	74.5
Factor F Pharmaceutical Industry Development Program (DITAC)	26.3
International Science and Technology Cooperation Programs (DITAC)	5.1
Metal-Based Engineering Program (DITAC)	5.6
Motor Vehicle and Component Development Grants (DITAC)	2.3
Pulp Mill Research (DITAC)	1.9
Service Industries Research Program (DITAC)	0.2
Space Industry Development Centres (DITAC)	0.4
Technology Development Program (DITAC)	3.2
Vendor Qualification Scheme (DITAC)	1.2
Advanced Manufacturing Technology Development Program (IRDB)	0.1
Discretionary Grants Scheme (IRDB)	14.0
Generic Technology Grants Scheme (IRDB)	
Manufacturing and materials technology	4.9
Biotechnology	3.1
Information technology	4.5
Communications technology	4.3
Environmental technology	0.9
Total	17.7
National Procurement Development Program (IRDB)	4.4

National Teaching Company Scheme (IRDB)		1.8
150% Taxation Concession: revenue foregone (ATO, IRDB)		316.0
Intellectual Property:	patents (DITAC)	cost neutral
	copyright (A-G's)	costs unavailable
	plant variety rights (DPIE)	cost neutral
Cooperative Research Centres Program (PM&C)		18.2
National Health & Medical Research Council Commercialisation of Research (in 1992) (DHHCS)		0.3
Collaborative Research Program (first half of 1992) (DEET)		2.7
Australian Civil Offsets Program (DITAC)		) Administrative
Partners for Development Program (DITAC)		) costs
Defence Offsets Program (Defence)		) only
DSTO Industry Support Office (Defence): being trialed in 1992-93		
Multifunction Polis (DITAC)		2.7
National Industry Extension Service (DITAC)		16.3
(includes Enterprise Network Program		0.5)
Small/ Medium Business Enterprise Development Program (DITAC)		1.4
(Payments to States and Territories		1.0)
Australian Trade Commission (DFAT), including:		275.2
Payments under the *Export Development Grants Act 1974*		134.0
Other export market development schemes (International Trade Enhancement Scheme)		20.7
Agricultural Marketing Innovation Fund		4.5
Interest subsidy for financing eligible export transactions (EFIC)		10.9
Export Access Program (DITAC)		1.0

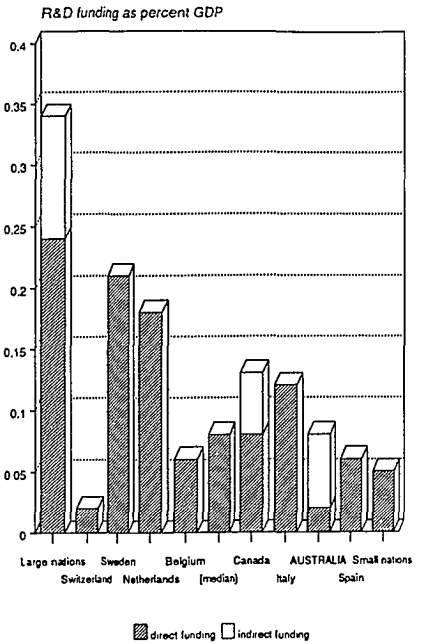
Sources: 1992-93 Science and Technology Budget Statement; Portfolio Program Performance Statements 1992-3; Annual Reports.

Figure 2.3 Percentage of Australian Firms Undertaking R & D in Selected Industries in 1988-89



Source: drawn up by the BIE from data contained in the Australian Bureau of Statistics Catalogues No. 8104 and 8203.

Figure 2.4 Comparison of Funding for Industry by Government in Some OECD Countries, Based on the Latest Available Figures



Note: Information about indirect funding is not available for those countries for which none is shown.

Source: DITAC, Science and Technology Policy Branch, *Australian Science and Innovation Resources Brief 1992: Measures of Science and Innovation 3*, a Report in a Series on Australia's Research and Technology, and their Utilisation, AGPS, Canberra, 1992, p. 21.

series of R & D Corporations which correspond to different industry sectors. The R & D Corporations are largely controlled by producers.

2.39 These corporations were discussed in Volume 1 of the Committee's Report, where the Committee noted that the levy system enables a large number of individual producers with a very low capacity and very little economic incentive to conduct research to cooperate in sponsoring research of use to the whole industry. By matching the funds raised by levy payers, the Government maximises the incentive to producers to support research. The Committee considered, however, that the justification for the provision of matching funding by the Government is that it demonstrates the value of research to the industry. Once the demonstration has convinced producers of this, the producers should be expected to assume full responsibility for supporting research, except in clear cases of market failure. The Committee recommended a review of the levy mechanism as the most rational means of providing support where it is deemed necessary on public good grounds.

2.40 The Committee did not attempt to review the system of R & D Councils and Corporations as many have been in operation for only a short time. The Committee noted that a review of the R & D Corporation model has recently been completed and recommended that 'the efficiency and effectiveness of the organisational, administrative and funding arrangements of the R & D Corporations be reviewed on a regular basis'.[20]

2.41 Support for private sector investment in mining R & D is confined to the general measures, such as the 150% tax concession, that are available for all types of R & D. The industry itself finances R & D of general significance to its members through its own association, the Australian Minerals Research Association (AMIRA). AMIRA obtains contributions from its members and finances research from contracts paid for by those members whom the research will benefit Research for the coal industry is carried out by the Australian Coal Association which is wholly supported by funds provided by the coal industry. Government support for the mining industry has been confined to the conduct of relevant research in public sector research organisations such as CSIRO and the Bureau of Mineral Resources, Geology and Geophysics.

2.42 Innovation within the manufacturing and service industries is supported by programs administered by the Department of Industry, Technology and Commerce (DITAC). A number of programs are the direct responsibility of the Department while others are run by the Department's IRDB. The IRDB was established under the *Industry Research and Development Act 1986* to encourage

20. JCPA. *Public Sector Research and Development: Volume 1 of a Report on Research and Development*, AGPS, Canberra, June 1992, p. 159.

R & D and so promote the development, efficiency and international competitiveness of Australian industry. The IRDB, which is composed largely of businesspeople, administers the following programs which represent the Government's major means of providing assistance at the level of the firm:

- the National Procurement Development Program (NPDP), which is designed to promote business growth through government purchasing;
- the Advanced Manufacturing Technology Development Program, which is modelled on the NPDP and relates to the development, trialing and demonstration of advanced manufacturing technology;
- National Teaching Company Scheme, which fosters relationships between public sector research institutions and companies;
- Grants for Industry Research and Development which comprise:
  - the Discretionary Grants Scheme, which assists companies that are unable to benefit adequately from the tax concession; and
  - the Generic Technology Grants Scheme, which targets commercially driven R & D in fields that have been identified by the Board as having strategic importance to Australia's industrial involvement in biotechnology and technologies relating to the environment, communications, information systems, and manufacturing and materials; and
- with the Australian Taxation Office, the 150% tax concession.

2.43 In addition, DITAC administers programs for firms and the science and technology community that contribute to the Government's industry policy of encouraging the development of internationally competitive, sustainable industries

that can, by assisting economic growth, raise Australia's living standards and increase employment. DITAC's programs that directly support private sector R & D include:

- the International Science and Technology Program, which promotes international scientific cooperation by increasing the participation of Australian researchers in overseas research programs; and
- the Australian Civil Offsets and Partnerships for Development Programs, which require overseas companies doing business with the Commonwealth to increase their R & D expenditure in Australia.

2.44 Other DITAC programs focus on particular industries. They are:

- the Australian Building Research Grants Scheme;
- the Service Industries Research Program, which is jointly funded with the industry to research service sector issues;
- the Metal Based Engineering Program, which is run jointly with Austrade, to assist firms to improve international competitiveness and increase exports;
- the National Space Program, under which a number of Space Industry Development Centres, jointly funded with industry, have been established; and
- the Pharmaceutical Development Program, which encourages R & D by allowing price increases for drugs in return for a commitment to perform R & D.

The Vendor Qualification Scheme, which assists firms wishing to provide goods manufactured to international standards, supports the efforts of particular industries to enter overseas markets.

2.45 Further programs are operated by departments other than DITAC. The Office of the Chief Scientist, for example, oversees the Cooperative Research Program, under which university, public sector research organisations and industry work together on specific topics, partly financed by industry. The Australian Research Council (ARC) provides postgraduate and research fellowship awards for university staff to carry out research for firms; the ARC's schemes were considered

by the Committee in Volume 1.[21] With the Collaborative Research Grants Program established in 1992, the ARC and industry jointly fund research in higher education institutions.

2.46 As discussed at some length in Volume 1, the requirements and policies of the Department of Defence have stimulated the transfer of technology from the Defence Science and Technology Organisation (DSTO) to industry. The establishment of a DSTO Industry Support Office, which was recommended in Volume 1 as a means of reinforcing industry-research interaction in aerospace,[22] was funded by the Government in the 1992-93 Budget. The Committee also recommended that:

> ... the Defence Science and Technology Organisation identify those areas where its expertise coincides with Australian industrial capability and defence requirements, and concentrate on these areas by:
>
> - setting up an industry advisory group to devise industry development strategies for the Organisation's expertise; and
>
> - forming long term alliances with companies.[23]

2.47 The commercialisation of R & D is also assisted by a number of programs that promote and support business in general. The National Industry Extension Service (NIES), for example, is a network of State, Territory and Commonwealth agencies which help firms to identify their needs for improved management practices and provide financial and other assistance to meet their needs. Overseas marketing is promoted by a number of Austrade's programs, which are discussed in Chapter 6.

2.48 A final means by which the Government seeks to support the private sector's performance of R & D is the promotion of close relationships between

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21. JCPA. *Public Sector Research and Development: Volume 1 of a Report on Research and Development*, AGPS, Canberra, June 1992, pp. 95-96.
22. JCPA. *Public Sector Research and Development: Volume 1 of a Report on Research and Development*, AGPS, Canberra, June 1992, p. 240.
23. ibid., p. 288.

research organisations and university researcher on the one hand and industry on the other. Several schemes with this objective have been established, two of which were reviewed by the Committee in Volume 1 of its Report; they are:

- the Australian Technology Group, which will assist the translation of research to commercial products;[24] and
- the requirement that CSIRO, the Australian Nuclear Science and Technology Organisation and the Australian Institute of Marine Science fund 30% of their expenditure from outside sources.[25]

Conclusion: Criteria for Assessing the Commonwealth's Support for Private Sector Research and Development

2.49 In its examination of individual programs in Chapters 3-9, the Committee drew on its analysis of successful innovation to ask the following questions about the Government's programs for innovation by the private sector:

- do the programs concentrate on support for innovation that is market driven?
- do the programs support innovation in industries subject to stiff competition?
- do the programs foster the forming of linkages of all kinds; do they promote contact between researcher, technologist and industry, or between customer and industry, or do they stimulate the formation of networks or clusters of related businesses?
- do the programs assist in educating businesses in better ways of operating?
- do the programs provide support over a sufficiently long period that positive results could reasonably be expected to have been achieved?
- are the programs well matched to the Australian industrial environment?

24. ibid., pp. 187-88.
25. ibid., pp. 152-55.

2.50 Other questions asked of each program are whether the program has been evaluated and with what result. The Committee regards the evaluation of the results of programs against their objectives as an essential element in the effective use of public funds. However, the Committee is aware, as it observed in Volume 1 of its Report in relation to cost-benefit analysis, that the results of such evaluations may have to be interpreted with caution. The particular difficulty that attaches to assessing support for R & D is the long lead time to the commercialisation of research. The full economic benefits to society may not be evident for decades after the research is conducted. Furthermore, the indirect benefits may be difficult to assess fully.[26]

2.51 Finally, by comparison with most overseas countries, Australia's support for innovation favours indirect as opposed to targeted funding (Figure 2.4). The Committee has attempted to form an opinion on the relative merits of these two approaches and, if both have merits, the most appropriate mix of the two for Australian circumstances.

26. ibid., pp. 170-71.

Chapter 3

TAXATION AND CAPITAL

Introduction

3.1 Evidence presented to the Committee emphasised the need to consider the overall innovation process rather than focus upon R & D as such.[1] Achievement of technical success by firms undertaking the R & D phase of an innovation is generally acknowledged.[2] The ability of firms to commercialise these R & D results and the apparent poor conversion rate of these results into marketable and marketed products and processes are increasingly the focus for attention in government programs and policies.

3.2 The impact of the taxation system on this process and the availability of capital, particularly venture capital, are issues which need to be considered as part of an evaluation of R & D support. In this chapter, particular attention is given to the role of the 150% taxation concession for R & D and the attempts to establish venture capital funds in Australia. As taxation policy has a pervasive role throughout the economy beyond the taxation concession for R & D, reference will be made to tax issues under a number of headings.

Taxation Concession for Research and Development

3.3 The 150% tax concession for R & D is the cornerstone of the Government's commitment to encourage increased levels of private sector R & D. It objectives are to stimulate innovation and competitiveness in Australian companies by:

- increasing companies' investment in R & D;
- encouraging better use of Australia's existing research infrastructure;

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1. Evidence, p. 1253-56.
2. *Industrial Research in Australia*, a Report of the Research Committee of the IRDB, Vol 1, October 1990, p. 3.

- improving conditions for the commercialisation of new process and product technologies developed in Australia; and

- developing a greater capacity for the adoption of foreign technology.[3]

3.4 The incentive was originally to apply to expenditure incurred on or after 1 July 1985 and before 30 June 1991. In the May 1989 Statement, *Science and Technology for Australia*, the scheme was extended until June 1993 after which time it was to be reduced to a 125% concession until June 1995. This deadline for the conclusion of the concession was removed in the March 1991 Statement, *Building a Competitive Australia*. In the 1992-93 Budget, it was announced that the concession would remain indefinitely at the 150% rate.

3.5 The concession is available to the majority of companies and public trading trusts undertaking R & D in Australia. DITAC has argued that the concession is market driven, being neither industry nor product oriented and allowing individual companies to determine both the specific areas of innovation and the direction of their R & D activities.[4] It is argued that commercial considerations, therefore, determine both the distribution and the level of R & D supported by the concession. Nevertheless, the enabling legislation, section 73B(2) of the *Income Tax Assessment Act 1936*, does preclude certain types of expenditure, focusing primarily upon the R & D stages of the overall innovation spectrum.

3.6 The tax concession allows companies incorporated in Australia, public trading trusts and partnerships of eligible companies to deduct up to 150% of eligible expenditure when lodging their corporate tax return, thereby effectively reducing after tax cost of eligible R & D to approximately 41.5 cents in the dollar (based on a corporate tax rate of 39%).

3.7 For R & D activities to be eligible for the concession they must contain an adequate level of Australian content and be primarily undertaken in Australia. The results of the supported R & D projects are to be exploited for the benefit of the Australian economy. Exploitation arrangements entered into with other parties are to be on normal commercial terms. In practice, these exploitation requirements are normally considered to occur as a result of the domestic commercialisation of the R & D, often through the manufacture of the product or process in Australia. This normal exploitation includes the contribution that the commercialised product or process makes to the nation by

3. Evidence p. S1372.
4. Evidence p. S1373.

way of the balance of payments through both exports and import replacement, the generation of additional employment opportunities, the establishment of additional manufacturing facilities and related infrastructure, and other similar benefits.[5]

3.8 Refinement of the operation of the concession has extended its application to facilitate access by small to medium-sized firms in particular, to R & D expertise and facilities without having to invest in the infrastructure required to undertake R & D. Registered Research Agency (RRA) status can be given to an organisation to undertake contracted R & D for multiple clients. Companies who contract research to an RRA are able to claim the full 150% tax concession on their contract expenditure even if this falls below the $20,000 threshold for a concessional rate that applies to other forms of expenditure. In addition, payment for contracted work to an RRA may be claimed up to 12 months in advance of the work actually being undertaken. For small firms, the ability to contract RRAs to undertake research work is seen as a convenient entry point into R & D activity.

3.9 As an incentive for collaborative research activity, the legislation also provides for syndicated R & D ventures. Under the syndication rules, two or more eligible companies jointly undertake R & D activities and each party claims their proportion of the expenditure for the tax concession. Syndication allows for 'in-principle' prior approval of the proposed R & D project, so facilitating the attraction of investment funding as a consequence of the 12 month in-advance payments being eligible for concessional tax treatment. Recent amendments to the syndication arrangements have sought to limit the use of this aspect of the legislation for tax minimisation schemes.[6] These amendments have eliminated tax exempt bodies, such as CSIRO and other public sector institutions, from participation in structured financing arrangements forming part of syndicates, and structured arrangements where the financial risk is essentially absent from the project.

3.10 Changes to legislation announced in 1991 have confirmed that all industry contributions to the Cooperative Research Centres (CRC) are eligible for the tax concession without the application of a clawback of benefit which applies to projects where a government grant or subsidy is also provided.[7] These

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5. Evidence p. S1375.
6. The Treasurer, the Hon J Dawkins, MP. Taxation Laws Amendment Bill (No. 5) 1992: Income Tax (Dividends and Interest Withholding Tax) Bill 1992, Explanatory Memorandum, pp. 100-01.
7. The Prime Minister. *Joint Statement with the Hon R Free, Minister Assisting the Prime Minister for Science,* Media Statement, 13 December 1991, p. 2.

changes will facilitate involvement by the private sector in the CRC program and not place this involvement at a disadvantage to other forms of collaborative R & D encouraged by the tax concession.

3.11 Responsibility for administering the concession is divided between the IRDB and the Commissioner for Taxation. Under the *Industry Research and Development Act 1986*, the IRDB is responsible for:

- the registration of companies wishing to claim the concession;
- the determination of whether R & D activities are eligible; and
- the determination of whether the results of the R & D activities are exploited commercially to the benefit of the Australian economy.

3.12 The Commissioner for Taxation is responsible for determining expenditure entitlement for the concession and the eligibility of company and financial structures as they relate to the concession. The joint responsibility for the concession requires close liaison between the IRDB and the Commissioner. To this end, an officer of the Tax Office attends most meetings of the relevant committee of the IRDB as an observer.[8]

Evaluation

3.13 In its 1991-92 Annual Report, the IRDB claimed that the tax concession provides a considerable incentive to industry to undertake R & D.[9] Australian Bureau of Statistics data on R & D expenditure by businesses show increases in real terms until 1990-91 when there was a decline. This decline has been attributed by the IRDB to the overall decline in economic activity levels. The concession required an estimated $273m in company tax revenue foregone in 1990-91, although this estimate does not allow for the impact of increases in company tax losses which might never be realised against taxable income. Around 2,200 companies were registered for the concession in the 1989-90 income tax year.

8. IRDB. *1991-92 Annual Report*, AGPS, Canberra, p. 58.
9. IRDB. *1991-92 Annual Report*, AGPS, Canberra, p. 49.

3.14 The BIE completed an interim evaluation of the tax concession in 1989.[10] This report concluded that the concession had a positive effect on the size of companies' R & D budgets and on the amount of R & D undertaken.[11] Approximately one third of the increase in R & D expenditure was attributed to the concession. The BIE also concluded that the concession had a positive impact on collaborative R & D.

3.15 The BIE's findings are supported by further studies undertaken by the Centre for Technology and Social Change (TASC) which primarily studied the communications technology and food processing sectors.[12] TASC concluded that there was no evidence that the tax incentive directly led companies to adopt a technology strategy, but those firms with a strategy had made changes in R & D investment in response to the concession. Other submissions to the Committee, such as that from the Metal Trades Industry Association, supported this view.[13]

3.16 In May 1989, the Auditor-General released an efficiency audit report in relation to the tax concession.[14] The report identified early implementation difficulties encountered by the IRDB, but concluded that these problems were, in part, a result of the absence of a firm legislative base at the commencement of the scheme. The IRDB acted upon the Auditor-General's recommendations and established standard operating procedures.[15] The Auditor-General is currently undertaking a further review of the tax concession program which will be available in 1993.

3.17 The effect of dividend imputation has been raised as an issue by a number of witnesses to the Committee and in other reports.[16] By reducing a company's tax liability, the tax concession may reduce a company's ability to pay

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10. BIE. *The 150 Per Cent Tax Concession for Research and Development Expenditure - Interim Report*, AGPS, Canberra, December 1989.
11. Evidence, p. S1381.
12. TASC. *Technology Strategies in Australian Industry*, AGPS, Canberra, 1990.
13. Evidence, p. S1899.
14. The Auditor-General. *Efficiency Audit Report, Industry Research and Development Board and Department of Industry, Technology and Commerce: Taxation Concession and Grants for Industry Research and Development Schemes*, AGPS, Canberra, May 1989.
15. Evidence, p. S1382.
16. BIE, op. cit.; Australian Manufacturing Council, *The Global Challenge: Australian Manufacturing in the 1990s*, July 1990; EPAC, *Investment and the Cost of Capital*, Council Paper No. 52, AGPS, Canberra, June 1992.

franked dividends. The distribution of unfranked dividends places a requirement on shareholders to pay tax on those dividends. This in turn may place pressure on firms not to undertake R & D.

3.18 An Ernst and Young study undertaken in 1990 examined this issue and reported that the level of R & D activity had not been affected by the introduction of dividend imputation. Over 93% of respondents to the survey reported that the value of the concession to the company remained unaffected by dividend imputation. Over 90% reported that the value of the concession to shareholders remained unaffected.[17] The Committee notes, however, that Ernst and Young's survey was restricted to companies that had used the concession. A different result might have been obtained had the sample included companies that had not used the concession.

3.19 One possible positive effect of the dividend imputation requirements is that it might encourage firms to retain unfranked profits for reinvestment purposes, thereby increasing internal capital resources for research and other purposes and deferring the payment of tax on those potential unfranked dividends. Effectively therefore, an interest free loan from the Tax Office to the company would be provided for as long as companies refrained from paying unfranked dividends.[18]

3.20 The BIE has been commissioned to undertake an effectiveness and efficiency review of the tax concession. This review is expected to be completed in January 1993. As part of this review, the BIE will also further examine the issue of dividend imputation and the impact of imputation on R & D behaviour.

17. Ernst and Young Management Consultants. *Study of the Effect of Dividend Imputation on the 150 Percent Taxation Concession for Research and Development*, Report to the IRDB, October 1990.
18. Evidence, p. 426.

Comment

Effectiveness of the Concession

3.21 The evaluations of the tax concession completed to date have focussed on two of the four primary objectives of the scheme, namely:

- increasing companies' investment in R & D; and
- encouraging better use of Australia's existing research structure, for example, through encouraging greater collaborative research and participation by companies in R & D projects with research institutions and RRAs.

3.22 There is evidence that suggested that achievement of these objectives is likely to create a change in attitude towards R & D within participating firms.[19] Submissions from firms also identified apparent correlation between increased R & D activity and examples of successful commercialisation of R & D results. For example, Nucleus Ltd noted the importance of the tax concession for its successful commercialisation of medical products.[20]

3.23 R & D activity is only one element of the innovation process. Successful commercialisation of R & D is the basis of the third and fourth primary objectives of the tax concession scheme, namely:

- improving conditions for the commercialisation of new process and product technologies developed by Australian companies; and
- developing a greater capacity for the adoption of foreign technology.

Beyond anecdotal evidence, there has not been a strong link yet demonstrated between the operation of the tax concession and the achievement of these remaining two primary objectives.

19. TASC, op. cit.; BIE, op. cit.
20. Evidence, pp. S1112-14.

3.24 Research on the Australian Industrial Research and Development Incentive Scheme (AIRDIS) suggested that there is a strong link between the conduct of R & D by a firm and innovative activity.[21] This earlier research indicated only one in six firms in Australia not involved in at least some R & D activity were innovators. By contrast, less than one in twenty of the firms undertaking R & D were unsuccessful in translating this R & D into some form of innovation. The creation of an environment, where R & D activity has increased and where there is a change in attitude towards R & D within the firm, appears to increase innovative activity and thereby improve the conditions for Australian companies to commercialise new product and process technologies.

3.25 The conversion of R & D results into a product or process does not necessarily mean that the innovation will be commercialised successfully. More recent evaluation of AIRDIS supported firms has established that failure of the research project rarely occurs because of technical deficiencies. Rather, most failures are due to market-related issues in the commercialisation process.[22]

3.26 The available evidence, therefore, supports the conclusion that the tax concession has been meeting its objectives. The recent decision to retain the concession at the 150% rate is consistent with this evidence. Completion of the BIE effectiveness and efficiency review is required to confirm this relationship between the availability of the concession and the achievement of the primary objectives.

3.27 The Committee notes that the tax concession might be just as effective, but at a reduced cost in terms of foregone revenue, if it were restricted to incremental R & D expenditure by applicants over a moving base period. While there is some initial attraction in this approach, the available evidence is not conclusive. For example, it is not clear whether a higher rate of concessional deduction would be required to provide sufficient incentive for companies to strive for additional R & D activity, given the influence of a range of other factors on the decision to undertake R & D.

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21. DITAC. *The Promotion of Indigenous IR&D in Australia and the Effectiveness of the Industrial Research and Development Incentive Scheme,* Report Prepared by Price Waterhouse, 1985.
22. *Industrial Research in Australia,* a Report of the Research Committee of the IRDB, Vol 1, October 1990, p. 3.

3.28 Similarly, there has been argument in favour of providing some form of special dispensation to companies that experience a 'wash out' effect on the tax benefit as a result of the dividend imputation policy and the payment of unfranked dividends. It has been proposed that one option would be to allow companies to convert their concession claim at the same net present value so as not to affect their dividend imputation positions. Despite the Ernst and Young report to the IRDB on the issue, there still appears to be some level of concern that dividend imputation is in effect discouraging investment in R & D or distorting reinvestment decisions by companies. Further evidence should be forthcoming in the BIE report to either substantiate or dismiss this concern.

3.29 **The Committee recommends that:**

- **the tax incentive be continued indefinitely;**
- **consideration of and action on the current Bureau of Industry Economics review of the 150% taxation concession be a priority activity for the Industry Research and Development Board, which should:**
  - **take into account the outcome of the current Australian National Audit Office efficiency audit of the administration of the scheme;**
  - **determine from the review and audit reports whether evidence exists to support the provision of the concession on incremental expenditure only; and**
  - **consider whether further action needs to be taken to remove any distortion caused by the dividend imputation provisions and, if so, what form this action might take.**

Administration of the Concession

3.30 With the retention of the 150% tax concession and the enabling legislation and administrative arrangements, there are a number of practical aspects which need to be clarified in the operation of the scheme. Some of these practical issues arise from the joint IRDB/Australian Taxation Office (ATO) administration of the scheme. In general, working arrangements between the two administering authorities run reasonably satisfactorily, although the current audit by the Australian National Audit Office may uncover particular

problems.[23] Nevertheless, there are three areas of particular concern which have been brought to the attention of the Committee and require direct action to remove potential uncertainty in the market place.

3.31 The first of these areas of uncertainty relates to the treatment of plant expenditure for R & D purposes. The ATO has interpreted current legislation to exclude as eligible expenditure the purchase of plant and equipment used initially for R & D purposes and subsequently for commercial purposes. In a private meeting with the Committee, the IRDB expressed the view that equipment used in this way should be eligible for the concession for the period for which it is used exclusively for R & D purposes. The Committee concurs with this view and believes that the IRDB is in a better position than the ATO to determine the eligibility of plant and equipment purchased for R & D purposes.

3.32 A second type of problem has arisen in the interpretation of the requirement that R & D be mainly undertaken in Australia. In these cases, the ATO interprets the enabling legislation to give recognition for a minor amount of incidental 'directly related' expenditure occurring overseas, while the IRDB has interpreted the legislation to preclude from eligibility R & D that has had any activity undertaken overseas. The Committee considers that the enabling legislation should more clearly indicate that some R & D may occur overseas.

3.33 Thirdly, the potential for conflict exists in the application of the legislative powers given to the IRDB to determine the commercialisation of R & D results and the ATO's responsibility to determine whether R & D has been undertaken on behalf of the concession applicant. Particular difficulty is experienced in deciding whether subsidiaries of overseas firms, which are determined to be undertaking and commercialising R & D in Australia in accordance with the legislation, are in fact simply acting as agents of their parent company because by definition they are 'subsidiaries'.

3.34 Conflict in interpreting and applying legislation will always arise until that legislation is tested before the Courts. Nevertheless, the Committee is of the view that the failure to resolve differences of opinion between administering agencies can only serve to lessen the effectiveness of the concession.

23. IRDB. *1991-92 Annual Report*, AGPS, Canberra, p. 59.

3.35 **The Committee recommends that:**

- **section 73B of the *Income Tax Assessment Act 1936* should be amended to give the Industry Research and Development Board the power to determine the eligibility of plant and equipment purchased for research and development purposes, subject to the concession for eligibility being retained only for plant and equipment which is used solely for research and development purposes or only for that period in which it is used solely for research and development purposes;**

- **the enabling legislation be amended to remove any doubt that the concession applies to research and development which is mainly undertaken in Australia, as currently interpreted by the Australian Taxation Office; and**

- **the Australian Taxation Office and Industry Research and Development Board continue to work in close consultation on matters of legislative interpretation, particularly as it relates to the commercialisation of research and development and the determination of whether the research and development is undertaken by companies on their own behalf.**

Joint Research and Development Projects

3.36 Evidence presented to the Committee has highlighted the potential the tax concession has for encouraging a greater level of collaborative and joint R & D effort by the private sector and public research institutions. CSIRO noted that it 'has numerous collaborative and contract research proposals where industry has committed funds as a result of this policy.'[24]

3.37 Recent legislative changes allowing the concession allowance to be applied to contributions to CRCs will contribute to the networking process between private and public sector research groups. Similarly, the Committee

24. Evidence, p. S1331.

endorses the continued support being given for collaborative research involving RRAs and syndication approvals granted as part of the concession scheme.

3.38 Collaboration in R & D and its commercialisation should be facilitated wherever possible through the operation of the tax concession, provided opportunities for tax minimisation schemes are avoided. Some difficulties still arise in the administrative requirements relating to collaborative research, particularly when this involves two or more groups working together on a research project, but wishing to commercialise the results in different ways. The present wording of the legislation can prove to be a hindrance to this simple form of collaborative research effort. Consideration could be given to a greater degree of discretion by the IRDB in assessing the commercialisation of these R & D projects, allowing due recognition to be given to the different ways in which research results might be commercialised without there necessarily being a sharing of the commercialised results between the parties.

3.39 **The Committee recommends that:**

- **the Industry Research and Development Board, in consultation with the Australian Taxation Office, continue to monitor the operation of the syndication and collaborative research elements of the tax concession to ensure that every opportunity is provided for joint research efforts that will bring net benefits to Australia; and**

- **the Industry Research and Development Board and Australian Taxation Office continue to discourage use of the tax concession legislation for artificial tax minimisation schemes which do not result in a net benefit to the nation.**

The Need for Greater Support for Commercialisation

3.40 The Committee notes that the tax concession's eligible expenditure and activity criteria focus upon the R & D stages of the innovation process. The Committee considers this focus to be inconsistent with the available evidence, which suggests that failure of supported projects tends to occur at the commercialisation stage. Given the relative magnitude of the commercialisation stage to the R & D stage (a ratio of 10 to 1 has been widely suggested in

evidence), it does not seem appropriate for the tax concession to be extended to provide support across this whole area. Nevertheless, the Committee believes that there is merit in sending a signal to the market that it must recognise that:

- *the commercialisation of R & D is an integral part of the overall innovation process; and*
- these costs and market place realities should be considered in conjunction with the decision to undertake R & D itself.

3.41 **The Committee recommends that:**

- **market analysis and development of market entry strategies be allowed as eligible supporting activities under the tax concession legislation, up to a limit of 10% of total eligible research and development expenditure in the relevant project.**

Other Issues

3.42 Anomalies can arise in the tax legislation which can have the effect of negating or reducing the direct impact of the 150% concession. The Committee recognises that it is not always possible to resolve these anomalies without creating wider problems or possibly loopholes in the law which would create even greater problems, presumably at a direct cost to the Australian taxpayer.

3.43 Evidence presented by Greenwoods and Freehills suggested that small start-up companies who avail themselves of the tax concession are disadvantaged by 1990 amendments that introduced subsection (27A) to section 73B of the Income Tax Assessment Act. Should the start-up company seek to transfer the intellectual property from the start-up company to another vehicle to facilitate its commercialisation or further development, the provisions of subsection 73B(27A) would require that any form of payment made for that technology for example, the issuing of shares in the commercialising company would be treated as income but would not be allowed to benefit from the capital gains or existing losses provisions of the Act.[25] Thus, the small start-up company and investor may be discouraged or disadvantaged when seeking to move to the commercialisation stage.

25. Evidence, pp. S1243-44.

3.44 **The Committee recommends that:**

- **the Industry Research and Development Board, in consultation with the Australian Taxation Office, examine the potential for distortion of investment and commercialisation decisions created by subsection 73B(27A), in conjunction with other parts of the Income Tax Assessment Act; and**

- **action be taken to remove any anomalies, without creating a loophole for unintended tax minimisation schemes.**

Capital

3.45 It is generally agreed that the innovation process does not end with the completion of the R & D stage. The IRDB in particular has been giving increasing attention to the difficulties encountered by firms in commercialising the results of R & D:

> It is apparent that many companies have looked on R & D as a stand alone activity, not requiring any consideration of the management, marketing and money issues that other investments would automatically involve. This is the fatal flaw and when R & D has been treated in a way similar to other significant investments, spectacular successes have been achieved in Australia.[26]

3.46 Access to capital to fund the investment in R & D and its commercialisation has been the subject of extensive debate and review. It has been claimed that there has not been a shortage of capital in Australia *per se*. For example, a DITAC study has estimated that the capital base of the private venture capital industry in Australia was approximately $794m as at June 1991.[27] The Economic Planning Advisory Council (EPAC) has also argued that there is no shortage of funds available, provided the venture projects offer

26. *Industrial Research in Australia,* a Report of the Research Committee of the IRDB, October 1990, Vol 1, p. 6.
27. MIC Licensing Board. *Annual Report 1990-91,* AGPS, Canberra, 1991, p. 19.

sufficiently high return to compensate for the risk involved.[28] Furthermore, with the increasing integration of Australia's markets into the global market over the last two decades, major domestic companies and financial institutions are able to access international funds on competitive terms.[29] The AIRG has also pointed out that the larger, internationally competitive firms in Australia have *ready access to venture capital. They do not require special support to access* these funds, but rather policies designed to allow these companies to grow. It is acknowledged, however, that there are very few companies in Australia which meet this criterion.[30]

3.47 For firms that are not widely recognised in international capital markets, access to capital is still heavily influenced by the supply of domestic investment funds and the tax and regulatory biases which influence the supply of these domestic funds. These influences are more likely to impact on small to medium-sized firms seeking equity funding to undertake R & D or its commercialisation than on larger firms. The existence of an available supply of funds in Australia, be it for debt finance or venture capital purposes, for the small and medium-sized firm does appear to be a major issue. Particular failings in the domestic economy that affect small to medium-sized firms have been identified as:

- risk averse behaviour by the banking and financial system, which biases investment decisions against support for innovative projects;
- high relative cost of compliance with the Corporations Act when submitting a prospectus for equity raising; and
- bias under the tax system towards investment in housing and rental properties.[31]

3.48 The availability of capital, but at a cost, raises questions as to whether Australian industry, particularly those firms involved in bringing forward innovations, are required to pay a high price for capital, be it equity or debt finance. There has been conflicting evidence on this issue with the BIE and

28. EPAC. *Issues in Business Finance,* Background Paper No. 15, AGPS, Canberra, 1991.
29. EPAC. *Investment and the Cost of Capital,* Council Paper No. 52, AGPS, Canberra, June 1992.
30. Evidence, pp. 605-06.
31. EPAC. *Investment and the Cost of Capital,* Council Paper No. 52, AGPS, Canberra, June 1992, pp. 14-15.

the Australian Manufacturing Council arguing that the cost of capital is slightly higher in Australia than in the major western countries,[32] while analysis by EPAC suggests that, over the long run at least, real costs of capital are in line with international rates.[33]

3.49 Although conflicting, the evidence does not suggest a large difference between the cost of capital in Australia and overseas. However, evidence has been presented to the Committee which suggests that there are other distortions existing in the Australian economy which can militate against the flow of capital towards small and medium-sized firms involved in R & D and its commercialisation. The inability of these firms to attract sufficient patient, long-term equity capital is a recurring theme in submissions received by the Committee.[34]

3.50 Research by the BIE and EPAC has highlighted the way in which the tax system in Australia can bias investment against risky projects.[35] As indicated in paragraph 3.17 the dividend imputation system can act to remove the benefit of the 150% tax concession for R & D in the hands of the shareholder when unfranked dividends are paid. However, it can also serve as a means of encouraging firms to reinvest that part of dividends which do not attract franking credits, thereby delaying the 'wash out' effects caused by shareholders being required to pay tax on dividends when a benefit has previously been received by the company from a tax concession such as the 150% concession. Because dividend imputation does not apply to foreign corporations and unincorporated enterprises, these entities are able to retain any benefit obtained from a tax concession, for example, an accelerated depreciation provision. This can serve to bias investment flows, although to what extent is unknown. The extent of the bias may be revealed by the BIE's current review of the 150% tax concession.

3.51 The carry forward provisions for tax losses limit the ability of smaller start-up companies to benefit from tax concessions provided for R & D. Inability to apply these losses to other income or the need to carry these losses

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32. BIE, *Australia's Cost of Capital,* Discussion Paper No. 15, AGPS, Canberra, 1991; Australian Manufacturing Council, op.cit.
33. EPAC. *Investment and the Cost of Capital,* Council Paper No. 52, AGPS, Canberra, 1992.
34. Evidence, pp. S982, S1046; DITAC *Bringing the Market to Bear on Research,* Report of the Task Force on the Commercialisation of Research, AGPS, Canberra, November 1991, pp. 17-18.
35. BIE, *Tax Losses and Risky Projects,* Discussion Paper 11, AGPS, Canberra, 1990; EPAC, *Investment and the Cost of Capital,* Council Paper No. 52, AGPS, Canberra, 1992.

for several years effectively reduces the incentive offered by these concessions and the attractiveness of this form of investment. The BIE has suggested possible options to address this problem. It favours the carry forward of tax losses with interest being paid by the ATO on those losses; this approach reduces but does not eliminate the distortion currently existing in the tax system.[36]

3.52 The focus of much of the evidence provided to the Committee has been upon creating additional pools of capital for investment in small to medium-sized firms undertaking R & D and its commercialisation.[37] The Management and Investment Companies (MIC) Program effectively sought to create such a pool of venture capital funds. The MIC Program was established in 1984 and sought to:

- promote the development of a private sector venture capital market; and
- encourage the provision of management, skill and equity finance to young, innovative, fast growing businesses.

3.53 Under the Program, the MIC Licensing Board licensed a number of Australian companies as MICs. The companies were given the right to raise an approved level of tax deductible capital. A 100% deduction in the year of investment was allowed for funds placed in an MIC. In turn, MICs could invest in businesses certified as eligible by the Licensing Board.

3.54 In 1987, the BIE reviewed the MIC Program and concluded that it had served a useful demonstration purpose but should be discontinued. The Government subsequently decided to continue the Program until June 1991.

3.55 In the February 1992 One Nation Statement, the Government announced the establishment of the Pooled Development Funds (PDF) Program, to come into operation from 30 June 1992. The PDF Program allows a concessional tax rate of 30% to apply to profits of investment companies

36. BIE. *Tax Losses and Risky Projects,* Discussion Paper 11, AGPS, Canberra, p. 23.
37. Submissions pp. S1003, S1045, S1742.

established as PDFs. These investment companies are required to supply capital to small and medium-sized firms with total assets of less than $30m. Other restrictions apply to the operation of PDFs, including requirements that they:

- not invest more than 20% of their capital in any investee;
- not invest more than 5% of their capital in start-up companies; and,
- unless otherwise approved, acquire at least 10% of the investee's paid up capital.

As at 1 December 1992 only one PDF has been approved, although two or three other applications are being considered by the PDF Board.

3.56 The Government also announced the establishment of the Australian Technology Group (ATG) in the February 1992 One Nation Statement. The decision to establish the ATG was based on a recommendation of the Task Force on the Commercialisation of Research, which concluded from its research that many existing technology transfer bodies lack adequate finance to further develop and market promising Australian technology.[38] The objective of the ATG is to provide the range of services required to translate Australian research and technology into products and services which can be delivered to the Australian and international markets on a fully commercial basis.

3.57 In announcing the formation of the ATG, the Minister for Science and Technology, the Hon R Free said:

> In creating the ATG, the Government has put funds directly into the 'commercialisation' end of R&D&C. Not only has the Government publicly acknowledged that the 'C' is no longer silent, but it has backed that acknowledgment with thirty million dollars in up-front funding.[39]

38. DITAC. *Bringing the Market to Bear on Research,* Report of the Task Force on the Commercialisation of Research, AGPS, Canberra, November 1991, pp. 28-29.
39. The Hon R V Free, MP, Minister for Science and Technology. *Australian Technology Group: New Board Geared for Success,* Media Statement, 22 October 1992, p. 2.

3.58 In view of submissions made to this Committee that a 'fund of funds' approach should be used to require superannuation funds to place a certain percentage of their investment funds into venture capital projects in Australia, the further comments made by the Minister for Science and Technology in launching the ATG are significant. He said:

> Given the sheer magnitude of Australian savings now invested in superannuation funds, I expect the new Board to be active in persuading the finance sector that the ATG represents a 'prudent' investment. What would amount to a very small step by these funds towards the Group could represent a giant step forward in securing a technological future for Australia.[40]

3.59 The One Nation Statement also contained a number of other initiatives by the Government to address concern about the cost and availability of capital. In general, these provisions have not been directed towards R & D or commercialisation activities in particular, although the lifting of the capital gains tax exemption for goodwill in small businesses from 20% to 50% of the value of goodwill may have some impact on small companies seeking to access funds.

Evaluation of Past and Current Programs

3.60 The MIC Program ceased operating in June 1991. An evaluation of the Program by DITAC showed that, after eight years of operation, the availability of venture capital in Australia rose from nearly nothing in 1982-83 to 32 venture capital and development capital funds operating in mid-1991 with an estimated capital base of over $1b, which includes government and semi-government funds.

3.61 The MIC Licensing Board claimed that the MIC Program was successful in its catalytic role of fostering the establishment of a viable private sector venture capital industry in Australia.[41] Other submissions received by the

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40. loc. cit.
41. MIC Licensing Board. *Annual Report 1990-91,* AGPS, Canberra, 1991, p. 16.

Committee have been more critical of the MIC Program, although in the context of arguing for a continuation of some form of special investment fund for development capital.[42] Criticism has been directed towards:

- the constraints applied to the operation of the MICs which, it is argued, militated against their success;
- a focus by MICs on highly successful projects with a need for growth funds but that would have succeeded without MIC support; and
- agency capture of the MIC Licensing Board by the licensed MICs.

3.62 The Committee is not convinced by the evidence presented to support all of these criticisms. Nevertheless, there appears to be merit in the view that the MIC requirements may have been over-prescriptive. There is a danger that this approach will continue into the PDF Program which is only just starting. Comments from within the finance industry suggest that the PDF operating constraints:

- do not give a sufficient tax concession margin - a concessional tax rate of 30% on profits is offered by comparison with the normal company tax rate of 39%;
- are overly restrictive in terms of how investments may be held; and
- have an arbitrary cut off of $30m.

3.63 The Australian Industry Development Corporation (AIDC) has as part of its charter the provision of loan or equity funds for new or improved technology. However, the AIDC has also been required to operate in accordance with sound business principles. Commerciality and profitability are firm objectives for the AIDC.[43]

42. Evidence, pp. S1001, S1048, S1743, S1897.
43. AIDC. *1992 Annual Report Australian Industry Development Corporation*, p. 3.

3.64 AIDC, through its Development Financing business arm with AIDC Ltd, has developed a technical and financial skills base which enables the organisation to assess the complex risks associated with medium to long-term loans and equity capital placement. AIDC provides management resources for the development capital component of AMP Society's Development Australia Fund and is examining other opportunities to provide management and technical skills to manage other institutional funds. However, the commercial and profit objectives of the AIDC are such that its involvement in financing the development and commercialisation of research is unlikely to be extensive. This has certainly been true of its past performance.[44]

3.65 In June 1992, the AIDC announced a fundamental shift in strategy. The core focus of its investment strategy is now towards the infrastructure and natural resource project arenas. While this represents a significant redirection in AIDC's primary focus of business, in practice it has very little effect on AIDC's participation in the venture capital market for small to medium-sized firms. The AIDC has not been a major participant in this market preferring to focus its attention towards the larger corporate end of the market.

3.66 The ATG is still in its formulative stages. It is proposed to seek private sector capital to at least match the $30m contributed by the Government. In this formulative stage, it is important that the ATG establish its operating and financing strategy such that it will attract private sector participation. This may require an initial focus upon a limited range of industries and technologies in Australia as the ATG develops its own capabilities.

3.67 The Government's intention that the ATG should focus its initial fund raising activities on the finance sector, and in particular superannuation funds, highlights the accumulation of investment funds by the superannuation industry. In a private meeting with the Committee, Mr R Block suggested that, in the last 12 months, there has been an emerging trend towards greater investment by the superannuation industry in venture capital markets. This action follows on discussions between the Government and the superannuation funds industry and extensive public discussion of a 'fund of funds' concept. The recent behaviour of the industry, however, may reflect a growing realisation of the economic necessity to explore other markets.

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44. Evidence, p. S1014.

3.68 Evidence presented to the Committee suggested that, even with these changes, the investment mix of the superannuation funds would still be biased against venture capital opportunities with a high performance risk. The main points at issue are argued to be:

- the high variability in risk associated with venture capital type investments which discourage funds managers; and
- the need to acquire franked dividends in Australia as part of the process of balancing a fund's portfolio in terms of investments and location of investment, which leaves little room in the portfolio for possible high capital growth investments in the Australian market, such as might be achieved from venture capital placements.[45]

3.69 Intervention which endeavours to remove or in some way 'compensate' for these risk assessment/risk balancing tasks may, however, only serve to encourage investment in areas which are not warranted, with a resulting misallocation of resources and loss of national welfare. The Committee is of the view that the Government's role should be one of removing or ameliorating distortions created by other government policies or regulations to enable the appropriate market signals to operate. Where the Government can facilitate the emergence of a pool of funds without creating other distortions, then there is a role for an appropriate policy regime.

Comment

Impact of Taxation

3.70 The ability of Australian-based R & D projects to access capital to fund debt or equity requirements will be a continuing challenge for innovating firms. Access to funds does not appear to present the same level of difficulty for larger firms as it does for small to medium-sized firms. However, it is from amongst the small to medium-sized firms that new growth industries or technologies are most likely to be generated, particularly in a nation which has very few large firms in international terms.

3.71 The tax system can work against new companies raising the necessary capital even when tax concessions such as the 150% R & D incentive

45. Evidence, pp. S1046-47.

and accelerated depreciation provisions exist. The loss of real benefit from these concessions in a situation of carry forward debt militates against riskier investment projects. Similarly, the ability of firms to obtain capital gains roll-over relief on the sale of an R & D business or its amalgamation into another entity can have undesired consequences.

3.72 Resolution of these problems involving changes in taxation legislation, which is already extremely complex, is fraught with difficulties and may only serve to create other unintended anomalies. While the Committee would prefer to see these problems removed, a more realistic approach at this time may be to keep the issues under review. The BIE report on the 150% tax concession may provide further useful information in relation to the real impact of some of these tax-related difficulties.

Pooled Development Funds

3.73 Because of the problems with PDFs enumerated in paragraph 3.62, the Committee is not convinced that the PDF scheme will create the desired pool of venture capital funds. There has been very little interest in the scheme to date, particularly from groups which have the management and technical skills required to operate investment funds of this type. Nevertheless, the Committee recognises that the existence of only a small number of PDFs would contribute to the available venture capital funds.

3.74 **The Committee recommends that:**

- **the Department of Industry, Technology and Commerce reconsider the existing requirements for the operation of Pooled Development Funds to determine whether they should be modified to make the Pooled Development Funds concept more attractive to the market.**

Australian Technology Group

3.75 With the establishment of the ATG, a further vehicle has been created whereby public and private sector funds might be accumulated and used to develop and commercialise new technology. The Committee believes that, in its formulative period, the ATG will need to demonstrate that it has a market focus and the necessary expertise to attract investment from the private sector, particularly from the superannuation funds. The creation of a private sector-based board and wide contact with the investment community is the first step in

establishing the credibility of the ATG. This needs to be built upon by the early appointment of a chief executive officer and the finalisation of a business plan and strategy which can be publicly released.

3.76 **The Committee recommends that:**

- **the initial focus of the Australian Technology Group be upon a limited number of industry sectors and technologies, particularly in areas where there is a domestic market as well as an international market to ease the commercialisation process; and**

- **the Australian Technology Group give initial focus to forming joint ventures with established major corporations as a means of developing credibility and wider investor confidence.**

Investment by Superannuation Funds in Research and Development

3.77 The superannuation funds, under present policies, are quickly becoming major sources of capital funds. While anecdotal evidence suggests that there has been a change in their investment behaviour over the last 12 months, the statistics collected on this industry are incomplete and allow no opportunity for independent assessment of this behaviour. The Committee notes that the Senate Select Committee on Superannuation (the Sherry Committee) has made certain recommendations in relation to the disclosure of information on investments so that consumers can compare the investment profile of funds. In particular, the Sherry Committee has recommended that 'trustees should have to report to members and to the ISC (Insurance and Superannuation Commission) on investments in new asset classes such as development and venture capital and infrastructure investment.'[46] This Committee endorses the recommendations of the Sherry Committee on the need for additional statistical information to be provided.

46. Senate Select Committee on Superannuation. *Safeguarding Super: the Regulation of Superannuation,* First Report of the Senate Select Committee on Superannuation, June 1992, p. 109.

3.78 **The Committee recommends that:**

- **the Government require superannuation funds to report details of their holdings in certain types of investments, including investments in new asset classes such as development and venture capital;**
- **the Insurance and Superannuation Commissioner develop a standardised reporting system for use by superannuation funds in reporting on their investments; and**
- **the information provided to the Insurance and Superannuation Commissioner be reported to the Parliament.**

3.79 The Committee considers that the collection of data, as recommended, will enable the Government to assess the degree to which superannuation funds are investing in new asset classes such as development and venture capital. The data will form the basis for the Government to judge the extent to which there has been a change of direction in investment behaviour by superannuation funds. If the funds were found to be investing 3% or more of their assets in these areas, as recommended by the Task Force on the Commercialisation of Research,[47] a major improvement in the available finance for R & D and its commercialisation would have been achieved. If not, the Committee considers that advisability of the Government taking action on the Task Force's recommendation might have to be reconsidered.

3.80 Inasmuch as the present 'prudent man' rules relating to the investment of superannuation funds might be discouraging investment in venture capital opportunities, the Committee is of the view that these rules should be clarified to remove any impediment to such investment.

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47. DITAC. *Bringing the Market to Bear on Research*, Report of the Task Force on the Commercialisation of Research, AGPS, Canberra, November 1991, p. 21.

3.81 The Committee recommends that:

- **the Government review the prudent man rule with a view to removing any impediments to the investment of superannuation funds in research and its development and commercialisation.**

Tax Exempt Savings Accounts

3.82 The Committee notes the existence of the Tax Exempt Special Savings Accounts (TESSA) in the UK which are designed to encourage higher levels of savings by the general community. This scheme works on the basis of giving tax exemption to interest on savings in a special account operated by a bank or similar financial intermediary. Taxpayers are limited to the amount that they can invest each year, with a maximum investment limit per taxpayer of £9,000 over five years. Financial institutions are able to offer a lower rate of interest on TESSAs than on standard accounts, but TESSAs still prove attractive to smaller savers. Removal of the funds during the five year period results in tax being paid on interest in the normal way.

3.83 The concept of a TESSA type scheme where the savings accumulated could become part of a pool of 'patient capital' available for investment in R & D and its commercialisation has some attraction to the Committee.

3.84 The Committee recommends that:

- **the Government examine the possibility of introducing a tax exempt savings program with a requirement for a substantial component of the savings accumulated to be invested into Australian research and its development and commercialisation.**

Chapter 4

GRANTS

Introduction

4.1 Grants to support R & D represent a method of targeting funds to selected firms which satisfy particular criteria. They provide a stimulus for work in areas that underpin new industrial processes and in which Australian firms might be expected to perform well.

4.2 This chapter considers seven sources of grants. The Generic Technology and Discretionary Grants Schemes and the Advanced Manufacturing Technology Development Program provide grants that are awarded by the IRDB and administered by DITAC. The National Teaching Company and the International Science and Technology Schemes are DITAC programs. Small grants for the commercialisation of medical research are provided by the National Health and Medical Research Council (NH&MRC), and the Australian Research Council awards grants under its Collaborative Research Grants Program for joint research between industry and universities.

4.3 DITAC told the Committee that its administration of grants schemes entailed their promotion, the assessment of applications and managing the disbursement of funds. At the time of its appearance before the Committee in April 1991, it had adequate and appropriately qualified staff to administer these schemes.[1]

4.4 The grants are evaluated by three means:

- by financial oversight;

1. Evidence, pp. 1055-57.

- through commercial evaluation after the projects have started, including an examination of the impact of grants on companies that have received them compared with companies that have not; and

- from evaluations carried out by external bodies.[2]

Generic Technology Grants Scheme

4.5 The Generic Technology Grants Scheme was established by the IRDB under the *Industry Research and Development Act 1986* to focus research capabilities into agreed priority areas. The Scheme's objective is to stimulate in these areas the development of enabling technologies, without which significant improvements in critical fields of industrial innovation would be restricted. The Scheme acts by encouraging collaboration between academics, public sector researchers and industry in market led research.

4.6 Five technologies have been declared under the Act: they comprise information technology, manufacturing and materials technology, biotechnology, communications technology and environmental technology. Priority areas within each technology have been identified in consultation with researchers and industry.

4.7 The major activity of the Scheme in relation to these technologies is the provision of grants for research. Grant applications for each technology are assessed by specialist committees composed of representatives from tertiary institutions, industry, public sector research organisations and government departments. The committees make recommendations for funding to the Board. During 1991-92, expenditure on new and existing projects for the selected technologies was:

Manufacturing and materials technology	$ 4.87m
Biotechnology	$ 3.07m
Information technology	$ 4.51m
Communications technology	$ 4.32m
Environmental technology	$ 0.93m
Total	$17.70m

2. Evidence, pp. 1060-61.

Evaluation

4.8 In 1989, the Auditor-General carried out an efficiency audit on DITAC and the IRDB's administration of, among other programs, the Generic Technology Scheme. The audit found the administration of the Scheme to be generally satisfactory and made recommendations for its improvement in establishing standard procedures, and monitoring, reviewing and documenting the use of grants.[3]

4.9 In a report prepared for the IRDB in 1991, Pappas Carter Evans and Koop drew attention to shortcomings in the operation of the Generic Technology Scheme. They observed that:

- researchers, as the parties with the major financial interest in projects, tended to take over management of them, often formulating projects in terms of science-based objectives and then attempting to persuade companies to invest in them;
- commercial enterprises rarely selected an innovative project and sought out a researcher to undertake it; and
- the technologies chosen for development were poorly matched to the market in which ultimately they would be commercialised.[4]

Pacific Technology Ltd made similar points in its submission of October 1990; it pointed out that grants were being made progressively less often to commercial organisations.[5]

4.10 Pappas Carter Evans Koop suggested that a greater emphasis should be put on the commercialisation element of innovation by replacing the Generic

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3. The Auditor-General. *Efficiency Audit Report - Industry Research and Development Board, Department of Industry, Technology and Commerce: Taxation Concessions and Grants for Industry Research and Development Schemes*, AGPS, Canberra, May 1989.
4. Pappas Carter Evans and Koop. *Innovation in Australia*, a Report for the IRDB, AGPS, Canberra, July 1991, p. 13.
5. Evidence, p. S1097.

Technology Scheme with a program promoting strategic technologies that might be successfully commercialised internationally. They nominated communications, materials and solar cell technology as appropriate technologies for such promotion

Discretionary Grants Scheme

4.11 The Discretionary Grants Scheme complements the 150% tax concession by providing grants to firms which are unable to take adequate advantage of the concession. The firms concerned are usually small to medium-sized and do not have taxable profits in the early years of their growth. By providing such grants, the Scheme aims to facilitate the formation of firms that are able to compete on international markets. It also aims to promote :

- collaboration between firms obtaining Discretionary Grants and organisations able to ensure the commercialisation of the firms' R & D; and
- an awareness of the importance of R & D in the development of future economic growth and international competitiveness.

4.12 The Scheme was established under the *Research and Development Act 1986* and will continue until 1994. Its grants provide support for up to three years at a maximum of 50% of eligible expenditure which must exceed $50,000. Over the life of the Scheme from July 1986 to June 1992, 1148 applications had been considered, 410 approved and $110m provided to companies engaged in manufacturing, mining, construction, software production, development of systems and processes, the service industries and market research.

Evaluation

4.13 A survey of 105 of the companies supported by the Scheme showed that employment by these companies had grown by 12% per year and turnover by 25%. The major growth occurred in very small companies. Follow up of these companies is continuing for five years after their receipt of grants to determine the long-term impact of the grants on the companies' operation. A weakness of this evaluation, however, is the absence of a control group of firms with which the firms supported by the Scheme can be compared.

4.14 More than 100 projects supported by grants have been completed. While 80% were technical successes, only 40% were effectively commercialised. The

main reasons for failing to commercialise useful technologies were the companies' tendency to underestimate the time and financial resources required. In the light of this finding, new applicants are now required to demonstrate that they are able to commercialise the results of their R & D.[6]

Advanced Manufacturing Technology Development Program

4.15 This Program was established in 1991, following the Industry Statement, *Building a Competitive Australia*, and will provide $20m over four years. The Program supports joint projects to trial and demonstrate and/or research and develop new products, including prototypes of manufactures, services and systems which meet the requirement of end users and improve the take up of new technology in industry. The Program covers advanced computer controlled or microprocessor based equipment used in the design, production testing, or handling of a product, advanced manufacturing techniques or services, and advanced materials and related process technology. It also supports project related market research.

4.16 The Committee welcomes the initiative taken in establishing this Program. It notes that, up to that time, support for advanced manufacturing technology had been at a very low level by international standards and largely uncoordinated.[7]

Comment

4.17 Since the introduction of the Generic Technology and Discretionary Grants Schemes, the IRDB's approach to awarding grants has altered to take more account of the context in which the R & D will be carried out. The comment by the then Chairman of the IRDB quoted in paragraph 2.11 shows that the Board now considers the business plan and availability of capital for the R & D for which support is sought, as well as the intrinsic value of the R & D itself.

4.18 In their report to the IRDB, Pappas Carter Evans and Koop proposed that the previous experience of companies in commercialising their R & D should also be taken into account in awarding grants. They pointed to the finding that

6. IRDB. *Annual Report 1990-91*, pp. 29-34.
7. Evidence, p. 892.

inexperience was an important contributory factor in failure to commercialise successfully among 42 projects studied.[8] Peptide Technology Ltd, in its submission to the Inquiry, also suggested taking into account the medium to long-term survival prospects of applicants.[9]

4.19 In giving evidence to the Committee, the IRDB made the additional point that companies dealing with different types of R & D need different forms of support. For example, research on materials technology is generally carried out by well-established firms and university departments that are relatively well able to cope with the seven to ten year time frame to commercialisation. Here the need is for more interaction between business and university researchers. By comparison, biotechnology companies are small, have been in business for a very short time and tend to have only six months capital in hand. Such companies' greatest needs are for discretionary grants, involvement in the NPDP or assistance in involving better established industries in the use of their technologies. Recognition of the differing situations for each sector of Australian industry has led the IRDB to consider emphasising 'strategic' rather than generic grants.[10] This point is discussed further in Chapter 10.

4.20 In the 1992-93 Budget, the IRDB's expenditure for the 1992-93 financial year is estimated at $45.8m. Its funds have been provided, for the first time, as a one-line allocation which will allow a more efficient and flexible operation of its grants schemes. The Committee discusses this matter further in Chapter 10.

4.21 The Committee received some detailed criticism of the way in which the grants are awarded. Incitec Ltd pointed out the apparent contradiction between the purpose of grants to support projects that would not otherwise proceed and the requirement for applicants to demonstrate that they had financial support and direction by a commercial partner.[11] By requiring these conditions, it might be argued that a grant is unnecessary. However, the Deputy Director of DITAC commented that:

> In the past we have asked firms what they would have done if they had not had the grant. You find that a good number of them say that they would probably have done the research anyway; maybe half of them would say that. But the half that

8. Pappas Carter Evans and Koop. *Innovation in Australia*, a Report for the IRDB, AGPS, Canberra, July 1991, pp. 19-25.
9. Evidence, p. S1743.
10. Evidence, pp. 1297-1300.
11. Evidence, p. S1234.

> say that would also tell you that by having the grant they were able to do the research that much faster, put more resources into that research, make it more successful and get it to market more quickly.[12]

4.22 BHP and Pacific Technology expressed the view that the three year time frame of grants was too short in relation to the time needed to move from precompetitive research to commercialisable technology.[13] A further criticism was that only scanty feedback was provided to unsuccessful applicants. Incitec Ltd pointed out that, if more comprehensive information was available, it would assist in the preparation of future applications and save both time and expense.[14] The IRDB acknowledged this criticism; it claimed that a lack of resources ruled out the possibility of providing such information but it did provide counselling to applicants with respect to ways in which applications could be improved. Information could also be obtained by unsuccessful applicants through Freedom of Information requests.[15]

4.23 In its report on the shipbuilding industry, the House of Representatives Standing Committee on Industry, Science and Technology noted industry criticism of the difficult bureaucratic procedures involved in applying for grants.[16] The Chairman of the Australian Shipbuilders' Association Ltd claimed that:

> ... the take-up rate for R&D [schemes] was considerably below the potential for the industry. ... Application costs, time lags and difficulty in understanding definitions of eligible projects were cited as reasons for less than optimum take-up rates.[17]

The Standing Committee expressed concern that 'the apparent confusion about possible government support also may be present in other eligible industry groups'.[18] Similar criticisms were made of other programs designed to support private sector R & D; they are discussed further in Chapter 10.

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12. Evidence, p. 1044.
13. Evidence, pp. S1097, S1154.
14. Evidence, p. S1234.
15. Evidence, pp. 1300-02.
16. House of Representatives Sanding Committee on Industry, Science and Technology. *The Shipbuilding Industry: in the Wake of the Bounty*, AGPS, Canberra, May 1992, p. 55.
17. ibid., pp. 24-25.
18. ibid., p. 26.

4.24 Notwithstanding the criticisms, there was general support for grant schemes among the businesses that made submissions to the Inquiry; of 25 such submissions, 12 singled out grant schemes for support. However, as an officer of the BIE commented to the Committee:

> Nearly always the impact of government incentives to a particular company is clearly positive ... our research shows that virtually all recipients of incentives are in favour of them and respond positively to them. But that is to be expected. That does not take account of the fact that any incentive has to be paid by somebody else in the community. It may well be that the sum of the costs that they are facing for other people's incentives may well exceed the one that they are receiving.[19]

4.25 This point raises the issue of the relative costs and benefits accruing from a program and the need for a careful analysis of each program to ensure that the funds expended are being cost-effectively used. The Committee notes that the Industry Commission and the BIE have evaluated some of the Government's programs for supporting industry based R & D, provided advice on the extent to which the programs are fulfilling their objectives and made recommendations for their improvement. The Committee discusses this matter further in Chapter 10, in the context of the overall costs and benefits that are derived from the various Commonwealth schemes for the support of private sector R & D.

National Teaching Company Scheme

4.26 The objective of the National Teaching Company Scheme (NTCS) is to enhance the international competitiveness of Australian industry by fostering the development of new and longer-term working relationships between public sector research institutions and companies in the manufacturing and services sector. It operates by funding projects in which a graduate student works on a company R & D project under the joint supervision of an academic and a company manager. This allows for the transfer of knowledge and skills to the company in the form of a specific R & D project, usually designed to develop a new product or process. Apart from establishing links between industry and researchers, the Scheme also sensitises companies to the value of investing in R & D as a strategy for company development and provides a facility for extending the capabilities of graduates so that they become more useful to Australian industry.

19. Evidence, p. 434.

4.27 NTCS was established in 1985, based on a similar British scheme, and funded until June 1992. In 1990-91, the Commonwealth Government made grants worth $1.85m, and the States provided additional funding. Following an evaluation of the Scheme by the BIE, it has been added to the suite of programs for which the IRDB is responsible and its funding has been continued.

Evaluation

4.28 Evidence presented to the Committee identified a number of minor problems that arose largely from the different cultures in academia and industry. Clearly, there are constraints on the publication of the results of research carried out for industry, and there have been concerns about the extent to which university researchers understand and accept the need for confidentiality of commercially sensitive information. Furthermore, it is important that agreement on intellectual property rights be sought as projects develop.[20]

4.29 In its submission of November 1990, DITAC indicated that the Scheme was being evaluated on an ongoing basis. At that stage the evaluation indicated that $7.8m had been expended and 199 projects had been supported. The status of these projects at that stage was as follows:

. successfully completed	44
. terminated	33
. lapsed	13
. ongoing	109

4.30 DITAC advised the Committee that a change in the operation of the Scheme was made in 1989, with greater emphasis being placed on the selection of companies with established infrastructure and a capacity to successfully complete the project. As a result of this change, small companies were no longer targeted and better results have been obtained from grants since then.[21]

4.31 The BIE carried out an evaluation of the NTCS, on which it reported in May 1991. The evaluation concentrated on projects funded in the early stages of

20. Evidence, pp. 1127-28, S1235.
21. Evidence, p. S1400.

the Scheme to allow time for the impact of projects on company performance to become fully apparent, and for long-term linkages between companies and research institutions to develop.[22] The BIE concluded that:

- the NTCS had shown 'remarkable flexibility' in terms of the types of projects funded, industries assisted and the kinds of firms supported;
- company performance showed most improvement among participating companies that:
  - had prior experience of working with research institutions, even if that experience has been only informal; and/or
  - were very small (employing less than 15 people);
- larger firms (employing more than 100 people) and those with previous experience of working with research institutions benefited most in terms of an increased expenditure on R & D, in-house R & D skills and awareness of the research institutions's R & D capabilities; but
- the Scheme had been less successful in assisting the development of continuing working relationships between companies and institutions.

4.32 The BIE noted that 'the objectives of the NTCS in policy terms ... remain as relevant today as they were in 1984-85 when the Scheme was first introduced'.[23] It recommended continued funding for the Scheme at current levels on the grounds that it clearly stimulates business expenditure on R & D. However, the BIE highlighted two areas for further scrutiny. One is the possible duplication of the Scheme with other, recently established programs which include similar objectives to the NTCS. The program with the greatest potential for duplication of the NTCS is the ARC's Postgraduate Research Awards (Industry). The BIE recommended that a watching brief be kept on the two schemes to ensure that overlap does not occur. The second area of concern, which the BIE intends to investigate in the future, is the multiple use of non-tax R & D programs.

4.33 Another of the recommendations related to limiting the Scheme to assistance to the manufacturing and services sector so that resources are not spread too thinly. A third recommendation focused on the need to reverse the shift away from making grants to very small firms, as these firms were found to be the most able at translating research results into improved company performance.

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22. BIE. *The National Teaching Company Scheme*, Program Evaluation Report 10, AGPS, Canberra, 1991.
23. *ibid.*, p. ix.

4.34 Most of the recommendations, however, concerned the need to increase the establishment of long-term working relationships between industry and research institutions. These recommendations included:

- developing a brokerage function for the NTCS to help put firms into contact with relevant research institutions - it is suggested that the brokerage should cover engineering, sciences and computing;
- disseminating information about the advantages to companies participating in NTCS of working with research institutions so that more are persuaded of the need for such links;
- no longer funding companies that already have formal links with institutions, because they do not need government assistance to form such linkages; and
- monitoring the progress of companies with no previous experience of collaborating with research institutions when they are awarded grants and perhaps intervening as a means of increasing the likelihood of a successful collaboration.

4.35 The Committee endorses the BIE's recommendations and notes that DITAC has implemented all but two of them. It discusses further some of the issues raised by the BIE's review in Chapter 10.

International Science and Technology Collaboration Program

4.36 The International Science and Technology Program (ISTP) seeks to promote international scientific cooperation by increasing the participation of Australian researchers in overseas research programs. It operates through the Bilateral Science and Technology Collaboration Program, which largely supports basic research, and the Major Grants Program.

4.37 The Major Grants Program, which was established in 1989, supports large-scale cooperation between Australian and overseas institutions and research

consortia for periods of up to three years. Of particular relevance to support for private sector R & D are the Program's aims:

- to provide a means for global interactions by Australian industry through strategic research collaboration; and
- to increase Australian participation in international science and technology programs and networks for precompetitive R & D, especially with Europe, the USA and Japan.

4.38 The International Industrial Collaboration Program was introduced in the 1992-93 Budget to assist consortia of Australian firms and research agencies to develop alliances with overseas groups and so acquire or develop industrial knowledge. This program will concentrate on activities downstream of precompetitive research and will emphasise collaboration with firms in Asia. It will provide:

- competitive grants for the costs of negotiating access to bilateral and multilateral industrial technology programs;
- a brokerage function through which industry could identify appropriate relationships from visits and missions; and
- seed support for demonstration projects.

4.39 With one exception, the Committee received little information about industry's views of the ISTP. BHP, however, believed that 'assistance from ISTP in setting up the international linkages could prove very beneficial to the critical early stages of ... international experiment[s]'.[24] The Committee notes that the Program is due for review in 1992.

4.40 The Committee also notes that agreements have been reached during 1991-92 for joint R & D with Korea and China and commends DITAC for pursuing such links.

24. Evidence, p. S1159.

Support for Commercialising Medical Research

4.41 The Working Party on the Commercial Development of Medical Research, under the chairmanship of J P Coghlan, noted the gap between basic medical research and its commercialisation as an area in which grants might make a useful impact. The Medical Research Committee (MRC) already made small development grants and had recently resolved to give special attention to such projects. This move had been assisted by changes to the composition of the MRC whereby a member of the IRDB has joined the Committee.

4.42 In spite of these initiatives, however, the Working Party believed that an additional impetus was needed and recommended that $5m should be provided annually for five years for development grants, with a review of the program at the end of this time. The Working Party further recommended that the grants should be applied to feasibility studies, market surveys and provisional patent protection. In the long term, it envisaged that the funds applied to commercialise medical research might be administered at arms-length from the NH&MRC, possibly in association with the IRDB[25].

4.43 The Committee welcomes the moves to gain more effective commercial benefit from medical research and believes that they should be pursued vigorously. The Committee considers that a well-articulated plan to effect more comprehensive, rapid commercialisation of appropriate research should be an urgent priority.

4.44 **The Committee recommends that:**

- **the National Health and Medical Research Council and the Industry Research and Development Board cooperate to produce a program to further stimulate the commercialisation of medical research.**

4.45 In the 1992-93 Budget, it was announced that 'the NH&MRC has nominated "Commercialisation of medical research" as a special initiative topic for

25. Department of Health, Housing and Community Services. *Report of the Working Party on the Commercial Development of Medical Research*, December 1991, pp. 11-12.

funding'.[26] The NH&MRC will also continue to support a number of commercial development projects with export potential.

Collaborative Research Program

4.46 The Collaborative Research Program, which was funded in the 1991-92 Budget, is designed to encourage greater research collaboration between higher education institutions and industry by offering research grants on a matching funding basis. $2.3m were provided in 1992 and 41 grants made in the first round of applications. In reporting on the Program, the National Board of Employment, Education and Training (NBEET) stated that 'the interest shown in the Collaborative Research Grants Program has been very encouraging, especially given the limited time frame in which to submit applications in the first round'.[27] Because of the limited funding of the Program, over $10m of guaranteed industry research funding cannot be taken up.

4.47 NBEET also drew attention to an assessment carried out in the USA of different types of research interaction between industry and higher education, which concluded that 'one-on-one' collaboration, such as that promoted by the Collaborative Research Program, was most successful.

The Repayable Grant

4.48 In November 1991, the Commonwealth and Queensland Governments provided a repayable grant to CSIRO to form a consortium with three companies to develop a low-cost technology for the production of magnesium metal. This represented the first use of such a grant. The Committee also notes that the Working Party on the Commercial Development of Medical Research recommended that 'consideration should be given to recouping the cost of these Grants against royalty/licence income of successful Projects'.[28] Such conditions are imposed on awardees in several overseas grants schemes, for example, the French equivalent of the National Industry Extension Service which is discussed in Chapter 6.

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26. The Hon R Free, MP. *Science and Technology Statement 1992-93*, Budget Related Paper No. 6, AGPS, Canberra, 1992, p. 1.19.
27. National Board of Employment, Education and Training. *Employment, Education and Training Act 1988: Expanding the Research Base in Private Industry and Improving Interaction in Research across Sectors - Developments since 1998: Advice of the National Board of Employment, Education and Training and its Australian Research Council*, Canberra, October 1992, p. 3.
28. Department of Health, Housing and Community Services, op. cit., p. 12.

4.49 In the Committee's view, repayable grants represent a useful addition to the type of assistance provided by the Government to industry. The Committee believes that repayable grants, which are in effect interest free loans, should be considered for wider use and this use should be closely monitored.

4.50 **The Committee recommends that:**

- **agencies awarding grants for research and its development and commercialisation review the merits of requiring at least part repayment of grants by firms that gain financial benefit from receiving them.**

Chapter 5

THE PROTECTION OF INTELLECTUAL PROPERTY

The Nature of Intellectual Property Rights

5.1 The successful commercialisation of R & D in Australia is influenced by many factors, one of which is the protection of intellectual property. In Volume 1 of the Report, the Committee defined commercialisation as the 'transfer of intellectual and industrial property for financial return'.[1] In this chapter, issues such as the impact and adequacy of current intellectual property protection will be examined.

5.2 Intellectual property has been defined as:

> ... an invention, idea, product or process that has been registered with the government and that awards the inventor (or applicant) exclusive rights to use the invention for a given period of time.[2]

5.3 Several Acts provide protection for intellectual property, including the *Patents Act 1990*, the *Copyright Act 1968*, the *Circuit Layouts Act 1989*, the *Plant Variety Rights Act 1987*, the *Trade Marks Act 1955* and the *Designs Act 1906*. Responsibility for these Acts is spread across several government departments. The Australian Patent, Trade Marks and Designs Offices have responsibility for industrial property encompassing patents, trade marks and industrial designs. The Attorney-General's Department has responsibility for copyright and circuit layouts, whilst the Plant Variety Rights Office of the Department of Primary Industries and Energy has responsibility for plant variety rights (PVR).[3]

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1. JCPA. *Public Sector Research and Development: Volume 1 of a Report on Research and Development*, Report 318, AGPS, Canberra, June 1992, p. 174.
2. Butler, A. 1990, 'The trade-related aspects of intellectual property rights: What is at stake?', *Review, Federal Bank of St. Louis*, vol. 72, No. 6, p. 35.
3. Evidence, pp. S1909-11, S1919-20, S1941-42.

5.4 The rationale behind intellectual property rights (IPR) is to provide inventors with 'an opportunity to gain, for a limited time and without competition, a return on their investment in genuine creative activity and a reward for their efforts'.[4]

5.5 Intellectual property rights granted by the Government are not the only mechanism for protecting and successfully commercialising the results of R & D. A survey of US R & D managers found that secrecy, lead time, moving quickly, establishing market share and service were rated more highly than patents as the most effective means of gaining returns from new processes.[5] However, it has been claimed that, 'in the absence of government intervention, maintaining exclusive rights to an innovation for any period of time is often difficult'.[6]

Industrial Property

5.6 Industrial property rights, including patents, designs and trade marks, provide the owners with 'an exclusive right to use and exploit the patent, trade mark or design during the life of the right'.[7] In terms of the commercialisation of R & D, patents have been described as providing the most wide-ranging protection for inventions.[8]

5.7 The *Patents Act 1990* provides exclusive rights in Australia for inventors to make, hire, sell, use or import their inventions, or authorise other persons to do the same, during the term of the patent which can be for up to 16 years. A patentable invention is described as:

> ... a novel idea which permits in practice the solution of a specific problem in a field of technology. Such an invention must be new in the sense that there is no indication that it has already been published or publicly used; it must be non-obvious in the sense that it would not have occurred to any specialist in the particular industrial field had such a specialist been asked to find a solution to the particular

4. House of Representatives Standing Committee on Industry, Science and Technology, Inquiry into Genetically Modified Organisms, evidence p. S2305.
5. 'The commercialisation of research and development', *Economic Round-Up*, Winter 1992, p. 62.
6. Butler, A., op. cit., p. 39.
7. Evidence, p. S1909.
8. House of Representatives Standing Committee on Industry, Science and Technology, op. cit., exhibit 118, p. 3.

problem; and it must be immediately applicable to industry in the sense that it can be industrially manufactured or used.[9]

5.8 In order for a patent to be granted, an application must be accompanied by a description of the best way to recreate the invention. All descriptions are published prior to the patent being granted to ensure that interested parties have the opportunity to express any opposition. The descriptions are available for use immediately for genuinely experimental purposes and for others when the patent expires.[10]

5.9 Over recent years there has been growth in the number of annual patent applications in Australia from 16,500 in 1970 to 24,079 in 1989. Almost half of the 1989 applications were successful in achieving patents. The bulk of these applications came from non-residents; however, the percentage of applications by Australian residents increased from 24% to 30% of the total over this period.[11] The growth rate of overseas patent applications by residents of Australia was the highest internationally during 1981 to 1989.[12]

Copyright

5.10 The role of copyright is to protect, reward and encourage the skill, work and labour undertaken by an author. The 1980s have been a decade of major copyright reform in several areas and the Copyright Law Review Committee (CLRC) has conducted inquiries into computer software, conversion damages and parallel importation.[13]

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9. Evidence, p. S1909.
10. House of Representatives Standing Committee on Industry, Science and Technology, op. cit., p. S2305.
11. Ricketson, S. 1992, 'The future of Australian intellectual property law reform and administration', *Australian Intellectual Property Journal*, vol. 3(1), p. 4.
12. 'The commercialisation of research and development', *Economic Round-Up*, Winter 1992, p. 59-60.
13. Creswell, C. 'Government directions in copyright law and policy in Australia', paper given to the AIC Conference on Maximising Commercial Opportunities in Intellectual Property, Sydney, September 1992, p. 2; Fitzsimons, J. 'Copyright issues in the computing and software industry', paper given to the AIC Conference on Maximising Commercial Opportunities in Intellectual Property, Sydney, September 1992, pp. 21, 32.

5.11 The protection of computer software is a contentious issue that falls within the responsibility of the Attorney-General's Department. Traditionally, computer software has been protected under the *Copyright Act 1968* as a literary work. However, the adequacy and appropriateness of this protection is currently being examined by the CLRC. The CLRC's report is expected to cover the following issues:

- the form of protection;
- the ownership and duration of protection;
- exclusive rights;
- works created by or with the assistance of computer programs;
- works stored in computer memory; and
- published edition copyright.[14]

5.12 The Committee believes that the work of the CLRC will provide a useful contribution to resolving some of the issues relating to the protection of computer software.

Circuit Layouts

5.13 The *Circuit Layouts Act 1989* provides protection, similar to copyright, for circuit layouts and gives the owner 'exclusive right to copy the layout, to make an integrated circuit in accordance with the layout or a copy of the layout, and to exploit the layout commercially in Australia'.[15] Protection is currently available outside Australia where reciprocal arrangements are in place.

Plant Variety Rights

5.14 The *Plant Variety Rights Act 1987* enables plant 'breeders of new varieties to direct the distribution and sale of those varieties and to receive a royalty from the sale of plants and reproductive material of those varieties'. The right lasts

14. Evidence, pp. S1941-42.
15. Evidence, p. S1942.

up to 20 years and has been established to further encourage private sector investment in plant breeding and increase the trend towards public sector breeding becoming financially self-sustaining.[16]

5.15 Statistics provided by the Plant Variety Rights Office indicated that the private sector is a heavy user of the PVR scheme. Between 1988 and August 1992, 84% of 552 applications were from the private sector. The average rate of rights granted over this period was 33%. The benefits of this scheme in relation to the commercialisation of R & D are reinforced by the PVR Office which stated that 'it is probable that the PVR scheme has an indirect contribution to research and development in the private sector'.[17]

5.16 In November 1990, Dr Noel Byrne from the Intellectual Property Law Unit of the University of London completed an independent study of legal protection for plants in Australia under the patent and PVR legislation.[18] Some of the major issues that were addressed included the availability of PVR and patent rights in Australia for plant varieties, the administration of PVR and patent legislation, and the availability of public information about the difference between patent and PVR protection. The government response to the report is currently being prepared.[19]

The Benefits and Costs of Intellectual Property Protection

5.17 As discussed earlier, IPR provide protection in the country in which the rights are registered by ensuring that the owner has a monopoly to use and exploit those rights during their limited life. There are several benefits and costs associated with such rights and these are discussed below.

Benefits

5.18 Supporters of intellectual property protection argue that 'the patent system induces inventive activity that would not otherwise be undertaken; and the gains to society in the form of new products, processes and disclosed knowledge ... exceed the social cost of the monopoly grant'.[20] In addition, it has been claimed that

16. Evidence, p. S1919.
17. Evidence, p. S1920.
18. Byrne, N. *Legal Protection of Plants in Australia Under Patent and Plant Variety Rights Legislation*, November 1990.
19. Evidence, pp. S1915-16.
20 AIDA Research Centre Publication, *Patents and Technology in Australia: The issues and some proposals*, June 1991, p. 3.

'as long as innovation is considered desirable, assigning property rights to intellectual property is one way to encourage firms to innovate'.[21]

5.19 It is also argued that 'intellectual property has no value until it is exploited, either for the generation of wealth or for improvement of the wellbeing of the people'.[22] The Patents, Trade Marks and Designs Offices added that this 'profit opportunity' is designed to act as an incentive for innovation and it does not guarantee profit.[23]

5.20 The Institute of Patent Attorneys of Australia has also demonstrated their support for intellectual property protection in pointing out that:

> ... the Australian biotechnology industry has been identified as a world leader having the potential to benefit the Australian economy, and that potential is unlikely to be realised without the encouragement which the patent system provides for innovative research.[24]

5.21 More than ever, intellectual property is being recognised as an important business asset which needs protecting at almost any cost.[25] Patents are seen as a valuable tool to assist with the commercialisation of R & D, protecting a firm's position during the time when it is developing and manufacturing a product. Overseas patents are also valuable when a firm wants to transfer technology and expand further.[26]

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21. Butler, A., op. cit., p. 40.
22. Gibson, D. 'The value of public sector intellectual property', paper given to the AIC Conference on Maximising Commercial Opportunities in Intellectual Property, Sydney, September 1992, p. 2.
23. Evidence, p. S1911.
24. House of Representatives Standing Committee on Industry, Science and Technology, op. cit., p. S1437.
25. Liberman, A. 'An Asian perspective of international trademark & brandname requirements', paper given to the AIC Conference on Maximising Commercial Opportunities in Intellectual Property, Sydney, September 1992, p. 1.
26. Hyde, L. 'Case study: patenting a new substance', paper given to the AIC Conference on Maximising Commercial Opportunities in Intellectual Property, Sydney, September 1992, p. 4.

Costs

5.22 One of the costs of protecting intellectual property is that it can restrict competition and maintain high costs.[27] It has also been argued that:

> ... throughout the time that monopoly is in place there is likely to be some less than optimal allocation of resources because the new innovation is not being used widely by all firms in the industry, but it is just going to be used by the one firm that has the patent.[28]

5.23 A paper, released in July 1991 by the Trade Practices Commission on the application of the *Trade Practices Act* to intellectual property, draws attention to the fact that 'patents, copyright, registered designs, trade marks and confidential information are all areas that may provide a corporation with power which may be used to damage competition in markets'.[29]

5.24 CSIRO has recognised that the protection and confidentiality of intellectual property rights, that has resulted from commercialisation, can have negative impacts on the traditional advancement of fundamental knowledge:

> Traditionally research, and especially longer-term, more fundamental research, proceeds by an open, interactive process based on full publication and peer review of research methodology and findings. This process is crucial to the advancement of fundamental knowledge through the independent and critical evaluation of concepts and discoveries by the world-wide scientific community, and is a key basis for the progress and reward of individual scientist[s]; but the tradition now has to be blended with other considerations as research proceeds towards commercial application.[30]

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27. House of Representatives Standing Committee on Industry, Science and Technology, *Genetic Manipulation: The Threat or the Glory?*, AGPS, Canberra, February 1992, p. 235.
28. Evidence, p. 830.
29. Evidence, p. S1911.
30. Evidence, p. S1324.

5.25 The Committee concluded that, although there are negative aspects to the protection of intellectual property, the benefits gained are sufficient to justify the continuation of IPR.

The Scope of Patent Protection

5.26 The scope of patent protection and the types of inventions that should be patented have given rise to much debate throughout the history of patenting.[31]

5.27 The scope of patent protection varies widely from country to country.[32] In many countries, certain industries are excluded from patent protection. Some of the products concerned include pharmaceutical products, animal and plant varieties, medical techniques, food products and computer programs.[33] Some of these products are considered unpatentable on public interest grounds, for example, medical techniques and medicines in poorer developing countries.[34] In other circumstances, however, there are arguments for broadening patent definitions to embrace modern technologies, such as those that are software based.[35]

5.28 The scope of the Australian patent system is quite wide, having the capacity to apply to almost any type of new development provided it meets the requirements of the *Patents Act 1990*. In recent years, however, attempts have been made by some parties to exclude or limit various developments from patent protection, such as inventions involving life forms.[36] In their report on genetic manipulation, the House of Representatives Standing Committee on Industry, Science and Technology discussed the issues surrounding the patentability of living organisms.[37]

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31. House of Representatives Standing Committee on Industry, Science and Technology, Inquiry into Genetically Modified Organisms, evidence p. S1433.
32. Butler, A., op. cit., p. 35.
33. ibid., pp. 36, 45.
34. House of Representatives Standing Committee on Industry, Science and Technology, op. cit., p. S1433.
35. ibid., p. S1433.
36. ibid., pp. S2304, S2306-8, S1431, S1433.
37. House of Representatives Standing Committee on Industry, Science and Technology, *Genetic Manipulation: The Threat or the Glory?*, AGPS, Canberra, February 1992, p. 224.

5.29 The general position in Australia is that 'patent legislation should not contain any specific exclusions from patentability which are based on sectors of technology'.[38] For example, the Institute of Patent Attorneys of Australia oppose changes to the criteria for patentability and, more particularly, the subject matter for which patents can be obtained. The Institute believes that such changes are an inappropriate means of discouraging activities in areas perceived by some to be undesirable.[39] In addition, Australia's recent submission to the General Agreement on Tariffs and Trade (GATT) on the matter of Trade Related Aspects of IPR (TRIPS) stated that 'patents should be available for inventions in all fields of technology'.[40] In the absence of specific exclusions, however, the Commissioner has other means of refusing an application: 'the Commissioner may refuse to grant a patent for an invention of which the use would in his opinion be contrary to law or morality'.[41]

5.30 The Committee considers that the present patent system within Australia is sufficiently flexible in scope to cope with new developments and inventions in all fields of technology.

The Adequacy of Current Protection

5.31 Most observers believe that there are adequate property rights for research in Australia. A Treasury paper on commercialising R & D claimed that 'Australian inventors are protected by a relatively well developed system of IPR, including patents and copyright'. However, it was claimed that there are still questions regarding the effectiveness, price and impact of the patent system.[42]

5.32 DPIE commented on the adequacy of intellectual property protection and noted that, in many cases, the legislation is sufficient to overcome any market

38. House of Representatives Standing Committee on Industry, Science and Technology, Inquiry into Genetically Modified Organisms, evidence p. S2308.
39. ibid., pp. S1433, S1440.
40. ibid., p. S1434.
41. ibid., p. S2312.
42. 'The commercialisation of research and development', *Economic Round-Up*, Winter 1992, p. 62.

failure, enabling firms to reap most of the potential benefits. The Department also noted, however, that:

> ... in a number of cases it is not enough just to have patents or copyrights or brandnames. A lot of research and development or innovation is not easily patentable. The nature of the innovation is such that, even with a patent in place, it can be very easily copied by other firms, so the patent does not provide a great deal of protection. Patents and copyrights are quite difficult and quite complex to administer.[43]

These and other issues relating to the adequacy of property protection are discussed in greater detail in the remainder of the chapter.

Is Protection Too Broad in Some Circumstances?

5.33 In an article discussing the patenting of life forms, examples were given of patentees obtaining an unfair advantage through the granting of broad patents:

> Some of the patents granted to date, particularly in the US, seem very broad in scope ... If patents are granted too widely, there are likely to be disputes and it is not clear whether courts will interpret patents in this area broadly or whether applicants will be required to limit the scope of their claims.[44]

Is the Time Taken to Process Reasonable?

5.34 If Australia is to become competitive internationally, it is important that R & D is undertaken at a sufficient speed to ensure that projects have the best chance of staying ahead of the competition. As Montech Pty Ltd pointed out,

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43. Evidence, p. 830.
44. House of Representatives Standing Committee on Industry, Science and Technology, op. cit., exhibit 118, p. 13.

'projects with potential must be handled with the optimum speed so that competing technologies do not overtake the initiative'.[45] Along with many other factors, the time taken to process applications for intellectual property protection is important.

5.35 At present, the time taken to process patents is being reduced by the Patents Office. This is in response to complaints about the length of time taken between lodging applications and their determination.[46] At 30 June 1992, the time between lodgement and examination of patent applications was 18.5 months, down from 20 months at 30 June 1991.[47]

5.36 The Committee commends the Patents Office for reducing the time taken to process patent applications and urges it to continue its efforts to reduce processing time further.

Can Inventions be Adequately Described?

5.37 In the past there have been problems obtaining patents due to difficulties in describing and reproducing the invention. This was particularly the case with regard to obtaining plant and animal patents until the advent of DNA technology.[48]

Ownership of Intellectual Property in Collaborative Arrangements

5.38 Many factors need to be taken into account when determining who owns the outcome of research. These include the sources of funding, pre-existing technology levels and who has contributed to the development of the ideas.[49] The importance of ownership was highlighted at a conference on 'Maximising Commercial Opportunities in Intellectual Property' by David Wilson, who advised that 'the important thing is to ensure that ownership of all of the rights is where you want it to be'.[50]

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45. Evidence, p. S1928.
46. DITAC. *Annual Report 1990-91*, p. 106.
47. DITAC. *Draft Annual Report 1991-92*, chapter 2, p. 34.
48. House of Representatives Standing Committee on Industry, Science and Technology, op. cit., exhibit 118, p. 9.
49. Evidence, p. 598.
50. Wilson, D. 'Maximising the benefits from design and character protection', paper given to the AIC Conference on Maximising Commercial Opportunities in Intellectual Property, Sydney, September 1992, p. 2.

5.39 The issue of intellectual property ownership has caused some concern in situations where commercial firms make significant contributions to research through graduate scholarships, but do not receive any of the benefits of ownership. BHP noted that 'some universities have, in the past, wished to retain all the intellectual property generated by graduate students and this has caused problems'.[51]

5.40 Where there are collaborative R & D arrangements between the public and private sectors, agreements to share and/or license the resulting IPR are an important consideration. In the case of CSIRO, the ownership of IPR generated through sponsored research is carefully negotiated with the commercial partners involved. CSIRO has found that:

> ... partners prefer exclusive rights to intellectual property, but it will be of little benefit to have done the research if the chosen partner, given exclusive rights, proves unable to commercialise successfully. Where the partner has not fully funded the research and earned full ownership of the intellectual property, CSIRO maintains oversight of the commercialisation process.[52]

When entering into collaborative agreements, CSIRO takes into account the relative inventive, technological, financial and other inputs to the R & D in determining the nature and extent of the IPR to be acquired by itself and its partner.[53]

International Considerations

5.41 Intellectual property has become a very significant factor in international trade and commerce since TRIPS were brought within the ambit of GATT in 1986. The economic and commercial significance of intellectual property is now firmly established in the international context.[54]

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51. Evidence, p. S1158.
52. Evidence, p. 1324.
53. ibid., p. 1324.
54. Liberman, A., op. cit., pp. 1, 3.

5.42 For Australian R & D to reach its full economic potential, effective penetration of international markets is essential. However, 'many industrial countries have become increasingly concerned over the lack of international protection of intellectual property rights (IPR)',[55] and the high levels of infringements.[56]

5.43 Over the years, there have been problems in reaching international agreements on IPR, largely due to differing incentives to protect IPR rights across countries.[57] 'Each country has its own perspective, its own laws, its own capacity or willingness to enforce those laws, its own self interest and its own international obligations to consider'.[58] The optimal amount of IPR protection differs across innovating and non-innovating countries. Innovating countries, such as the USA and Japan, offer the most extensive patent protection in some areas such as biotechnology, and developing, non-innovating countries, tend to offer the least.[59]

5.44 Responsibility for international agreements on IPR is largely held by the World Intellectual Property Organisation (WIPO). WIPO, through the Patent Cooperation Treaty, is standardising patent procedures by giving applicants the opportunity to file for a patent in a central office, and specify the countries in which the application is to have effect. This will reduce costs by centralising the search and examination work associated with determining patent eligibility.[60]

5.45 Representatives from the Attorney-General's Department regularly attend overseas conventions that discuss the international treatment of IPR. Efforts have been made to extend the protection of Australian copyrights abroad and bilateral protection agreements are now being negotiated with Singapore and Indonesia.[61] A report on information technology and telecommunications to the Prime Minister's Science Council supported these efforts in recommending that the Australian Government 'encourage the enhancement of intellectual property protection in the Asia-Pacific region so that the intellectual component of Australian software exports will be protected as it would be in Australia'.[62]

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55. Butler, A., op. cit., p. 34.
56. 'The commercialisation of research and development', *Economic Round-Up*, Winter 1992, p. 62.
57. Butler, A., op. cit., p. 44.
58. Liberman, A., op. cit., p. 1.
59. Butler, A., op. cit., pp. 38, 44-5; House of Representatives Standing Committee on Industry, Science and Technology, op. cit., p. S1433.
60. ibid., p. 41.
61. Creswell, C., op. cit., p. 2.
62. Office of the Chief Scientist, Department of the Prime Minister and Cabinet, *Information Technology and Telecommunications: Looking to the Year 2000*, AGPS, May 1992, p. 5.

5.46 The Committee commends the efforts of the Attorney-General's Department in extending the protection of Australian property rights abroad and the contributions of the Australian Government in supporting WIPO's refinement of international agreements and the standardisation of patent procedures.

The Enforcement of Intellectual Property Rights

5.47 Concern has been expressed by some patent owners that there are difficulties in enforcing IPR in Australia and overseas[63]. These difficulties have resulted in increasing levels of infringements and litigation.[64] In order to ensure that a high degree of intellectual property protection is enacted and enforced at an international level, the USA has initiated its own procedures. As a result, the United States Trade Representative has placed Australia on its Priority Watch List after identifying problems with the enforcement of IPR. The reasons given for the US reservations related to audiovisual exports and the level of protection provided to sound recordings and textbooks.[65]

5.48 In March 1992, the Industrial Property Advisory Committee (IPAC) released their report in response to ministerial concerns regarding the enforcement of industrial property rights in Australia, specifically the ease, cost and timeliness for Australian industry.[66] The Committee recommended that:

- the Federal and Supreme Courts should adopt a more managerial approach to the resolution of disputes to shorten the length of proceedings and reduce the cost of settlement;
- the Federal Court should remain the sole appeal court; and
- a legislative framework similar to the *Courts Mediation and Arbitration Act 1991* should be adopted to facilitate hearings across Australia.

Public submissions to the report were due by 30 September 1992.[67]

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63. DITAC. *Annual Report 1990-91*, p. 113.
64. Ricketson, S., op. cit., p. 5.
65. Liberman, A., op. cit., p. 2.
66. Industrial Property Advisory Committee, *Practice and Procedures for Enforcement of Industrial Property Rights in Australia*, March 1992.
67. Evidence, pp. S1914-15.

5.49 The Committee believes that the work of IPAC will provide a useful contribution to resolving some of the issues relating to the enforcement of IPR.

5.50 The infringement of IPR is thought to be quite high, with estimated annual costs to the owners at $70b worldwide.[68] In addition, the pirating of technology is expected to continue 'as long as the direct cost of counterfeiting (or copying), including the likelihood and penalties associated with being caught, is less than the profits earned by the firms doing the copying'.[69]

5.51 In relation to the international enforcement of IPR, it has been recognised that 'WIPO does not have an international dispute settlement mechanism whereby an applicant (or country) can file a complaint against another country's implementation of the treaties'.[70] Furthermore, many countries 'do not have explicit penalties associated with violations of intellectual property rights, and few impose civil penalties'.[71]

5.52 The Committee considers that the enforcement of IPR is an important issue and that WIPO's efforts to improve international enforcement should be strongly supported by the Australian Government.

5.53 While every possible effort is needed to enforce IPR, litigation may not always be the most appropriate course of action. A balance needs to be struck between enforcing IPR and achieving commercial objectives. Litigation to re-establish a monopoly 'must be assessed in terms of impact on the business and reputation ... Too often parties to litigation find themselves locked into the litigation without any real appreciation of the costs or time involved'. [72]

The Cost and Complexity of Seeking Property Rights

5.54 The processes involved with seeking a patent can be complex and costly. Before initiating a patent application, it is advisable to seek advice on the

68. 'The commercialisation of research and development', *Economic Round-Up*, Winter 1992, p. 62.
69. Butler, A., op. cit., p. 41.
70. ibid., p. 43.
71. ibid., p. 44.
72. Muratore, A. 'Aligning intellectual property with commercial objectives', paper given to the AIC Conference on Maximising Commercial Opportunities in Intellectual Property, Sydney, September 1992, p. 1.

prospect of obtaining registration, any likely opposition, issues relating to the term, royalties and scope of the licence, assignability, general terms, infringements, exclusivity and territory.[73] When applying for a patent, there is also the need to obtain a complete specification setting out the full description of the invention.[74]

5.55 The intricacies and procedures involved with the preparation of a patent application are complex and time consuming. It is the belief of Sirotech that over the last decade 'we have not often been particularly clever in devising protection mechanisms for our intellectual property'.[75] An officer from the BIE told the Committee that the major weakness of public sector research organisations, is on 'the legal side in terms of protecting intellectual property, and perhaps in working out the precise form of the commercial agreement'.[76] The complexity of the process is further illustrated by DPIE which pointed out to the Committee that 'patents and copyrights are quite difficult and quite complex to administer'.[77] To overcome some of the complexities, many firms seek assistance from an intermediary or a patent attorney, which can be quite expensive.

5.56 Concern over the cost of obtaining IPR has been expressed by some patent applicants, particularly individual inventors.[78] These costs include the fees charged by the Patents Office, which operates on a full cost-recovery basis, and the optional costs of seeking assistance from a patent attorney.[79] Evidence presented to the Committee suggested that the cost of seeking international patents could deter the seeking of adequate international protection. For example, Mr H Sebel stated that getting 'adequate protection around the world, which at the best will probably not be iron-clad, will initially cost tens of thousands of dollars, and ultimately perhaps more than $100,000'.[80]

5.57 In 1991-92, the Patents Office reported a surplus of $2.4m, indicating that the fees and charges recovered from applicants exceeded the amount required to cover the costs of providing industrial property services.[81] The Committee considers that a surplus of this magnitude is inappropriate; however, it understands the difficulties associated with determining a budget based on future forecasts. The

73. Newton, R. 'Due diligence in protecting intellectual property', paper given to the AIC Conference on Maximising Commercial Opportunities in Intellectual Property, Sydney, September 1992, p. 7.
74. *Licensing Australian Technology Overseas*, AGPS, April 1984, p. 40.
75. Evidence, p. 466
76. Evidence, p. 407.
77. Evidence, p. 830.
78. DITAC. *Annual Report 1990-91*, p. 113.
79. ibid., p. 104.
80. Evidence, p. S1039.
81. DITAC. *Annual Report 1991-92*, chapter 3, p. 35.

proposed moves to organise future financial arrangements on a Trust Account basis will make it possible to carry over surpluses from one year to the next and pass the benefits of any accumulated funds to clients.

5.58 The Committee believes that an independent review of the appropriateness of the current costing structure is required. It is envisaged that such a review would consider the mechanisms to determine the costs and whether there is any scope to reduce these costs. It is felt that these measures are necessary because the Patents Office operates as a monopoly and applicants are unable to seek alternative suppliers where they are dissatisfied with the price or quality of service. The Committee considers that the establishment of an advisory committee to offer feedback on the services provided by the Patents Office would be beneficial. It has been noted that the high cost of obtaining patents may deter firms from commercialising their R & D, especially on an international scale. The Committee believes that the extent to which this occurs needs to be established, with a view to reducing patent costs, or providing assistance to firms experiencing difficulties.

5.59 The Committee recommends that:

- the Government establish an independent body to review the costing structure of the Patents Office and determine whether there is any scope to achieve greater efficiencies and streamline the process; and
- the Department of Industry, Technology and Commerce:
  - set up an advisory committee of users to monitor the costing structures of the Patents Office on an ongoing basis and provide feedback on their needs and the services provided; and
  - consider whether programs supporting research and development should be extended to giving assistance towards the cost of patents where those costs may deter the commercialisation of research and development, especially on an international basis.

The Difficulty of Obtaining Patents

5.60 In Australia, patent applications have increased from 16,500 in 1970 to 24,079 in 1989. Almost half of the 1989 applications were successful in achieving

patents.[82] Concern has been expressed, however, by some patent applicants over the difficulties in obtaining industrial property rights, both in Australia and overseas.[83] In its 1990-91 annual report, DITAC indicated that 'difficulties experienced by Australians seeking industrial property rights in other countries are beyond the immediate control of the Government or the Offices and are being addressed through the Offices' involvement in international negotiations'.[84]

The Administration and Formulation of Intellectual Property Rights

5.61 In his article on the future of Australian intellectual property law reform and administration, Professor Sam Ricketson of Monash University pointed to the need for a 'far higher priority to be given to the matter of intellectual property reform and administration'.[85] He recommended that the present division of responsibility between three government departments should cease and all components of intellectual property administration be brought under one department.[86] He noted that intellectual property law should not be seen as 'a series of separate categories which exist quite independently of each other'.[87] He also highlighted the problems of overlap between the laws. For example, computer software may be protected under both the *Copyright Act* and the *Patents Act*, and new plant varieties under either the *Plant Variety Rights Act* or the *Patents Act*.[88] Other commentators have also pointed to an apparent lack of policy direction in relation to intellectual property protection.[89] For example:

> When the world is working to harmonise copyright law, Australia appears to be returning to distinct laws for different types of work ... We are setting up quite complicated codes for each of these three areas (books, records, computers) and creating separate copyright acts for each kind of work. It is almost a historical regression.[90]

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82. Ricketson, S., op. cit., p. 4.
83. DITAC. *Annual Report 1990-91*, p. 113.
84. ibid., p. 113.
85. Ricketson, S., op. cit., p. 1.
86. ibid., p. 25.
87. ibid., p. 23.
88. ibid., p. 23.
89. Candi, E. 'A response to government developments from the recording industry', paper given to the AIC Conference on Maximising Commercial Opportunities in Intellectual Property, Sydney, September 1992, p. 3.
90. *Business Review Weekly*, 14 August 1992, p. 31.

5.62 The approach taken by the Government has been defended by some who believe that the Government has made a case-by-case analysis of each copyright issue, looking to the merits of each case and coming up with a policy stance as thought fit.[91]

5.63 Professor Ricketson also made further suggestions for the reform of intellectual property protection. He recommended:

- the establishment of a permanent Intellectual Property Law Reform Commission which would have the ultimate goal of producing 'high quality and well-researched law reform proposals in the intellectual property area'; and
- the continuation of the Intellectual Property Advisory Council who would 'be concerned with wider questions of the co-ordination of innovation and information policy'.[92]

5.64 The Committee considers that problems, such as the overlap of coverage between the different laws, may arise in the protection of intellectual property under the present system where responsibility is spread across three separate departments.

5.65 **The Committee recommends that:**

- **the Law Reform Commission review:**
  - **the Government's policy for protecting intellectual property;**
  - **the appropriateness of the present legal framework for protecting intellectual property; and**
  - **the administration of intellectual property protection by three departments.**

91. Candi, E., op. cit., p. 3.
92. Ricketson, S., op. cit., pp. 24-25, 27.

Determining the Value of Intellectual Property

5.66 Determining the monetary value of intellectual property is a contentious issue. As stressed by the Institution of Engineers, intellectual property must not be sold cheaply because, when it is, the real benefits to Australia are lost. The Institution supported CSIRO's move to encourage joint ventures that utilise intellectual property, rather than 'letting it go cheaply and leaving it in the hands of some private company, which may be a multinational and which will exploit it outside this country'.[93]

5.67 On the other hand, the AIRG noted unrealistic expectations in relation to the value of intellectual property on the part of CSIRO and universities. It suggested that such expectations inhibit increased links with industry, and noted that 'we are prepared to pay for value, but we want to see the value there for what we put our money in for'.[94] The BIE also noted that some firms had concerns that research organisations had overstated the value of intellectual property and asked too high a price.[95]

Access to Advice and Information

5.68 Evidence provided to the Committee indicated that advice on intellectual property systems and international research as a whole is required by private sector research firms. The Patents Office would appear to be in a good position to provide some of this advice, given its level of expertise and access to extensive information. However, the Patents Office has statutory limitations on the amount of advice it can give and liability is also a consideration. In Volume 1 of its Report, the Committee suggested that information from the Patents Office, combined with information from Australian and overseas science and technology databases, could be a useful resource to address the specific needs of private companies.[96]

5.69 The Committee took the view that there was merit in establishing an agency to act as a one-stop shop for firms which wanted information about the state of the art in relevant research fields, the resources available in the public sector for

93. Evidence, p. 175.
94. Evidence, pp. 589, 598.
95. Evidence, p. 405.
96. JCPA, op. cit., p. 75.

contract research and the commercial opportunities relevant to such research.[97] This type of information has the potential to significantly contribute to the successful commercialisation of R & D.

5.70 The Committee noted the usefulness of Sirotech, CSIRO's one-stop shop for the commercialisation of its research. Sirotech claimed that one of its great contributions over the last five years had been to increase awareness and therefore ensure that research programs were developed that did not duplicate research protected elsewhere. Sirotech informed the Committee that:

> ... consideration of intellectual property therefore, brings to the scientific researcher a view of ways in which he might then modify his research program to take into account the intellectual property that already exists in the market place in the way of another patent.[98]

This point highlights the need to be able to easily identify other patents that exist in both the local and international markets.

5.71 The Committee notes that funding for the establishment of the Australian Technology Group (ATG) was announced in the Prime Minister's One Nation Statement in February 1992.[99] The ATG is to act as an intermediary in the commercialisation of research, especially that performed in the public sector, and has among its objectives the protection and control of intellectual property and the development of international trade in intellectual property. In Volume 1 of its Report, the Committee supported, with a recommendation, the role of the ATG in the provision of information about commercial opportunities in domestic and international markets.[100]

Taxation Issues

5.72 The AIRG pointed out to the Committee that the current taxation regime is not encouraging Australian companies to obtain worldwide ownership of intellectual property rights. Where worldwide patents are purchased to add to work in Australia, only the portion applicable to Australia can be depreciated. That is the portion in which the firm is receiving income in Australia. The overseas portion that

97. ibid., p. 75.
98. Evidence, p. 466.
99. The Prime Minister. *One Nation*, February 1992, p. 78.
100. JCPA, op. cit., p. 77.

is not earning income for Australia is treated as capital and cannot be deducted against income as a depreciation expense. Dr Kjar provided an example where the 'portion which you have got in Norway not earning an income in Norway at present but maybe stopping somebody from producing in Norway so you can produce in Australia and export to Norway' is not deductible under current taxation legislation. The AIRG therefore suggested that worldwide patents should be depreciated at the same rate as Australian patents, that is, over the life of the patent.[101] The Committee believes that such a move would produce useful support to the export efforts of Australian firms.

5.73 **The Committee recommends that:**

- **the Government consider amendments to the taxation legislation to allow the depreciation of worldwide patents that add to work in Australia, but do not provide income, as a means of encouraging Australian companies to operate on the world market.**

Is the Period of Protection Adequate?

5.74 The term of a patent in Australia is up to 16 years from the date of filing an application. In several cases, however, firms have sought extensions of up to four years because the period in which the product was available for sale under protection was considerably shortened due to product testing requirements.[102] This has occurred in the case of pharmaceuticals for which there is insufficient opportunity to exploit the patent due to regulatory testing requirements.[103] A four year extension has also been sought for genetically modified organisms.[104]

5.75 Another means of extending protection beyond the original patent's life is to develop a patent portfolio which provides a 'web of protection' and ensures that all improvements are patented. This approach was employed by the Orbital Engine Company when it used a series of patents to provide greater protection.[105]

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101. Evidence, pp. 600-01.
102. Butler, A., op. cit., p. 36.
103. Evidence, p. S1910.
104. House of Representatives Standing Committee on Industry, Science and Technology, *Genetic Manipulation: The Threat or the Glory?*, AGPS, Canberra, February 1992, p. 226.
105. Mischlewski, D. 'Opening address: the increasing commercial importance of Australian intellectual property', paper given to the AIC Conference on Maximising Commercial Opportunities in Intellectual Property, Sydney,

5.76 The arguments for extending patent protection must be approached with caution as 'the length of patents is restricted - usually to a fixed maximum life - to balance property right incentives against monopoly distortions.'[106]

September 1992, p. 2.

106. 'The commercialisation of research and development', *Economic Round-Up*, Winter 1992, p. 62.

Chapter 6

MANAGEMENT AND MARKETING ASSISTANCE

Introduction

6.1 The Government assists Australian industry in relation to management and marketing through its support to tertiary institutions that teach business courses and produce graduates with a basic knowledge of some of the concepts and practices of these fields. It also provides assistance to industry through more direct means in the form of the programs and services of the National Industry Extension Service (NIES), Austrade and the Export Finance and Insurance Corporation (EFIC).

Education

6.2 In May 1990, the Senate Standing Committee on Industry, Science and Technology reported on the use of 'new management techniques' in Australia's manufacturing industries. It found industry to be characterised not only by 'a low level of implementation but also a low awareness of the techniques and the productivity benefits that ensue' from their use.[1] Reporting in November 1991, the Task Force on the Commercialisation of Research identified a shortage of management skills as one of the impediments to the commercialisation of technology in Australia.[2] Witnesses to the Committee's Inquiry reiterated this point; for example, Professor D Samson, Professor of Manufacturing Management at the University of Melbourne, told the Committee that:

> The conversion of technical benefits in upstream innovation processes into downstream wealth creations processes does not occur automatically but requires a high degree of managerial skill.[3]

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1. Senate Standing Committee on Industry, Science and Technology. *People and Technology: New Management Techniques in Manufacturing Industry*, AGPS, Canberra, May 1990, p. ix.
2. DITAC. *Bringing the Market to Bear on Research*, Report of the Task Force on the Commercialisation of Research, AGPS, Canberra, p. 3.
3. Evidence, p. 495.

6.3 The critical importance of managerial skills is clear from case studies that have shown that output can be increased by 30% by changing the managerial approach employed. In cases where new technologies are introduced, new ways of managing in terms of organisational structures, work practices and decision making may be needed.[4] Familiarity with this knowledge and how to deal in practice with such situations is important.

6.4 A report to the Australian Manufacturing Council, *The Global Challenge*, underlined as most urgent the need for a 'New Workplace Culture' in Australian firms.[5] The key elements of this culture include:

- flatter organisational structures in which management decision making is delegated more widely than in traditional organisations;
- continuous pursuit of improvements in productivity and quality through concerted efforts to incorporate the ideas of workers at all levels of the organisation;
- more team-based approaches to problem solving that utilise multiple skills;
- attention to technologies based on people as well as hardware technologies;
- flexible production processes relying on multiskilled workers and their ability to effect rapid changeovers with consistent quality;
- increased involvement of suppliers in product design, quality improvement and productivity efforts;
- human resource policies which foster worker commitment and retention through employee ownership or other means of encouraging workers to become stakeholders in the corporation; and
- support for skills upgrading and retraining across the firm's workforce.[6]

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4. Evidence, pp. 496, 511.
5. *The Global Challenge: Australian Manufacturing in the 1990s*, Final Report of the Pappas Carter Evans and Koop/Telesis Study, Australian Manufacturing Council, July 1990.
6. ibid., pp. 58-59.

It is clear that an understanding of the need for such a culture is paramount and every effort should be made to disseminate knowledge of the need for it and how its implementation can be achieved.

6.5 At a more specialised level, a study undertaken by the Research Committee of the IRDB showed that Australian firms tended to be unaware of the role of R & D in increasing competitive advantage, the processes by which innovation occurs and the need to integrate innovation into company strategic plans.[7] There is, however, a dearth of courses in Australia that deal with the management of engineering, technology, R & D and manufacturing management. Most focus on marketing, finance and human resources.[8] The Committee noted, in Volume 1 of its Report, that a recent report to the National Board of Employment, Education and Training (NBEET) had found that general management courses provided only sparse and scattered coverage of science and technology issues. Management courses that specialise in such issues:

> ... are very new or have not yet started. They face difficulties in finding staff with qualifications and experience adequate to the new tasks. In some cases, they have difficulty in attracting students.[9]

6.6 Furthermore, members of the Metal Trades Industry Association (MTIA), informed the Committee that Masters of Business Administration were not:

> ... very valuable in a manufacturing sense. In terms of financial control or strategy ... they have their strengths but, when it comes down to the development, manufacturing, commercialisation-type business, there is not a lot of training in that area. ... it is mostly learnt on the job ... The people who are providing the training are not up to date in current world techniques.[10]

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7. *Industrial Research in Australia*, a Report of the Research Committee of the IRDB, Vols 1, 2.
8. Evidence, p. 521.
9. Jevons F, Dowling F B and Saupin M. *Science and Technology Issues in Management Education*, A Report to the National Board of Employment, Education and Training and the Science and Technology Awareness Program of DITAC, AGPS, Canberra, February 1992, p. 23.
10. Evidence, pp. 926-27.

6.7 The authors of the report to NBEET pointed out that, as well as knowing about technical innovation, Australian managers need to develop a more generally innovative attitude. They stated that:

> Ultimately, the best outcome will be for S&T [Science and Technology] issues to suffuse large parts of the general management curriculum rather than constituting an additional and separate set of items. That would form part of a more general reorientation and rejuvenation of Australian business from its historical legacy of an inward-looking, short-term, accounting-dominated ethos towards a more innovative ethos dedicated to achieving long-term competitive advantage.
>
> Such a thoroughgoing reorientation will not occur overnight. The crucial question for the future is how best to promote it and speed it up.[11]

6.8 The Committee noted that a number of initiatives are being taken to address the problem. The Government has funded two key centres for strategic management, which give equal weight to teaching and research and involve industry with their work. These centres can be expected to contribute to knowledge about the theory of innovation. At present, adequate knowledge is lacking and represents an impediment to understanding and teaching about the role of innovation and management.[12] In addition, the Government announced in the 1992-93 Budget that it will encourage further efforts by universities and TAFE colleges to introduce innovation related topics to courses on science, technology, engineering and business. The Committee believes that such initiatives are essential and should be pursued vigorously.

6.9 The challenge is not only the production of suitably qualified graduates but also the continual upgrading of the skills of existing managers. While experience has been shown to be a significant teacher and to contribute to future company success,[13] it is essential that a way be found to speed up the rate at which companies move up the learning curve. Several solutions seem possible. For example, the Committee believes that there is a good case for some part of company expenditure on training being devoted to management training. Dr Stocker, Chief Executive of CSIRO, suggested to the Committee that another way in which the

11. Jevons F, Dowling F B, Saupin M, op. cit., p. 25.
12. Evidence, p. 522.
13. Pappas Carter Evans and Koop. *Innovation in Australia*, Report for the IRDB, AGPS, Canberra, July 1991, p. 25.

level of expertise in management would improve is by attracting back to Australia Australians who have been working overseas as managers and encouraging Australians to work overseas with multinational companies.[14]

6.10 In their report to the IRDB, Pappas Carter Evans and Koop advocated that training should be provided by major management schools for companies receiving funding for innovation[15], while the Task Force on the Commercialisation of Research proposed assistance to such companies in the form of an adviser. The adviser would be selected by the Board from the ranks of recently retired managers, directors or engineers to provide high level management advice and report regularly to the Board. The Task Force believed that the most valuable way of providing information and advice to companies was through 'direct personal involvement in the management of the project by those skilled in the exploitation of research results'.[16] The Committee supports both these recommendations as potentially valuable means of raising the level of management expertise in Australian firms.

6.11 **The Committee recommends that:**

- **companies receiving grants for research and development be:**
  - **examined by the granting body to ascertain whether they require management training; and**
  - **assisted to obtain this training; and**
- **innovative companies be assisted to obtain management advice of a high order from experienced managers.**

6.12 Of the schemes for improving management practice that are already in place, the NIES has been in operation for longest and will be considered in detail. Additional programs were instituted in the March 1991 Industry Statement, *Building a Competitive Australia*:

- a management training initiative as part of the Workplace Reform Program;

14. Evidence, pp. 489-90.
15. Pappas Carter Evans and Koop. *Innovation in Australia*, a Report for the IRDB, AGPS, Canberra, July 1991, p. 32.
16. DITAC. *Bringing the Market to Bear on Research*, Report of the Task Force on the Commercialisation of Research, AGPS, Canberra, pp. 9-10.

- the Australian Best Practice Demonstration Program (ABPDP) to accelerate the spread of best practice reforms and an improved workplace culture throughout Australian industry;

- a training strategy for small business management in the Small and Medium Enterprise Development Program.

National Industry Extension Service

6.13 The NIES represents a source of management and marketing information for firms. The Service provides a single point of contact for uniting the suppliers of managerial, planning and quality expertise in the private sector with Australian enterprises needing those skills. It helps firms to identify their needs for improved management practices and then provides financial and other assistance for them to engage consultants to fill gaps in in-house expertise. It is a network of Commonwealth, State and Territory Government agencies, the objective of which is to assist firms in the traded goods and services sectors to become internationally competitive. It was established in 1986 and extended in 1990 until 1995; a review by the Industry Commission is planned for 1993.

6.14 The Commonwealth Government coordinates Commonwealth, State and Territory activities, advises on national policy priorities and, in consultation with the States and Territories, arranges the development of new products, coordinates the monitoring and review of NIES activities and provides funding. The States and Territories market NIES services to firms through their field officers or private sector consultants, maintain appropriate infrastructure support and also provide funding. The profile of NIES operations varies from State to State according to the size and nature of their industry sectors and State Government targets and priorities.

6.15 A NIES Advisory Board ensures that effective reviews of the NIES are carried out, advises on developing needs, and reports to the Australian Industry and Technology Council. The Board consists of equal numbers of individuals from the private and public sectors and is chaired by a person from the private sector. The Commonwealth and States, Austrade, the Australian Manufacturing Council and the Small Business Council are all represented on the Board.

6.16 The work undertaken by the NIES has included the fostering of curriculum development in tertiary education centres for strategic management, promotion of Total Quality Management, and the development of a planning model and a tool for assessing the current position of firms and their needs. The NIES has also developed programs on preparing an export plan and exploiting product and

process innovation, and has supported enterprise workshops that promote skills in the innovation and commercialisation of new products and services. It has further trained consultants in the use of these products. The possibility of networking and joint ventures by complementary firms is being explored as a means of improving the international competitiveness of small, innovative firms. The NIES has also sponsored activities designed to encourage international competitiveness and awareness.

6.17 The rationale for the provision of services by the NIES rests on two observations:

- small to medium-sized businesses represent the most rapid area of business growth in the economy; and
- their successful commercialisation of research results often fails because of poor management and marketing skills.

Providing advice to companies is seen as a way of helping firms to remain in business.

6.18 The Committee notes that a number of OECD countries operate schemes that, like the NIES, provide consultancy services. In some respects these schemes differ from Australia's. In the UK for example, firms receiving consultancy services contribute towards the cost. Some of the schemes, such as the French one, also provide grants or loans which are repayable if the venture supported is successful. All the overseas services concentrate on assisting with business planning, while the NIES emphasises strategic planning.[17]

Evaluation

6.19 A number of evaluations of the NIES have been carried out, in addition to NIES staff's ongoing collection of information about the impact of NIES programs, at both State and Commonwealth levels. The BIE has twice examined the impact of NIES programs on firms, once in 1987 and again in 1988. In September 1989, a report on a major evaluation of the first three years of the NIES's operation

17. Evidence, pp. 1107-10.

was presented to the Australian Industry and Technology Council (AITC) by the then National Advisory Committee on Extension Services.[18] The report indicated that:

- a good partnership had been established between State Governments, the Commonwealth Government and the private sector that resulted in the more effective use of funds than previously;
- a network had been established by governments and the private sector consultancy industry to provide an enterprise improvement program - the establishment of the network had promoted professionalism in the consulting industry and represented a means for the delivery of further policy initiatives to businesses and of giving feedback relevant to macro and microeconomic reform to governments;
- the Service had been used by thousands of firms, many of which returned for additional assistance; and
- acceptance of change and its more rapid implementation was spreading.

On the basis of this evaluation, the AITC recommended that the NIES should continue beyond the original termination date in 1991.

6.20 A major national evaluation of the NIES was carried out by Price Waterhouse in 1991.[19] It showed that the NIES had had a positive impact on all 46 of the companies surveyed in terms of their approval of the program and its impact on best practice and international competitiveness. Furthermore, NIES field officers were operating at high levels of efficiency and effectiveness, and using the Service to deliver sectoral programs was cost-effective compared with administering them separately.

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18. National Advisory Committee on Extension Services. *NIES - Future Directions,* a Report to the Australian Industry and Technology Council, September 1989.
19. Price Waterhouse. *An Evaluation of the National Industry Extension Service (NIES),* Vol. 1, Canberra, April 1992.

6.21 In relation to the impact of the NIES on the extension services available, Price Waterhouse found that:

- an effective national coordination network had been established and was maintained at relatively low cost;
- the NIES had stimulated rationalisation of the extension services available in the States;
- the NIES had been very active in developing new, and improving existing, industry extension service products, which were readily available; and
- a range of activities had been delivered to improve the quality of private sector deliverers of extension services.

6.22 The evaluation yielded suggestions for improving the Service's operation. Having shown that the more programs a company has undertaken, the greater its international competitiveness and its commitment to best practice, Price Waterhouse suggested that the NIES should focus on its existing client base. Furthermore, client firms should be selected on the basis of their preparedness and ability to undertake a long-term program of enterprise improvement. In addition, the subsidy for program participation could be varied according to a firm's need for it.

6.23 However, there were many firms that had not so far been involved in NIES programs, and attempts should be made to reach them, for which additional funds would be needed. Price Waterhouse also highlighted that:

> Another important issue is that of remaining, and newly arisen, overlaps between NIES and other Commonwealth and State enterprise level assistance programs.
>
> Improved rationalisation and coordination of government programs for industry should remain a NIES network objective. It is arguable however, that only moderate levels of NIES resources should be allocated to this objective given the obvious

> difficulties inherent in removing overlaps and the State/Federal issues that are sometimes involved. Rather, NIES should consider strategies for minimising the extent of industry confusion caused by the existence of different programs and delivery agencies.[20]

6.24 A further review that was carried out by K Luscombe and Associates amplified the information available about firms that have not made use of NIES services. This review established that 13% of the chief executives surveyed did not know of the NIES and a proportion of those who knew of the NIES did not understand its role. As a result of these findings, the NIES is developing a national marketing strategy.

6.25 In 1992, the BIE examined the economic rationale for industry extension services, such as the NIES. It concluded that market deficiencies in the supply of and demand for information about best practice process technologies do exist, and government intervention to rectify these deficiencies might be justified. It is, however, difficult to establish the extent of the deficiencies. The extent to which services like the NIES are cost-effective depends on the accuracy with which market deficiencies are identified and the potential costs of intervention assessed.

6.26 The BIE considered that, compared with other options for addressing market deficiencies:

> One of the most attractive attributes of NIES is its flexibility in relation to the technologies and firms it assists and the level of that assistance. This flexibility means that firms and technologies can be treated differently as circumstances change. The extent of targeting can be adjusted quickly, as can the level of subsidy. Consequently, as long as the nature and extent of any market failures can be correctly identified, NIES has the ability to adjust its assistance to maximise its impact. This flexibility, coupled with the regular reviews of its operations, should allow NIES to provide assistance to only those areas where it is most justified.[21]

The BIE stressed the importance of flexible targeting of assistance. Constant re-evaluation of NIES operations is also necessary to ensure that they do not crowd out other technologies and technology suppliers and complement other means of

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20. ibid., p. 14.
21. 'NIES study', *Bulletin of Industry Economics*, No. 13, September 1992, p. 29.

technology diffusion. In addition, ongoing review reveals changing needs for services as firms' practices and attitudes change. The BIE also drew attention to the need for research into the role of government in the diffusion of technologies.

6.27 Lastly, mention should be made of a planned review during 1992-93 of the infrastructure and procedures for delivering NIES programs. This review will form the basis for the introduction of intra-State benchmarking as a means of increasing the efficiency and cost-effectiveness of program delivery.

Comment

6.28 The Committee applauds the NIES for providing a valuable range of services to Australian firms and doing so in an efficient and cost-effective manner. The Committee recognises that more useful outcomes are obtained if firms access more than one of NIES programs and believes that providing a battery of programs appropriate to each firm's needs should be one of the NIES's goals. The Committee also believes that the NIES's services should be available to a wider audience and commends the NIES on undertaking a marketing drive to achieve this. If the NIES is to extend its services in these ways, additional funds will be required.

6.29 **The Committee recommends that:**

- **additional funds be made available to the National Industry Extension Service so that it can supply its services to firms that have not yet used them and more extensive services can be provided to existing clients.**

6.30 In making this recommendation, the Committee urges the NIES to be rigorous in extending its programs only to those firms able to benefit fully from them and avoiding subsidies to firms able to pay for the consultancy services they need. It also notes DITAC's view that:

> The NIES program has never been envisaged as a program which will stay in situ for a long time. It is a program which is designed to ... encourage management in the small to medium firms to actually seek expert advice on different aspects of business development, business management and business growth, and to encourage in that same context the other side of

> the marriage - appropriate consultancy infrastructure ... In time, just as happened in the agricultural extension service arena, the public sector pulls back and you have a private sector driven approach ... [22]

The Committee believes that DITAC should monitor closely the arena in which the NIES is operating and consider reducing its services as the private sector is able to fill the gap left and Australian firms incorporate into their thinking the realisation that management skills need to be upgraded continually.

6.31 However, as the Committee noted in paragraphs 6.13-6.15, the NIES provides a means whereby a variety of government initiatives can be delivered to industry and feedback provided to government. If the Government is to withdraw its involvement with the NIES, it would be important to ensure that these functions could still be performed by other means.

Marketing Assistance

6.32 Although none of Austrade's services is specifically aimed at R & D, they assist in creating and maintaining a sustainable competitive advantage in the international market place. They may thus directly and indirectly influence the commercialisation of R & D. The services include:

- export information (general counselling and advice on export planning, referrals and information, overseas import requirements, seminars, workshops and videos, reference library and publications, exporters' newsletter);
- identification and marketing of export opportunities (overseas trade information, trade intelligence reports, consortium facilitation, development bank projects, investment facilitation, tender and investment opportunities, 24 hour on-line database);
- research and assessment of market opportunities (identification of overseas distribution channels, export market overviews and snapshots, competitor analysis, importer contact list, distribution and promotional methods, market and press monitoring, tailored market research, credit status reports);

22. Evidence, p. 1111.

- assistance overseas (trade displays, exhibitions and seminar management, visitor briefing, itineraries and appointment schedules, interpreting and translation);

- investment and strategy services (Investment Promotion Program, business development units);

- export assistance schemes (Export Market Development Grants Scheme (EMDG), International Business Development Scheme (IBD) which has been replaced by the International Trade Enhancement Scheme (ITES), Innovative Agricultural Marketing Program (IAMP)); and

- trade and marketing services (trade missions overseas, overseas visitors).[23]

6.33 In a submission to the Inquiry, Austrade pointed out that some of its programs provide substantial assistance to commercialising R & D. The IAMP, for example, is administered jointly by Austrade and the Department of Primary Industries and Energy and supports the implementation of innovative produce, processes and marketing ideas in the rural industries. A similar program is the IBD scheme which currently supports 44 projects. About half of these projects involve the overseas commercialisation of R & D in the fields of biotechnology, laboratory, medical and scientific equipment and advanced materials. The IBD scheme provides concessionary risk sharing finance, which would not be available normally from commercial sources, for assistance in developing new international business opportunities. It requires participants to develop a comprehensive business plan, which many of the participating companies have found a very useful exercise. The IBD has, however, been replaced by the ITES, which is directed largely towards applicants with demonstrated records of success in exporting who need assistance to expand substantially their international business activities.

6.34 The Committee noted that several of Austrade's programs have been evaluated and substantial benefit to cost ratios found. For example, in 1989-90 the EMDG paid out $179.6m in taxable cash grants for exports that generated receipts of $4.8b. When the performance of the IAMP was reviewed in 1990, it was found that over the previous four years $9.3m had been expended in relation to exports of $41m and import replacements of $26m.[24]

23. Evidence, pp. S1736-38, S1740-41, S1947-49.
24. Australian Trade Commission. *Annual Report 1990-91*, pp. 60-61.

6.35 The Committee recognises that such program results are impressive, but notes that Austrade has been the object of some criticism over the years. A review in 1990-91 of Austrade's activities and organisation by McKinsey and Company Ltd recommended drastic changes to make Austrade more effective. The recommendations were accepted by Austrade's board and the Government and implemented during 1991. The major changes introduced included a major shift of resources towards Asian markets, decentralising responsibilities to both overseas and domestic regional managers, and concentrating on developing relationships with and assisting high potential exporters.

6.36 The Committee believes that these changes should have gone some way to answering the criticisms that were levelled at Austrade. The Committee intends, however, to consider whether it should inquire into the performance of Austrade once the new structures and operational emphases have stabilised and enough time has elapsed to allow their strengths and weaknesses to emerge.

6.37 Financial support for marketing activities is discussed in paragraphs 3.40-3.41.

Other Programs

6.38 Development programs for individual sectors of industry use the NIES and Austrade to deliver segments of their programs and assist in developing schemes tailored to the needs of the industry or sector of the economy concerned. Two programs that are using the services of the NIES and/or Austrade are the Small and Medium Enterprise Development Program and the Metal Based Engineering Program.

Small and Medium Enterprise Development Program

6.39 In announcing the Small and Medium Enterprise Development Program (SMEDP) in March 1991, the Government recognised the significance of small and medium-sized businesses in contributing to economic growth. The Program, which is administered by DITAC, promotes both exports and the development of management and business skills in this sector. Under the auspices of the Program, a register of training courses for business advisers was being compiled with the Department of Employment, Education and Training during 1991-92.

6.40 The Program's Export Access element was launched in October 1991 and provides advice and some help with overseas travel expenses, and assists in developing export plans and introducing companies to overseas buyers. It is largely directed at companies that have not yet developed sufficient expertise and resources to maintain a sustained export program. In 1991-92, Export Access was run as a pilot program by the Australian Chamber of Manufactures with a management committee drawn from industry and employer bodies. In the 1992-93 Budget, the Program was extended until 1994-95 and now includes the Confederation of Australian Industry, the MTIA and State-based Chamber of Commerce and industry in the delivery of the program. The extended Program will employ additional project managers in peak industry and employer organisations in each State and Territory and a national coordinator, and will assist 700 firms.

Metal Based Engineering Program

6.41 The Metal Based Engineering Program was introduced in 1989. It was funded for four years at a cost of $15m. It encourages firms to internationalise their operations, establish and improve their export capability, develop an export culture and adopt new technologies. The Program provides up to 50% of the cost of the projects that it supports. DITAC is responsible for the key technologies element of the Program, while programs to improve international competitiveness and export performance are coordinated by the Department but implemented by the NIES and Austrade.

Overlap Between Programs

6.42 In its evaluation of the NIES, Price Waterhouse commented that there appeared to be 'growing areas of overlap between NIES and various Commonwealth programs'.[25] The most glaring case of overlap is with the ABPDP which is administered by the Department of Industrial Relations. Other programs where overlap or potential overlap exists are:

- the Energy Audit Program, Business Advisers for Rural Areas, and the Rural Industries Business Extension Service in the Department of Primary Industries and Energy;
- some of Austrade's programs; and
- DEET's training and skills program.

25. Price Waterhouse. *National Evaluation of the NIES Program, Volume 2, Part 1, Detailed Findings, Canberra,* May 1992, p. 141.

In the case of some of these programs, the NIES is working with the responsible agencies to minimise the extent of overlap.

6.43 The Committee is concerned by the possibility of duplication of services by government agencies as they work to improve management practices and exports by Australian firms. It also deplores the confusion caused by the existence of similar programs, which leaves firms uncertain about the appropriate source of assistance The Committee notes that the establishment of the NIES in 1986 and the ensuing rationalisation and coordination of Commonwealth and State programs were effective, not only in reducing the overlap of programs, but in reducing the public's confusion about the range of programs available. Price Waterhouse commented in this regard that:

> Initial gains in reducing firms' confusion are being undone to some extent by introduction of new Commonwealth government programs such as ABPDP which are being established and administered separately from NIES. It appears that the Federal Government may, by its own direct actions, hinder NIES achieving the aims agreed between Federal and State Ministers [in the 1986 Memorandum of Understanding and Commonwealth/State Bilateral Agreements which formalised the establishment of the NIES].[26]

6.44 The Committee believes that, when the establishment of new programs is being considered by departments, they should make every effort to establish whether there are already existing programs which could be modified for particular sectoral interests, rather than setting up separate programs. The Committee also urges all agencies to minimise the extent of overlap of their existing programs by consultation and cooperation with one another.

26. ibid., p. 155.

Chapter 7

PROCUREMENT

Government Purchasing

7.1 As a large purchaser of certain goods and services, the Government is in a position to produce a significant impact on the local industries producing these items. The role of the Government in stimulating the economy in this way is recognised in procurement policies for both the defence and civil elements of the public sector. The main impact of defence procurement on R & D and its commercialisation comes from the Defence Science and Technology Organisation (DSTO). In its examination of DSTO in Volume 1 of its Report on this Inquiry, the Committee concluded that better use could be made of DSTO's capabilities in encouraging industry development. The Committee recommended that:

> ... the Defence Science and Technology Organisation identify those areas where its expertise coincides with Australian industrial capability and defence requirements, and concentrate on these areas by:
>
> - setting up an industry advisory group to devise industry development strategies for the Organisation's expertise; and
> - forming long term alliances with companies.[1]

7.2 In the arena of civil procurement, the National Procurement Development Program (NPDP) targets the commercialisation of R & D and is discussed below. Some of the procurement guidelines provide a general stimulus to business which may flow through to R & D. For example, one of the three main principles on which Commonwealth purchasing is based, is the requirement that Australian and New Zealand suppliers should be given maximum opportunity to compete for government business.

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1. JCPA. *Public Sector Research and Development: Volume 1 of a Report on Research and Development*, AGPS, Canberra, June 1992, p. 238.

7.3 Another development in recent years that has served to boost private sector industrial capacity in certain fields is the move to contract out for the supply of certain services. An important area in which this move can produce benefits for the performance of R & D by the private sector is in the supply of information technology (IT) services to the Government. IT purchasing policies now require government departments and agencies:

> ... to test the market for outsourcing both new and existing IT service requirements ... as an alternative to maintaining in-house capabilities ... This is to be done with a view to achieving maximum outsourcing, subject to value-for-money and agency efficiency considerations.[2]

Outsourcing must be considered for all new IT projects estimated to cost more than $250,000 per annum. With such arrangements in place, firms developing products and services for government departments can later offer them for sale on the open market. The Information Exchange Steering Committee, which assists in the development of IT strategies and policies for the public sector, is monitoring the effectiveness of outsourcing.

7.4 Furthermore, as part of the Government's IT purchasing policy announced in March 1991, 'agencies are to migrate to supplier-independent open systems based on international standards as quickly as practicable according to standards endorsed by the Government'.[3] This requirement, combined with those discussed in the previous two paragraphs, can be expected to encourage the development of products which might become internationally competitive.

7.5 Another boost to assist Australian IT firms to access overseas markets is the establishment by the Government of a panel of suppliers for IT services. The rationale for the panel's formation is based on the observation that the initial expansion of the IT market in Asia is expected to be into the government sectors of these countries. To be considered, suppliers have to be either global companies or to have done substantial business with their own governments. To help position Australian companies to enter this market, a panel of firms is being established with which the Government will place competitive IT systems integration contracts costing more than $1m. The panel, known as the Restricted Panel of Systems Integrators, consists of nine Australian IT service companies and seven international ones.

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2. DAS Office for Better Buying. *Information Technology Buyers' Handbook*, AGPS, Canberra, 1991, p. 7.
3. ibid.

7.6 A further move by the Government to enhance the prospects of the local IT industry is the introduction of limited liability in Commonwealth contracts for developing computer software and using systems integration services.

7.7 The issuing of forward procurement plans by government departments and agencies is a further means of assisting local business to develop products. The Department of Administrative Services (DAS) advises that making information about likely future requirements available to the market at concept or research stages allows entrepreneurs to develop solutions for these requirements. It also provides an opportunity for industry to adapt existing products and services to a form suitable for government requirements.[4] The production of forward procurement plans is therefore encouraged while DAS examines the possibility of requiring it and the means by which it might be systematised. A further issue is the question of whether it is desirable and feasible to aggregate the requirements of a number of departments to provide industry with a larger, one-stop shopping list.

7.8 The Task Force on the Commercialisation of Research examined the impact of government purchasing on industry and pointed to the possibility of broadening the interpretation of the criterion of 'value for money' to include benefits to Australian industry as well as to the purchaser. The Task Force recommended that:

> Where an Australian bid for Government purchasing is not the most competitive, but is the second or third best bid, the top three contenders should be advised of each bid and be invited to submit a revised bid.[5]

The Task Force pointed out that, not only would this approach ensure that the most competitive tender was ultimately selected, but it would also provide an additional opportunity for an Australian firm to win the contract.

7.9 The Task Force also recommended the introduction of industry impact statements, which would be required before large contracts were let.

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4. DAS Purchasing Reform Group. *Commonwealth Procurement Guideline 4, Planning Government Procurement*, AGPS, Canberra, October 1990, p. 3.
5. DITAC. *Bringing the Market to Bear on Research*, Report of the Task Force on the Commercialisation of Research, AGPS, Canberra, November 1991, p. 13.

National Procurement Development Program

7.10 In addition to the encouragement that the general procurement requirements may provide to business to engage in R & D, a specific program, the NPDP, has been developed. It not only enables government customers and potential suppliers to work together to meet the Government's needs, but is specifically targeted at the later stages of commercialising precompetitive R & D. It is administered by the IRDB.

7.11 The NPDP commenced in 1987 as a response to the Inglis Committee of Review on Government High Technology Purchasing. This Committee found that a bias in government purchasing against buying Australian products was inhibiting the development of local industry. Government purchasers regarded investing in Australian made products as risky and tended to purchase better known and tested alternatives manufactured overseas. One objective of the Program is therefore to address the risk aversion of government purchasing agencies to buying Australian developed products and services.

7.12 More importantly, the Program aims to improve the efficiency and international competitiveness of Australian industry through providing grants for:

- joint industry-government R & D projects; and, in particular,
- trialing and demonstration of innovative Australian products and services, which meet forward procurement requirements of government agencies.

7.13 Grants are provided for projects that:

- are directed at the development of internationally competitive traded goods and services;
- will be completed within three years;
- are undertaken and commercialised in Australia;
- would not proceed without a grant; and
- would not have specific budget provisions available within the government agency.

Grants made under the Program meet up to 50% of eligible costs when these exceed $50,000. By February 1992, 87 project agreements had been signed, involving almost $25m in grant commitments.

7.14 As a result of the Program, Australian firms are provided with the opportunity to supply governments in circumstances in which supplies might otherwise have been purchased from overseas. The government partners include Commonwealth, State and local government agencies and wholly owned government companies. Orders from these bodies stimulate the development of new technologies and products which may be suitable for export. Furthermore, companies that have sold equipment to the Government and have it installed and running successfully gain leverage in their dealings with overseas customers. As a member of the IRDB told the Committee:

> You cannot actually export things unless you have a domestic base to do all your learning in. You have to succeed in that base, and be seen to succeed.[6]

Reactions to the Program

7.15 Most reactions to the Program have been positive. In its report on the NPDP, the Industry Commission (IC) noted that it was viewed very favourably by grant recipients.[7] The Task Force on the Commercialisation of Research recorded that, from its discussions with senior people in government and private sector research organisations, financial bodies and firms of all sizes, it was 'impressed by the substantial impetus the program can provide firms'.[8]

7.16 In 1990, a formal agreement was concluded between the Commonwealth and States for State participation in the Program as direct funding partners and the continuation of the Program to June 1995. In 1991, the NPDP was extended to include government business enterprises and government contractors. The Committee notes that the Task Force on the Commercialisation of Research recommended that the NPDP should be further extended to include private sector companies as purchasers. In making this recommendation, the Task Force drew a parallel between the support provided to private sector parties by the Advanced Manufacturing Technology Program and the proposed extension to the

6. Evidence, p. 1306.
7. Industry Commission. *National Procurement Development Program*, Report No 20, AGPS, Canberra, March 1992, p. i.
8. DITAC, op. cit., p. 13.

NPDP. The Task Force did acknowledge, however, that it would be necessary to monitor closely and limit the types of projects supported, if the Program were to be extended to transactions between private sector parties.

7.17 In its report on the NPDP, the IC pointed out that the Program had moved away from its original impetus, that stemmed from the recognition of the need to combat risk aversion, to take a risk averse approach itself. Among the firms it supports are a substantial proportion that have already made sales to government and overseas. Several respondents to an IC survey pointed to the discrepancy between the IRDB's present emphasis on an established track record and financial position and the perceived aim of the Program in assisting firms that could not otherwise proceed.[9]

Evaluation

7.18 In its submission to the IC's review of the NPDP, the IRDB pointed out that, in less than four years, fewer than half the projects awarded grants had been completed technically and had begun the process of commercialisation. Nevertheless, the Board claimed evidence for:

- a broadening of market opportunities within Australia and overseas beyond simply increasing sales to the Government sector;
- early initial growth of export sales with strong growth anticipated;
- a positive attitudinal change and learning of skills among participating firms with regard to the ability to commercialise and market overseas; and
- benefits to government partners.[10]

7.19 The Committee also notes that an administrative review of the Program has been carried out, as a consequence of which the application process was altered.

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9. Industry Commission, op. cit., pp. 55-57.
10. IRDB. Submission to the IC Inquiry into the NPDP, 1991-92, p. iv.

Evaluation by the Industry Commission

7.20 When the IC evaluated the NPDP in 1991, it criticised several aspects of the Program. The Program was found to have produced private benefit to the companies supported but little to the wider community. Furthermore, the IC pointed out that the income generated from sales of the products, whose commercialisation the grants supported, was considerably less than had been anticipated. This situation might change, however, as the time to successful commercialisation of research is often longer than the NPDP has been in operation.

7.21 The IC claimed that the several objectives of the NPDP were disparate and conflicted with each other, which resulted in difficulties in putting a suitable program into operation and in achieving the required results. The Commission examined three objectives of the Program to establish the extent to which they had been met. It considered:

- overcoming market failure;
- assisting the development of internationally competitive industries; and
- redressing perceived biases against little known Australian firms by government purchasers, particularly where such attitudes arise from risk aversion.

7.22 Government intervention to support innovation may be justifiable if market failure can be demonstrated. However, market failure was not included among the NPDP's criteria for supporting projects. In fact, firms with adequate resources to finance their projects had received assistance.

7.23 The IC pointed out that international competitiveness requires self reliance. A contradiction exists in supporting self reliance by subsidies such as the NPDP provides, as subsidies may well contribute to the development of a dependent culture. Furthermore, selective support for some firms may disadvantage those not supported and reduce the chances of their becoming internationally competitive.

7.24 Finally, the Commission found no evidence that the Program had raised confidence among government purchasers in the general capacity of local firms to commercialise successfully new products and processes. Risk aversion was difficult to substantiate and appeared not to have been targeted by the IRDB. It is also difficult to distinguish risk aversion from sound risk management. Recent

reforms of government purchasing, which are covered in paragraphs 7.1 to 7.7, encourage program managers to participate actively in joint developments and may represent a sounder approach to encouraging business development.

7.25 The IC claimed that the administration of the Program had been marred by several unsatisfactory characteristics:

- limited information had been available publicly about the operation of the Program;
- reasons for acceptance and rejection of grant applications had not been given;
- the Program appeared to have been driven by industry interests rather than by government procurement needs;
- the cost, to both the Government and applicants, of administering the Program was high at 20% of total costs; and
- consistent monitoring of projects receiving support had not been carried out.

7.26 The Industry Commission concluded that the NPDP should be terminated. It believed that problems in public sector procurement 'are best addressed by maintaining pressures for reform of government budgeting and procurement policies generally, rather than by programs such as the NPDP.'[11]

7.27 As an alternative to terminating the NPDP, steps could be taken to improve the Program, such as clarifying its objectives. The Commission stressed that, if the Program is to be retained, it must be driven by government procurement requirements and made a number of recommendations concerning arrangements that would secure this result. It suggested, for example, that the procurement scheme should be run by DAS with funds being provided to government departments in the form of loans, repayable if the project succeeded or as a share of the rights to intellectual property. The Commission also discussed the option of establishing an innovation program restricted to support where there had been market failure. The innovation program should, however, be established only after a wide review of the schemes that currently provided assistance for R & D.

11. IC, op. cit., p. viii.

Comment

7.28 The Committee notes the opposing views of the NPDP's worth on the part of the IC, the IRDB and participants in the Program. The administrators of the Program and those that benefit from it were, not surprisingly, in favour of it, while the IC's assessment found defects. A former member of the IRDB and a beneficiary of the Program told the Committee that 'the NPDP program is as a [*sic*] stupid a concoction as there ever was, but it is a necessary stupidity given other stupidities'.[12] Having located the source of these 'stupidities' in State Government procurement regulations, he stated that:

> If the country knew what it was trying to do, and each of these players had some internal basis for making sensible judgments, we would not have these peculiar concepts. I would hope that that would cause the need for NPDP to go away.[13]

7.29 The Committee believes that there may be merit in emphasising general government procurement as an indirect means of stimulating the performance and commercialisation of private sector R & D and dispensing with selective schemes such as the NPDP. It notes, however, that doubt has been cast on the possibility of such an approach being effective.[14] Furthermore, in its response to the IC's draft report on the NPDP, the Purchase Australian Office of the Department of Administrative Services pointed out that programs, such as the NPDP, act as signals for directions for appropriate corporate behaviour. In the case of the NPDP, it signals to government buyers and suppliers the need for changes in purchasing attitudes and an innovation-driven industrial culture. The Purchase Australian Office argued that the NPDP should be maintained until buyers' attitudes have changed and an innovative culture exists.[15]

7.30 In a private meeting with the Committee, the IRDB indicated that it was responding to the IC's report by reviewing and instituting organisational changes to the NPDP. The Committee considers that, as the Board modifies the

12. Evidence, p. 1306.
13. Evidence, p. 1307.
14. For example, by the Western Australian Department of State Development, quoted by the Industry Commission, ic, op. cit., p. 41.
15. *Industry Commission Inquiry into the National Procurement Development Program: Purchase Australian Office Position Papers*, Department of Administrative Services, Canberra, March 1992, pp. 34-35.

NPDP, it should take into account not only the points raised by the IC but also the need for support to be provided solely where large commercial markets exist for the new technologies.

7.31 The Chairman of the Board has also pointed out that some of the IC's conclusions were based on incomplete information which gave rise to misleading inferences. Other conclusions were drawn from answers to questionnaires that were either poorly designed or were intended for purposes other than that to which the Commission put them. The use of deficient information calls into doubt the IC's claims about the degree to which the Program was poorly known, the low returns in sales and exports earned by the participating firms, and the extent to which grants had been awarded to firms that had other sources of funds available to them.[16]

7.32 The Committee is concerned that a premier advisory body to the Government should operate in a less than professional manner and urges it proceed with greater thoroughness in future. The Committee understands that the IC completed its report on the NPDP in haste, but believes that higher standards should have been achieved.

7.33 **The Committee recommends that:**

- **the Industry Commission take steps to ensure that its work is prosecuted with careful attention to the acquisition of adequate data and the use of appropriate methodologies.**

7.34 The Committee notes that the Government is currently considering whether funding for the NPDP should be extended. The Committee considers that the conceptual basis of the NPDP is sound and provides good reason for the continuation of the Program. It concurs with the IRDB's view that:

> ... the Industry Commission has provided a simplistic analysis of complex issues central to the contribution of technology development and innovation to wealth creation and economic growth.

16. House of Representatives Standing Committee on Industry, Science and Technology. Inquiry into Government Purchasing Policies and Promotion of Australian Made Goods and Services, Exhibit No. 23.

> The Commission relies heavily on *a priori* argumentation based on ideal economic models [and]
>
> ... has little regard for the practical realities of the government marketplace and its importance to local companies in developing advanced technology products and services.

The Board concluded that 'there is little acknowledgment ... of the benefits to Australia of facilitating the growth of innovative, technology-based industries through measures such as the NPDP'.[17]

7.35 The Committee believes that schemes such as the NPDP provide an essential opportunity for firms to prove technologies and establish their credibility in the market place. Were the NPDP to be terminated as the IC has recommended, the Committee believes that it would be imperative for the NPDP to be replaced by a program that allows new technologies to be tested by Australian government agencies. The Committee acknowledges that the NPDP has a number of defects but considers that they can be overcome and recommends its continuation. Some of its defects, such as being poorly known and not well understood, are common to several grants programs and are discussed further in Chapter 10.

7.36 **The Committee recommends that:**

- **the National Procurement Development Program be continued to 1995, as agreed by the State and Commonwealth Governments; and**
- **the Industry Research and Development Board continue to modify the Program to eliminate inefficiencies in its operation.**

7.37 The Committee notes one of the IRDB's recent initiatives to improve on the operation of the NPDP. At present, the NPDP applies to one-off purchasing situations and is unlikely to produce a 'systematic shift from prudent, "risk averse" purchasing practices, to a broadly based culture of innovative procurement development'.[18] The development of such a culture is more likely with collaboration between procurement officers from different agencies and greater

17. House of Representatives Standing Committee on Industry, Science and Technology. Inquiry into Government Purchasing Policies and Promotion of Australian Made Goods and Services, Exhibit No 22, p. 1.
18. Gold E. 'Buying Australian', *Engineering World*, Vol. 2, p. 47, October 1992.

involvement for engineers in advising on procurement. The IRDB has indicated that in future funding decisions it would favour advisory mechanisms to guide the development of promising new technologies. The Board:

> ... can be expected, in future R & D funding decisions, to ensure that ... collaborations between technology developers and relevant industries, represented by an advisory group of key engineers, are provided with sufficient funds to conduct a rigorous, staged program of development.[19]

The Committee considers that this is a useful manner in which to modify the NPDP.

Performance Bond Guarantees

7.38 Risk aversion among purchasers of Australian goods was considered by the Task Force on the Commercialisation of Research, which found evidence of concern among the purchasers that manufacturers might not be sufficiently financially solvent to provide follow up service for their products. The Task Force pointed out that, by lodging a bond, a company supplying products provides assurance that it will meet its contractual obligations. If the company fails to meet its obligations, the bond defaults to the intending customer. However, providing a bond is often beyond the resources of small companies and, when they seek assistance from banks and financial institutions to guarantee the bond, these institutions tend to insist on full security.

7.39 The Task Force recommended that the Government establish a performance bond guarantee facility with a backing of $25m. It suggested that the facility could be modelled on that provided by the Export Finance and Insurance Corporation, which assumes part of the risk by insuring finance institutions against claims on bonds. The Corporation provides insurance on bonds, indemnifies financial institutions providing the bonds and, in special cases, issues the bonds itself.[20]

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19. ibid., p. 48.
20. DITAC. *Bringing the Market to Bear on Research*, Report of the Task Force on the Commercialisation of Research, AGPS, Canberra, November 1991, p. 14.

7.40 **The Committee recommends that:**

- **the Government provide a performance bond guarantee facility for sales in Australia of technology and related products, as recommended by the Task Force on the Commercialisation of Research.**

Chapter 8

OFFSETS AND PARTNERSHIPS FOR DEVELOPMENT

Introduction

8.1 Several Commonwealth schemes have been designed to provide indirect support to R & D in Australia through government procurement. Included in these are the Australian Defence Offsets Program, the Australian Civil Offsets Program (ACOP) and the Partnerships for Development Program (PDP).[1] These programs require overseas suppliers to the Australian Government to undertake various activities that will benefit local industry. The major activities generally undertaken include R & D, exports and technology transfer. To date, the Partnerships for Development Program appears to have stimulated the greatest amount of R & D activity.

8.2 In March 1991, the Civil Offsets Program was replaced with a number of more flexible, closely targeted programs including a modified Partnerships for Development Program, a new Fixed Term Arrangements Program for smaller suppliers of information technology, and new arrangements in the aerocomponents industry.[2] These programs are administered by DITAC, except for Defence Offsets, which are the responsibility of the Department of Defence.

Previous Joint Committee of Public Accounts Reviews of the Offsets Program

8.3 The Committee has devoted considerable resources to reviewing the Offsets Programs and the PDP in recent years, and the findings and recommendations of the Committee have been taken into account during the present Inquiry. In 1984, reports by both the Auditor-General and the Inglis Committee identified shortcomings in the administration of the Offsets Programs.[3]

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1. Industry Commission. *National Procurement Development Program*, Report 20, AGPS, Canberra, March 1992, p. F8
2. ibid., p. F10.
3. Auditor-General, *Reports of the Auditor General on Efficiency Audits, Administration of the Offsets Policy*, AGPS, Canberra, 1984, p. 25; Committee of Review on Offsets, *Report of the Committee of Review on Offsets*, AGPS,

Amendments were introduced to the programs in response to these two reports and, in 1986, the Joint Committee of Public Accounts undertook to follow up the adequacy of these amendments and whether further action or attention was necessary. The Committee's Report on its Inquiry identified four main areas of concern including:

- the need to widen the impact of the programs on Australian industry by increasing the number of Australian firms participating in the programs and by ensuring that overseas firms fulfil their offsets obligations;
- the valuation of technology transfers;
- inadequate record keeping by offsets authorities; and
- administrative matters such as dual administration of the programs, lack of consultative mechanisms and administrative discretion.[4]

8.4 The Committee considered that departmental responses[5] to the report were unsatisfactory. It was disturbed to find that in some areas corrective action had not been implemented, despite the fact that criticisms had been raised several times before. As a result, the Inquiry was re-opened to gain additional information and explanations. In November 1989, a further report by the Committee made recommendations:

- to ensure the consistency and equity in the application of the offsets policy amongst both overseas and local participants;
- to minimise the degree of administrative discretion utilised in assessing and evaluating offsets proposals; and
- to remove the shroud of secrecy for which the program had been widely criticised, by seeking to improve program visibility and accountability.[6]

Canberra, 1985, p. 4.

4. JCPA. *Implementation of the Offsets Program*, Report 270, AGPS, Canberra 1987, p. v.
5. Finance Minute on Report 270, October 1988, reproduced in JCPA. *Review of Finance Minute on Report 270 - 'Implementation of the Offsets Program'*, Report 305, AGPS, Canberra, November 1989, pp. 99-227.
6. JCPA. *Review of the Finance Minute on Report 270 - 'Implementation of the Offsets Program'*, Report 305, AGPS, Canberra, November 1989, p. vi.

8.5 A significant recommendation in the Committee's Report was for an independent full scale assessment of the national significance of the offsets policy, in particular to identify and quantify all policy implementation costs and to assess the success or otherwise of the policy in meeting both its civil and defence objectives.[7] This recommendation was, however, rejected by DITAC because major changes were made to the Civil Offsets Program after the Industry Statement of March 1991.[8] A formal response to this recommendation as it relates to the Defence Offsets Program has not been received from the Department of Defence. The Department has, however, prepared two reports on *Barriers to Industry Participation in Defence Work*[9] and the *Australian Industry Involvement Survey*.[10] It commented that 'the surveys, on their own, do not provide sufficient information on which to base firm conclusions as to the impact of the Offsets Program on defence-related capabilities'.[11] While the Committee commends the Department for its efforts in conducting the surveys, it is felt that they do not provide an adequate response to the Committee's recommendation. The Committee therefore reiterates its previous recommendation.

8.6 **The Committee recommends that:**

- **the Department of Defence undertake a full scale assessment of the national significance of the Defence Offsets Program, in particular its success in meeting its objectives.**

Defence Offsets

8.7 Under the Defence Offsets Program, overseas suppliers of goods and services with a value exceeding $2.5m, are obliged to work with Australian industry to foster or maintain industry capabilities that support the priorities of the Australian Defence Force (ADF) and thereby increase Australia's defence self-

7. ibid., p. 93.
8. Australian Civil Offsets Program - Including Partnerships for Development. *Annual Report 1990-91*, p. 37.
9. Defence Industry Committee Report, *Barriers to Industry Participation in Defence Work*, 1991.
10. Department of Defence, Industry Policy and Operations Division, Industry Involvement and Offsets Section, *Report on the Results of an Industry Survey Undertaken to Determine the Benefits Flowing to Australian Industry as a Result of the Department of Defence's Australian Industry Involvement Program*, July 1991.
11. Evidence, p. S1789.

reliance.[12] The types of activities that are accepted as Defence Offsets include R & D, training, venture capital investment, joint or collaborative ventures, technology transfer, purchases of Australian made products, overseas marketing, provision of facilities and administrative expenses.[13] These offsets obligations are incurred against 30% of the imported content of single or accumulated contracts.[14]

8.8 The overall level of offsets activity within Defence is quite high. In 1989-90, contracts worth $3.9b were awarded by the Department of Defence, with new offsets obligations totalling $347m.[15] In 1990-91, new offsets obligations were significantly lower, amounting to $82.3m.[16]

8.9 Since 1986 when R & D was identified as a separate eligible offsets activity under the program, the level of R & D has been increasing.[17] In its submission of 22 July 1991, the Department of Defence claimed that approximately $19m, or 12.5% of offsets obligations, had been credited as R & D since 1 January 1986.[18] R & D offsets activity is encouraged where firms can 'provide technological workload which exercises or extends capabilities in Australia, which are significant in terms of support to the ADF and self-reliance'. Eligible R & D activities include basic research, applied research and experimental development. All research activities under the Defence Offsets Program to date have been contracted to Australian companies or commercial organisations attached to universities.[19] Under the Defence Offsets Program, additional credit is awarded where R & D is commercialised locally.[20]

8.10 The Committee believes that Defence Offsets provide an important contribution to R & D in Australia, even though the contributions are relatively small compared to those derived from civil offsets and the PDP. However, the Committee believes that more information should be available concerning the Defence Offsets Program, so that a better basis exists for assessing the efficacy of the Program.

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12. Department of Defence. *Annual Report 1990-91*, p. 99; evidence, p. 623.
13. Evidence, p. 623.
14. Industry Commission, op. cit., p. F8.
15. ibid.
16. Department of Defence. *Annual Report 1990-91*, p. 99.
17. Evidence, p. S1782.
18. Evidence, p. S1781.
19. Evidence, p. 623-24.
20. Evidence, p. 624.

8.11 In its Report 305, the Committee recognised this problem and recommended that:

> Annual report disclosure on matters pertaining to defence offsets be expanded to encompass relevant statistical data necessary to facilitate a meaningful assessment of the Program's status, achievements, problems and prospects.[21]

8.12 This recommendation was accepted by the Department;[22] however, it failed to publish the information in its 1990-91 Annual Report. In a submission to the Committee in July 1991, the Department advised that 'the amount of space in the Defence Report allocated to the Defence Offsets Program had to be consistent with the value of the program relative to all of the other programs which also form part of the $8000m annual Defence expenditure'.[23] The Committee believes that this response is not satisfactory as it ignores the need to disclose matters pertaining to the Offsets Program.

8.13 **The Committee recommends that:**

> **the Department of Defence produce a separate report containing details of the Defence Offsets Program, similar to that produced by the Department of Industry, Technology and Commerce on the Civil Offsets Program and the Partnerships for Development Program.**

Civil Offsets

8.14 The Australian Civil Offsets Program (ACOP) operated for over 20 years and was reviewed and modified on a number of occasions.[24] In January 1990, the program covered all Commonwealth civil procurement and State and Territory purchases of information technology products, plant and equipment, commercial vehicles, and power generation and distribution equipment. The objective of the program was to use 'the bargaining power of government procurement programs to assist Australian firms gain access to markets and technology that are available to the large overseas corporations supplying Australian governments'. Offsets

21. JCPA. *Review of the Finance Minute on Report 270 - 'Implementation of the Offsets Program'*, Report 305, AGPS, Canberra, November 1989, p. 85.
22. JCPA. *Finance Minutes*, Report 306, AGPS, Canberra, Dec 1990, p. 70.
23. Evidence, p. S1785.
24. Evidence, p. S1853.

obligations were incurred against 30% of the imported content of purchases which individually or collectively exceeded $2.5m. They could be met through R & D, exports, technology transfer and a range of other activities. In 1989-90, the aerospace and information technology sectors accounted for 71% and 17% respectively of offsets obligations.[25] Under the Program, additional incentives were provided to firms where offsets expenditure resulted in the commercialisation of R & D within Australia.[26]

The Achievements and Deficiencies of the Civil Offsets Program

8.15 Over the years, the ACOP has made valuable contributions to industry development and R & D in Australia. The aerospace and information technology industries have particularly benefited, with the program being described as 'the main industry development tool for the aerospace industry'.[27] In 1989-90, government procurement of $1.9b incurred offsets obligations of $372m and actual expenditure on R & D was $127m, which represented about 36% of total offsets expenditure in 1989-90.[28] In an appearance before the Committee, DITAC claimed that 'in relation to research and development there have been some very good things done ... under both the offsets policy and the partnerships policy'. The JTECH product by Canon was cited as an example of the outcome of offsets driven R & D involvement. In addition, DITAC also stated that 'at present for Australia there are a significant number of potentially very important R & D activities occurring'.[29]

8.16 A number of deficiencies were also identified with the program which may have reduced the effectiveness and impact of the program, including the benefits flowing to R & D. When discussing the effectiveness of the program, an officer from DITAC stated 'we would be silly to claim that the offsets policy is perfect. In many cases we would be silly to claim it has achieved its objectives'.[30] He went on to say that the offsets policy has forced a lot of uneconomic activity to take place and that the limited success of the program has been because 'we have not tried to tailor activity to suit the sort of corporate direction, corporate strategy, to place in the market the companies who have the offset obligations'.[31] Other deficiencies have been identified, including possible higher costs for government,[32]

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25. Industry Commission. *Annual Report 1990-91*, p. 143.
26. Industry Commission Report, National Procurement Development Program, Report 20, AGPS, Canberra, March 1992, p. F9.
27. Industry Commission. *Annual Report 1990-91*, p. 144.
28. Industry Commission Report, National Procurement Development Program, Report 20, AGPS, Canberra, March 1992, p. F9.
29. Evidence, p. 1134.
30. Evidence, p. 1133.
31. Evidence, p. 1140.
32. Industry Commission. *Annual Report 1990-91*, p. 144.

uneven effects on domestic industries, lack of transparency and flexibility, and difficulties in obtaining modern technologies from the firms.[33]

8.17 In addition, the Metal Trades Industry has criticised the ACOP for a lack of R & D culture:

> ... the offsets program generally has encouraged Australian industry to build to print, as we call it - to build products which some other country has designed. That has led to *other countries giving us last generation technology. It has* been possible in some areas to break out of that but it has been very difficult. Our industry has now reached a stage where it must really learn how to design and to create total products in Australia.[34]

The New Arrangements

8.18 On 12 March 1991, the Minister for Industry, Technology and Commerce announced that the Civil Offsets Program would be replaced with a number of more flexible, closely targeted programs. In a submission to the Inquiry, DITAC claimed that 'an across the board program like offsets lacked the flexibility and focus to contribute in the most effective way to the development and internationalisation of local industry'. The new programs, although having similar objectives to offsets, were expected to be less costly to administer and more effective in their industry development role.[35] No new offsets activities were undertaken after 30 June 1991.[36]

8.19 The new arrangements that were announced in the Building a Competitive Australia Statement included:

- changes to the Partnerships for Development Program for information technology;

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33. Paper prepared by EPAC, *High Technology Industries in Australia - An Overview*, September 91, p. 37.
34. Evidence, p. 888.
35. Australian Civil Offsets Program - Including Partnerships for Development. *Annual Report 1990-91*, p. 6; and S1853.
36. Evidence, p. S1853.

- replacement of civil offsets arrangements in the aerocomponent industry with longer-term strategic agreements that will provide Australian firms with access to risk sharing work on a free and fair competitive basis;

- offsets no longer appropriate for telecommunications; and

- withdrawal from offsets in the automotive area as aspects were incompatible with the Enhancement of the Export Facilitation Scheme.[37]

8.20 Before the Civil Offsets Program was replaced, it was described as 'the primary instrument by which Commonwealth and State Governments used purchasing power to contribute to industry development objectives'.[38] As a result of the above changes, however, the Government now has other better directed means of contributing to these objectives, and the purchasing base of the Offsets Program has effectively been reduced by over 95%. In addition, the corporatisation or privatisation of many major Government Business Enterprises has also reduced the purchasing base of the Program.[39] A further factor that contributed to the decline of the Offsets Program was the difficulties that it was expected to present in the context of Australia's possible accession to the GATT Government Procurement Code.

8.21 Although the Offsets Program was replaced in 1991, there was still a requirement for information technology companies to meet their remaining offsets obligations. However, in the Australian aerocomponents industry, the new arrangements absolved 'participating firms of all existing and future obligations under the civil offsets program'.[40]

Partnerships for Development Program

8.22 The Partnerships for Development Program (PDP) was introduced in 1987 as an alternative to the Civil Offsets Program for overseas information technology companies. The objectives of the PDP and related Fixed Term Agreements (FTA) program are to encourage overseas suppliers of information technology to expand their long-term commercial activities in Australia by

37. Department of Prime Minister and Cabinet, *Building a Competitive Australia*, AGPS, Canberra, March 1991, pp. 3.25-27, 5.46-47.
38. ibid.
39. Evidence, p. S1853.
40. Industry Commission. *Annual Report 1990-91*, p. 145.

undertaking strategic investments in R & D and export activity.[41] Through these programs, the Government aims to expand the opportunities for Australian firms.[42] The emphasis is on 'innovation, promoting activities such as research and development and the formation of strategic linkages among companies'.[43] Under both programs, R & D activities can be carried out directly within the subsidiaries' R & D centres or externally in collaboration with Australian firms and researchers.[44]

8.23 Under the PDP, partners present a seven year business plan for their activities which are integral to their regional and global business and involve significant value-added R & D and export activity. The program requires partners selling both software and hardware to agree that, by the seventh year, 5% of their annual local turnover will be spent on R & D. In addition, exports must be equivalent to 50% of imports for hardware companies, and 20% for software companies. At the end of the seven year agreement, companies are expected to at least maintain their level of R & D and export activity, but will incur no additional obligations.[45] Prior to March 1991, there was an additional requirement for all exports to have an average local content of 70%.[46]

8.24 In the past, concern was expressed that:

> ... under the arrangements that were in place prior to the industry statement, there was a very high degree of difficulty for all but half a dozen of the partners to meet their targets.

One of the reasons given for this was that in meeting the target for 70% local content for exports, it was 'virtually impossible for all but a few ... because we do not have a sufficiently competitive components industry here to start with'.[47] Another

41. Office of the Chief Scientist, Department of the Prime Minister and Cabinet, *Information Technology and Telecommunications: Looking to the Year 2000*, AGPS, May 1992, p. 31.
42. Evidence, p. 1071.
43. Evidence, p. S1417.
44. Evidence, p. S1418.
45. Department of Prime Minister and Cabinet, *Building a Competitive Australia*, AGPS, Canberra, March 1991, p. 5.47 and S1418.
46. DITAC. *Annual Report 1990-91*, p. 38.
47. Evidence, p. 1142.

reason given for the difficulties in meeting targets was that some companies were being asked to undertake activities that were inconsistent with their operations. For example:

> ... asking Hewlett Packard to spend 5 percent of its Australian turnover on R and D in this country, when its core business is contracting back to the original type of operations that it had, is not consistent with good business for them or good business for us.[48]

8.25 As a result of the difficulties identified, discussions were held with interested parties to determine the changes that were necessary to make the PDP more effective 'against the background of the type of activities that the partner companies were doing here and against an assessment of what the likely outcomes of some of those activities were'. It was agreed that changes to make the Program more flexible were required.[49]

8.26 Major changes to the Program were announced in March 1991 in the Building a Competitive Australia Statement. The objective of the new arrangements was to provide 'an improved means for the suppliers of information technology to the Government to demonstrate their commitment to local industry development'.[50] Under the new arrangements:

- the threshold value of annual sales at which firms are required to undertake industry development activities was raised from $2.5m to $10m;
- firms selling over $40m annually to government are required to join the Partnerships for Development Program and enter into an agreement with the Federal Government; and
- the PDP was broadened to provide recognition for activities consistent with the Information Industries Strategy, which were not previously recognised.[51]

48. ibid.
49. ibid.
50. Evidence, p. S1854.
51. Department of Prime Minister and Cabinet, *Building a Competitive Australia*, AGPS, Canberra, March 1991, pp. 3.25, 3.27, 5.46-47.

8.27 The expanded range of eligible activities under the Partnerships Program included:

- substantial initiatives in strategic infrastructure development (for example, manufacture of electronic components) which are expected to generate export activity and are identified as essential to Information Industries Strategy objectives;
- investment in approved venture capital funds where the funds are to be invested in manufacturing capability (to be counted as expenditure on R & D);
- initiatives which focus on the development of third party (indigenous) industry capability of world standard in important industry sectors;[52] and
- extension of time in some cases.[53]

8.28 The changes to the PDP also included the introduction of Fixed Term Agreements (FTA) with effect from 1 July 1991. The new arrangements apply to firms with annual public sector sales of information technology equipment between $10m and $40m per annum. The term of the arrangements is for three to five years and the program is intended as a transition to the Partnerships Program. The new arrangements operate in a similar way to the PDP, but are not as prescriptive and place less onus on a company to conduct R & D and export activities. In August 1992, the Compaq computer company was the first to sign an agreement with the Government.[54] Guidelines outlining the operations of the Program have been prepared and negotiations with other companies over their industry development proposals are currently proceeding.

The Impact of the Programs on Research and Development

8.29 The PDP Program has had considerable impact on the level of R & D since its introduction in 1987. Expenditure on R & D was $63m in 1987,[55] $60.7m in 1988 and $112m in 1989.[56] By 1990, R & D expenditure had increased to $202m, with 21 companies involved with the Program. Projections suggest that R & D

52. Department of Prime Minister and Cabinet, *Building a Competitive Australia*, AGPS, Canberra, March 1991, p. 5.47.
53. Evidence, p. 1143.
54. *Financial Review*, 17 August 1992, p. 38.
55. DITAC. *Annual Report 1990-91*, p. 38.
56. Evidence, p. S1419.

expenditure could increase to over $400m per annum by 1997, depending on market conditions.[57] In the past, initial projections made by companies have been reviewed downwards as a result of downturns in the information technology market. However, companies are now generally meeting their year-by year business targets. In total, these figures indicate that the PDP has provided substantial benefit to R & D in Australia.

8.30 On the other hand, Mr W K Hannaford from Codan believed that, although the scheme has achieved some success, there are still weaknesses. He claimed that the scheme was expected to 'lead to significant product development in Australia and substantial increases in export for local industries, neither of which have occurred'. He observed that the scheme provided no real incentives to help new Australian enterprises. Furthermore, it did not recognise that multinationals were self-interested, were in Australia to service local markets and were restricted in their export activities by their overseas headquarters.[58]

8.31 Some of the significant R & D activities that occurred during 1991-92 are listed below:

- Apple launched a $10m Apple Development Fund designed to stimulate information technology developments among Australian companies;
- Ericsson who operate the largest privately funded R & D centre in Australia, has been given world competence status for a range of products;
- Digital Equipment Corporation (DEC) is developing wide area networking technology at Bond University where it has established the Network and Communications Group; and
- On the 30 June 1992, DEC completed its partnership program, achieving exports in its final year of $110m and R & D of $25m.

57. Office of the Chief Scientist, Department of the Prime Minister and Cabinet, *Information Technology and Telecommunications: Looking to the Year 2000*, AGPS, May 1992, p. 31.
58. Evidence, p. S1753.

8.32 Over 200 Australian firms and research bodies have benefited from the PDP through their linkage with partnership companies. Benefits have included:

- achievement of stringent quality, design, delivery and price requirements demanded by the global market place;
- formation of strategic alliances with overseas organisations which results in cost-effective access to complementary skills in, for example, product development and marketing; and
- entry to the international supply network and the development of specialised products and services for particular markets.[59]

8.33 The Committee notes that, with the current emphasis on outsourcing by government agencies as described in paragraph 7.3, the bargaining strength provided by the volume of centralised public sector purchasing to require export and R & D obligations is diminished. The impact of the PDP can be expected to lessen as outsourcing is increasingly pursued.

Program Deficiencies

8.34 Under the PDP, firms have their annual reports audited at least every two years and their work programs reviewed annually by DITAC.[60] The results of the audit process for each partner are discussed with DITAC but, to maintain confidentiality, they are not individually reported in the PDP annual report.[61]

8.35 During the audit process, one of the requirements is for the auditors to measure performance against targets. In the conduct of their work in 1990-91, the auditors identified several weaknesses, for example:

- ... due to the differences in the individual practices of the Partners and differing internal management and financial reporting systems, both the form and the content of Annual Reports contain variations between Partners;

59. Evidence, p. S1419.
60. ibid.
61. Evidence, p. 1141.

- ... there continue to be significant variations in the quality and quantity of information prepared by the individual companies;

- ... there appears to be a reluctance by some Partners to divulge at any great length the activities conducted under partnership;[62]

- ... the majority of companies have difficulty in assessing whether or not certain bodies are Government related and have tended to understate obligations;[63]

- ... most Partners do not have systems which readily facilitate the extraction of information relating to sales to Government organisations ... [resulting in the] over or understatement of reported Government sales;[64] and

- ... [there has been a] failure to keep proper records ... particularly ... documentation to support assertions made when projects were first put forward for approval.[65]

8.36 It was also observed that there were inadequate systems for recording offset obligations, the existence of government sales, and the imported content of these sales. In addition, the auditors noted that there was confusion and/or misinterpretation of the program guidelines among participating firms. Examples were given of partners having difficulties determining imported content and whether a particular sale constituted a sale to government.[66] The auditors suggested that 'it would be beneficial to encourage partnership companies to provide comprehensive descriptions of activities conducted during a reporting year'. They also emphasised the need for companies to maintain good records.[67]

8.37 The Committee is concerned that the weaknesses identified by the auditors may reduce the effectiveness and impact of the Program. It considers that the performance of firms against their targets has not been adequately monitored. It also notes that inadequate information is publicly available about firms'

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62 Australian Civil Offsets Program - Including Partnerships for Development. *Annual Report 1990-91*, Audit Reports, p. 89.
63. ibid., p. 85.
64. ibid., 95.
65. ibid., p. 86.
66. ibid., pp. 85-95.
67. ibid., pp. 85, 89.

performances to allow assessment of the Program's success. Furthermore, no sanctions are applied against those firms that fail to meet their targets. The Committee believes that DITAC should give high priority to rectifying the weaknesses identified in the PDP.

8.38 As at November 1992, an evaluation of the PDP as a whole had not been undertaken; however, an internal departmental evaluation is planned for the second half of 1993.

8.39 **The Committee recommends that:**

- **the Department of Industry, Technology and Commerce expedite its evaluation of the Partnerships for Development Program;**
- **when evaluating the Program, the Department identify the success of the Program in meeting Program objectives and examine the Program's deficiencies, particularly the need for:**
  - **improved guidelines to make the requirements of the Program clearer to firms;**
  - **continued standardisation of reporting requirements for partners in order to improve the quality of information prepared by them; and**
  - **comprehensive descriptions of activities conducted during each year by participating firms.**

Chapter 9

OTHER PROGRAMS

Introduction

9.1 This chapter considers a number of programs that provide support to private sector investment in R & D but do not fall into any of the categories of support that have been covered in previous chapters. Some of these programs, like bounties, give assistance that is not targeted at R & D and its commercialisation but is provided as part of a wider system of support to particular industries. Other industry specific programs are those relating to the pharmaceutical and space industries. A feature of other programs considered here is their role in establishing linkages between innovating elements of the Australian community; these programs include Cooperative Research Centres (CRC) and Space Industry Development Centres (SIDC). The Committee also considers the effect on R & D of programs that were established with other primary objectives than support for R & D, for example, regulations and the setting of standards.

Regulation

9.2 The regulatory framework within which an industry operates can affect the environment within which R & D is be carried out. Regulations are primarily intended to protect workers, consumers or the environment and often act to disadvantage the progress of R & D by slowing it down. An example of the inhibiting effect of regulation is seen in the pharmaceutical industry which is discussed in more detail in paragraphs 9.18-9.25. As pointed out by the Australian Science and Technology Council, regulations often act to increase the cost of R & D and the uncertainty and risk attached to successfully commercialising it. Excessive administrative delays in granting approval have been highlighted as a major contributor to costs, while uncertainty arises from:

- complicated or ambiguous regulations;
- frequent changes of regulation or the failure to change them in a timely manner to match changing circumstances;

- unavailability of adequate information about existing regulations; and

- discrepancies between Federal and State regulations.[1]

9.3 A discussion paper on energy R & D, issued by the Department of Primary Industries and Energy, pointed out other respects in which regulation can hinder R & D:

> The use of regulatory powers to stimulate R&D and technical change is not, however, simple, always effective or at low cost. Regulation can lead to entrenchment of a technology that meets the standard set, to the detriment of R&D for new technologies that can exceed it. In general, performance-based regulation ... is superior to technology-based regulation in terms of their respective incentives on innovation. The establishment and policing of regulation can be a time consuming and costly exercise.[2]

9.4 The costs imposed by the regulatory environment are one of the factors that influence investment decisions by companies operating globally. An independent working group that reported to the Prime Minister's Science Council on the pharmaceutical industry stated that steps can be taken to minimise regulatory impediments to international trade. It suggested that:

> ... any regulatory requirements imposed on industry should be harmonised with international standards or practices and should not impose any undue cost burdens on local firms vis-a-vis our international competitors.[3]

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1. ASTEC. *Improving Australia's Competitiveness Through Industrial Research and Development*, AGPS, Canberra, September 1987, pp. 46-47.
2. DPIE. *Energy Research and Development: a Discussion Paper*, AGPS, Canberra, September 1992, p. 17.
3. Office of the Chief Scientist, Department of the Prime Minister and Cabinet. *Development of a Pharmaceutical Industry in Australia - the Challenge of Partnership*, a Paper Prepared by an Independent Working Group for Consideration by the Prime Minster's Science Council at its fifth meeting, 13 December 1991, AGPS, Canberra, 1991, p. 23.

9.5 In some cases, however, regulations stimulate R & D. For example, energy R & D can be promoted by:

- performance standards, such as fuel consumption targets and energy efficiency standards for buildings;
- design standards; and
- environmental standards that place limits on pollutant levels, in emissions for example.[4]

9.6 Under the Government's current policy to reduce regulatory legislation consistent with economic and social goals, the inhibiting influence of regulation on R & D might be expected to diminish. However, as the IC pointed out in its 1990-91 Annual Report, 'the rate of Commonwealth Government regulation making remains historically high'.[5] In part, this high level of activity reflects the implementation of reform measures. Other moves to reduce the impact of regulation include the introduction of uniform legislation by all States and Territories and mutual recognition among States of each others' regulations. Legislation to effect the mutual recognition of regulations is currently being considered by State and Commonwealth Parliaments.

9.7 The Committee supports the reduction in regulatory impediments for the beneficial effect it may have in stimulating R & D. The Committee notes that the Office of Regulation Review (ORR) provides advice to the Government and information to the public on matters relating to regulation, and urges bodies, when reviewing regulatory regimes, to consider the impact of regulation on R & D, as well as on other outcomes.

Standards

9 8 By promoting internationally acceptable standards, the Government can help to position Australian industry to enter overseas markets more easily. As pointed out in paragraph 7.4, the Government's requirement that IT acquisitions be manufactured to international standards is an example of this approach. In this area, DITAC liaises with a wide range of bodies that influence standards. Furthermore, where Australia is at the leading edge of developing technology, as

4. DPIE, op. cit., p. 17.
5. IC. *Annual Report 1990-91*, p. 157.

with solar collectors, 'there has been substantial effort in developing, in conjunction with other IEA [International Energy Agency] countries, international standard test procedures for rating collector performance'.[6]

9.9 A number of bodies, including the Commonwealth Government's National Standards Commission, support the setting and testing of standards. In the 1992-93 Budget, the Commission's funding was increased 'so that the necessary measurement infrastructure is available to support the development and expansion of high-technology industries and to provide confidence in the validity of measurements used in industry, commerce, international trade, health and safety, and the community'.[7] The Government also provides grants to two organisations concerned with the setting and maintenance of standards. They are:

- Standards Australia, which is the peak standards writing body in Australia; and
- the National Association of Testing Authorities, which assesses and accredits laboratories for testing purposes.

9.10 The Government has assisted the capacity of industry to manufacture to international quality and safety standards with the Vendor Qualification Scheme. The Scheme consists of three parts:

- an infrastructure program which identifies those international standards that should be attained as a matter of priority and facilitate the verification, within Australia, of products and processes to those standards by enhancing capabilities to test them to international compliance levels;
- a vendor development program which identifies those firms that will form the nucleus of the vendor base and then assists these firms to attain Qualified Vendor Status; and
- an awareness program which is designed to improve local industry's understanding of the requirements and benefits of international accreditation.

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6. DPIE, op. cit., p. 17.
7. The Hon R Free, MP, Minister for Science and Technology, *Science and Technology Statement 1992-93*, 1992-93 Budget Related Paper No. 6, AGPS, Canberra, 1992, p. 1.51.

9.11 The Scheme, which is to run until 1994, covers telecommunications equipment, computer hardware and software and electronics components. Firms accepted into the Scheme can apply for a 50% subsidy on approved costs incurred in achieving international standards. As at 30 June 1991, 37 firms had been accepted into the Scheme. The Scheme is delivered by the State branches of the NIES.

9.12 Further support for standard setting is provided by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ). JAS-ANZ was established in 1991 by a treaty level agreement between the two governments, and is governed by an intergovernmental committee representing industry, business and professional associations, standards setting organisations, certification bodies and government. One of its main objectives is to provide certificates of conformity which are recognised in international markets. As a high priority, it will establish recognition of its accreditation program by similar national bodies within our major trading nations. With international acceptance of test results from national bodies, the need for multiple testing and the attendant cost and delay will be eliminated and increased confidence provided to purchasers.

9.13 The Committee believes that the setting of standards plays a useful role in stimulating R & D and its commercialisation, and urges the Government to continue and strengthen its support for the setting of standards.

Bounties

9.14 Bounties encourage industrial activity, part of which, at least in the more research-dependent industries, may affect investment in R & D. Bounties are paid on a number of products, including computers, ships, steel products, books and metal working machine tools. The Committee notes that, even in a research intensive industry, such as the computer industry, it has proved difficult to establish a definite connection between the support provided by the bounty and the level of R & D performed.[8] In addition, as the BIE pointed out, where it is desired to assist firms in specific activities like R & D, it is more efficient to target subsidies to that activity than to provide a bounty.[9] The Committee also notes that most bounties are to be phased out or reviewed by 1995. For these reasons, bounties are not discussed further, except to comment on the award of a bounty for fermentation technology.

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8. BIE. *The Computer Bounty Scheme*, Program Evaluation Report 8, AGPS, Canberra, 1990, p. 56.
9. ibid., p. 37.

9.15 In March 1991, the Government announced a bounty on the production of citric acid from 1991-95. The decision to provide a bounty was based on the need to offset the high domestic price of sugar and facilitate 'the continued development and commercialisation of leading edge Australian fermentation technology'.[10] The funds provided for bounty payments are expected to total $7.27m, and the level of support provided will be depend on the success with which the technology is commercialised. The bounty is paid to only one firm.

9.16 The Committee notes that the Industry Commission was critical of the Government's decision to provide a bounty on the grounds that:

> ... paying a bounty on an uncompetitive product ... is an indirect way of supporting the technology. It is not clear that this approach will fulfil the Government's objectives as well as one which assisted the desired activity directly.[11]

The Commission also observed that the decision to pay a bounty was not based on a public review.

9.17 The Committee notes that, where bounties are paid on other products, a number of competing companies are advantaged by it. In the case of the citric acid bounty, only one company is likely to benefit from it, which is a situation at odds with one of the requirements that the Committee identified in paragraph 2.49 as necessary for successful innovation. The Committee believes that bounties should be available only in industries where a number of firms are operating and urges the Government to support only those industries in which competition exists.

Pharmaceutical Industry

9.18 In the Australian pharmaceutical industry, government policy under the Pharmaceutical Benefits Scheme ensures that the costs of drugs to the consumer is maintained at a low level. The profits that firms can realise is therefore restricted and impacts on the amount of R & D they are able to undertake. The 'Factor f' scheme was instituted to reduce the effect of this impediment to the pharmaceutical industry's development and so stimulate the development of an innovative, internationally competitive industry. Under the scheme, companies are permitted

10. *Building a Competitive Australia*, AGPS, Canberra, March 1991, p. 5.4.
11. IC. *Annual Report 1990-91*, p. 141.

price increases for a small number of their products in return for a significant commitment to research, product development and local manufacture, as well as import replacement and increasing exports.

9.19 In March 1992, Senator Button, Minister for Industry, Technology and Commerce, announced that the scheme would be extended, with some modifications, until 1999 and funding increased for it. Extending the scheme for this period of time would help to provide the industry with a more predictable, stable environment in which to operate and might be expected to contribute $2b in exports by 2000.

Evaluation

9.20 By June 1991, nine companies had joined the Program and, in the five years since its inception, a total of $860m of new Australian activity had been generated in the pharmaceutical industries. Expenditure on R & D by Australian companies increased from 2.9% of sales in 1987 to over 6.5% in 1990. Furthermore, the ten companies now involved with the Program intend to invest $375m in new manufacturing and research facilities.

9.21 In 1991, the BIE reviewed the current state of the pharmaceutical industry and the factors constraining its development. The review included an assessment of the effectiveness and efficiency of the Factor f scheme. The BIE concluded that Australia, with less than two per cent of the global drug market, a slow marketing approval system and low prices paid for drugs, is not generally perceived as an attractive location for pharmaceutical activity. This is true even though Australia has high quality medical services, skilled labour available and is close to expanding Asian markets. The BIE found a number of shortcomings in the scheme as it then operated and suggested ways of improving it.[12]

9.22 The pharmaceutical industry was also considered by a Working Party on the Commercial Development of Medical Research which reported in December 1991. The working party commented that it had:

> ... encountered a widespread belief that the process of commercializing medical research in Australia was fraught with

12 BIE. *The Pharmaceutical Industry: Impediments and Opportunities*, Program Evaluation Report 11, AGPS, Canberra, 1991.

bureaucratic delays, over-regulation and unnecessary legal complexities. A number of examples of the large degree of dubious regulation by Government (at all levels) was cited to the Committee.[13]

The Working Party recommended that a government task force, working with the Business Regulation Review Unit and the National Health and Medical Research Council, should examine 'ways of minimizing and simplifying the range of current regulatory controls affecting the commercialization of therapeutics and diagnostics'.[14] Such an examination would focus on the need to centralise controls, eliminate inconsistencies between States and meet regulatory requirements in overseas markets, and consider the means by which these needs could be met.

9.23 Regulation in the pharmaceutical industry was examined by the Drug Evaluation Review conducted in 1991 by Professor P Baume, with the aim of identifying, among other things, means of accelerating the process by which new drugs are brought onto the market. Professor Baume's recommendations have been accepted and implemented by the Government. They include:

- the timely availability of new drugs;
- the alignment of new drug information requirements with those of the European community; and
- strict processing time limits for new drug applications by the Therapeutic Drug Authority.

9.24 The Committee believes that a watching brief should be kept on barriers to the effective exploitation of Australia's expertise in medical research and any identified should be removed as a matter of urgency.

9.25 **The Committee recommends that:**

- **the Business Regulation Review Unit and the National Health and Medical Research Council consult on an ongoing basis with interested parties to identify**

13. Department of Health, Housing and Community Services. *Report of the Working Party on the Commercial Development of Medical Research*, December 1991, p. 19.
14. ibid., p. 20.

regulatory barriers to the commercialisation of medical research and recommend on ways of minimising them.

Space Industry

9.26 In 1986, the Government responded to the recommendations of a working party on a space policy and organisation for Australia by establishing the Australian Space Board. Since then the Board has developed the National Space Program and, in 1990, introduced a program to establish a small number of Space Industry Development Centres (SIDC). The Centres aim to develop commercially viable space related goods and services by building on existing R & D capabilities in universities and industry, encouraging industry and university collaboration in space related R & D, bringing new commercial participants, professional researchers and research institutes into the space sector, and providing a visible focus for space R & D activities in Australia. Most of the funding provided under the Board's National Space Program has been allocated to remote sensing, communications and launch services industries.

9.27 The Centres are jointly funded by research institutes and commercial enterprises, where the research institutes are responsible for research and the industry partners concentrate on product development and marketing. Government funding will include, for a maximum of five years, an annual allocation of $25,000 for administration and promotion and up to $500,000 a year for specific R & D projects. At the end of May 1992, four SIDCs had been approved but only one is operational.

Evaluation

9.28 An Expert Panel that reviewed the National Space Program in 1992 noted the view in the space community that the Program had played:

> ... a catalytic role in strengthening Australia's space industry. The Program was recognised as having established a degree of credibility and expertise in Australian industry ... However, it was also noted that by world standards the industry base remains small and narrow in its experience.[15]

15. *An Integrated National Space Program*, a Report by the Expert Panel, DITAC, Canberra, June 1992, p. 91.

It was also felt that there were deficiencies in the industry strategy on which the Program is based.

9.29 The Expert Panel also concluded that the SIDCs were 'well regarded by most with whom the Panel has had discussions'. The Panel itself had been 'favourably impressed by the concept of SIDCs'. The Panel cautioned, however, against spreading funds too thinly over the Centres when it would be 'better to have a small number of adequately funded centres, than to encourage a welter of underfunded ones'. The Panel recommended the establishment of an additional SIDC specialising in remote sensing applications.[16]

9.30 In May 1992, the BIE published an economic evaluation of the National Space Program, of which the SIDCs form one element. The BIE concluded that the National Space Program's industry development activities could have been provided equally well through:

> ... the range of horizontal or vertical industry assistance programs already in place. The BIE has therefore recommended that industry development objectives for the space sector be delivered through the existing range of industry assistance programs.[17]

9.31 In responding to this recommendation, the Expert Panel pointed out that such an approach to space funding would set Australia apart from the other countries of the world. Furthermore:

> Decentralising the funding makes a coordinated space policy something of a lottery, for each of the elements essential for the overall plan will be judged by different review bodies, each using criteria tailored to its own priorities; some may survive intact, some may be modified and others may sink without trace.[18]

9.32 The Expert Panel argued that the space industry is a special case, deserving of different treatment from other industries because of the need for national coordination of its development, and therefore requiring its own funds.

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16. ibid., pp. 48-49.
17. BIE. *An Economic Evaluation of the National Space Program*, Research Report 43, AGPS, Canberra, 1992, p. vii.
18. *An Integrated National Space Program*, a Report by the Expert Panel, DITAC, Canberra, June 1992, p. 35.

Assurance of a planned program extending over several years was seen as an essential basis for encouraging public and private sectors and foreign partners to participate in joint ventures.[19]

9.33 Three of the Expert Panel's findings were of particular concern to the Committee:

- its 'view that the present level of Government funding of the NSP was inadequate to combine with private sector investments to achieve the necessary critical mass';
- the possibility that the public sector was crowding out the private sector in the field of remote sensing; and
- the absence of full cooperation from all players involved in the space program.[20]

9.34 In the 1992-93 Budget, the Government reaffirmed its support for a space program, particularly in terms of its need for continued access to remote sensing data. It announced that the Minister for Industry, Technology and Commerce would be designated the Minister responsible for space, an Australian Space Council would be created and a five year strategic plan developed. However, the increase in funds for the Space Program that was announced in the 1992-93 Budget was small, compared with that recommended by the Expert Panel.

Cooperative Research Centres

9.35 CRCs are a major new initiative in the Commonwealth's support for R & D. The Program was announced in 1990:

- to support long-term, high quality scientific and technological research which contributes to national objectives, including economic and social development, the maintenance of a strong capability in basic research and the development of internationally competitive industry sectors;

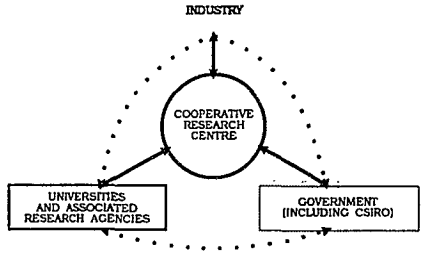
19. ibid., p. 35.
20. ibid., pp. xiv, 39, 53.

- to capture the benefits of research and strengthen the links between research and its commercial and other applications by the active involvement of the users of research in the work of the Centres;

- to build centres of research concentration by promoting cooperative research and, through it, a more efficient use of resources in the national research effort; and

- to stimulate education and training, particularly in graduate programs, through the active involvement of researchers from outside the higher education system in educational activities, and graduate students in major research programs.[21]

9.36 The model on which the Centres are based is illustrated below:



The Centres relocate and link outstanding researchers from universities, public sector research organisations and industry into integrated research teams with facilities concentrated in one location, preferably near university campuses. They focus on challenging research fields and areas which underpin existing or emerging industry sectors. Their work balances longer-term strategic research of a precompetitive nature with shorter-term, more practical research that lends itself directly to application or commercialisation.

9.37 Up to 50 Centres are to be established at an annual cost by 1995 of $100m at 1990-91 prices. They will be funded for five to seven years, after which time they will be reviewed. Two selection rounds have been completed and 34

21. The Hon R Free, MP, Minister for Science and Technology. *Science and Technology Statement 1992-93*, 1992-93 Budget Related Paper No. 6, AGPS, Canberra, 1992, p. 2.93.

Centres announced; a final round of selections is underway at present. The CRC Program is administered by the Department of the Prime Minister and Cabinet, overseen by an advisory committee which is appointed by the Prime Minister and chaired by the Chief Scientist. This committee is assisted by two expert advisory panels with expertise in a wide range of scientific and engineering disciplines.

Responses to the Program

9.38 There has been considerable interest in the CRC Program, in terms of the number of applications received by the Office of the Chief Scientist. The involvement by industry has, however, been less than some sections of the community had hoped for. As the Chief Executive of the Institution of Engineers commented to the Committee in October 1990:

> One disappointment to me so far is that some of the initial focus of the cooperative research centres seems to be on cooperation between research centres. That can help the research, but it will not help the research go anywhere unless it is cooperation between the research centres and industry.[22]

A member of the Metal Trades Industry Association (MTIA) also commented on the CRCs' emphasis on basic, precompetitive research. The MTIA believed that 'problems with safeguarding intellectual property in the cooperative research centre format have lead [*sic*] to applications ... concentrating on precompetitive aspects'[23]

9.39 Other evidence presented to the Committee suggested that the extent of industry participation might be in doubt. The Chief Executive of the Institution of Engineers, for example, pointed out that:

> ... in the introduction of those cooperative research centres great emphasis has to be placed on the industry interaction and the potential industry application. It may not be easy to always have industry forthcoming as an active partner because in many cases industry, which in Australia has a very limited research base of its own, might not readily see the benefits of working interactively.[24]

22. Evidence, p. 294.
23. Evidence, p. 881.
24. Evidence, pp. 285-86.

Yet, as Mr R Block pointed out in a private meeting with the Committee, CRCs must be industry driven if they are to be truly successful. The aerospace industry, for example, was strongly supportive of the concept of CRCs.

9.40 A member of the MTIA told the Committee that:

> We have joined with our major competitors, ASTA [Aerospace Science and Technology Australia] and several universities and the research laboratories, and have gained a CRC. We have perhaps been able to use it in ways that other organisations have not because of the strong industrial content of it. The initial programs of that will be manufacturing based programs. Also, just the involvement in that and in similar ones in the space industry has created a lot of synergy. We have found that, by joining with other companies, the rest of the world - particularly the space companies overseas ... - was very impressed by the fact that Australian companies were finally getting together and working together, working as one unit. That sort of thing has come about by getting together on CRC and SIDC submissions.[25]

9.41 By encouraging several industry and research groups to form CRCs, a greater chance exists of acquiring the critical mass needed for the most productive functioning of a research group, and of building strong interactive linkages between the cooperating groups.[26] The Task Force on the Commercialisation of Research, reviewing the role of CRCs in 1991, stated that:

> ... the Program has established strong and effective contacts between some of Australia's best research groups, firmly linking those groups to the users of research, whether these be in industry or government. Interaction will help all parties understand the constraints and meet the priorities of the others.[27]

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25. Evidence, p. 890.
26 Office of the Chief Scientist, Department of the Prime Minister and Cabinet. *Information Technology and Telecommunications Looking to the Year 2000*, a Paper Prepared by an Independent Working Group for Consideration by the Prime Minister's Science Council at its sixth meeting, 18 May 1992, AGPS, Canberra, 1992, p. 30.
27. DITAC. *Bringing the Market to Bear on Research*, Report of the Task Force on the Commercialisation of Research, AGPS, Canberra, November 1991, p. 27.

9.42 Greater emphasis has been placed on industry involvement in the selection of the final CRCs. While there was still a strong emphasis on high quality research, aspiring Centres were required to include the end users of research as key participants in the Centres' operation and present strategies for utilising or commercialising research results. The role of CRCs in contributing to the national objectives of developing internationally competitive industries was also stressed. As the Task Force on the Commercialisation of Research pointed out, the commitment of funds to a project by a company is a strong indication of the company's intentions to develop the research. The Task Force recommended that each Centre should have a 'minimum private sector funding level of 25 per cent of the total centre budget'.[28]

9.43 A target for industries' average contribution to the funding of CRCs was set by the Minister for Science and Technology, the Hon R Free, MP, at 25%. Industry commitments in the 73 applications made for the third selection round reached 18%, from which 33 were short listed. The 33 short listed applicants have promised 29% of the total investment in the proposed Centres. This compares with 17% in the second round and 11% in the first round. The Committee notes that a recent amendment to the taxation legislation allows industry to claim a 150% deduction on contributions to CRCs, which may have encouraged greater industry participation in the third round.

9.44 The Committee notes that CRCs have been operating in some OECD countries and the USA for some time and have proved very successful.[29] The Committee believes that a similar success should attach to the Australian CRCs. The Committee is concerned, however, by claims of potential problems with their operation. For example, in early 1992, a former CSIRO patent attorney pointed out that CSIRO's standard contract agreement for its participation in a CRC allowed it to vary or waive any condition that conflicts with CSIRO policy.[30] If such arrangements applied to all parties to a CRC, the chances of optimising the outcome of the CRC's work are likely to be diminished. As CSIRO is involved in many of the CRCs, the impact of this form of contract on CRC operations could be considerable.

9.45 The Committee is strongly in favour of moves to increase market-driven research and regards CRCs as a useful model for working towards this goal. The Committee will follow with interest the performance of the Centres and the reviews of their operations which are planned for a year before the termination of their current contracts.

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28. ibid., p. 28.
29. Evidence, p. 285.
30. *Science Technology*, January/February 1992, p. 4.

Chapter 10

CONCLUDING COMMENTS

Introduction

10.1 In this chapter, the Committee considers a number of points raised by its examination of individual programs in previous chapters and makes a number of general recommendations for their overall improvement. The Committee also discusses some of the more general issues relating to government support for R & D and the factors that influence its success.

Should Private Sector Research and Development Receive Government Support?

10.2 All the developed countries of the world and many of the developing ones provide support for the commercial exploitation of research. There is, however, a dearth of information about the effects and effectiveness of this support, although some indications of its impact were provided by a recently published survey. This survey suggested that:

- for every dollar of foregone tax revenue in the US, Canadian and Swedish tax credit schemes, firms' expenditure on R & D increased by 30c-40c;
- investment premiums for capital in the Netherlands had 'only a slight effect';
- in a German program that subsidised 25%-40% of the salaries of researchers in small and medium-sized firms, only 15% of the total program cost was expended on new research;
- to an extent that varies from scheme to scheme (20%-78%), grants have been given to projects that would have been undertaken without assistance; and

- in some cases, providing grants to firms stimulated investment in R & D while, in others, spending was depressed.[1]

10.3 The overall impression left by these studies is that, with most schemes, the greater proportion of the funding provided for R & D is in fact not used for R & D. When the funds are devoted to R & D, they are likely to go to support projects to which firms were already committed. The Committee notes, however, that it may be premature to draw a firm conclusion to this effect, given the small amount of research that has been done on the topic. Furthermore, a company may wish to retain a capability for R & D more for its use in assessing existing technologies than for carrying out original R & D. The Committee believes that more research is urgently needed to establish more precisely the value of public support for private sector R & D. The Committee returns to this point later in this chapter.

10.4 As it reviewed Australia's experience with the Commonwealth support of private sector investment in R & D, the Committee noted the difficulty of drawing firm conclusions about the extent of the stimulus provided by this support. In some cases, it is even questionable whether it is possible to do so in a cost-effective manner and with meaningful results. Several factors conspire to make a valid analysis difficult; they include:

- the time required to transform research into saleable product - if, typically, 10 to 15 years or more elapse before a profit is realised from a particular piece of research, the success or otherwise of that innovation will not be known for many years and the contribution of any assistance impossible to establish until then; and

- the number of factors affecting the outcome of attempts to innovate - so many variables influence the outcome of an attempt to commercialise research that it is difficult to pinpoint the relative contribution of each one.

10.5 The Committee believes that, when cost-benefit analyses of R & D support programs are carried out, their limitations should be fully acknowledged when the results of the analyses are interpreted. The Committee is concerned that, as in the case of the Industry Commission's report on the NPDP, this has not always happened. Although there are limitations to the uses to which evaluations of

1. Folster S. *The Art of Encouraging Invention: a New Approach to Government Innovation Policy*, The Industrial Institute for Economic and Social Research, Stockholm, 1991, pp. 31-38.

programs can be put, the Committee supports the process that has been put in place for assessing programs on a regular basis. Such assessments yield useful information about ways in which the programs can be modified to operate in a more appropriate, cost-effective and efficient manner.

Should the Assistance Provided be Targeted or Non-Directed?

10.6 As the Committee noted in paragraph 2.37, Australia appears to provide a larger proportion of its support for R & D by indirect means, by comparison with other countries for which information is available. The existence of this difference led the Committee to examine, within the limitations imposed by the lack of information on the subject, whether selective or non-selective schemes produce the better results.

10.7 Some information is available about the effectiveness of the 150% tax concession from a 1989 study by the BIE. The study found that a third of the growth in BERD over the period 1984-85 to 1986-87 could be attributed to the concession.[2] The Bureau is carrying out a further study of the effects of the concession and comparing the Australian scheme with comparable overseas schemes, which will extend understanding of the impact of such schemes. However, few of the other programs have been submitted to rigorous analysis.

10.8 Suggestive information has, nevertheless, been obtained from a survey of R & D managers in Swedish firms. The managers were asked to select a number of their own firms' R & D projects and indicate how the firms' decision to invest in these projects would have been affected by the availability of different types of subsidy. The nature of the subsidies were specified in exact economic terms. The effect was estimated for each type of support in terms of the ratio of R & D generated to the value of the support. The results, which are shown in Table 10.1, strongly suggest that selective self-financing support, where firms are required to repay subsidies, is the most effective in stimulating R & D.[3] Such results need confirmation by additional work, using a variety of methodologies and studying other countries, including Australia.

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2. BIE. *The 150% Tax Concession for Research and Development - Interim Report*, Program Evaluation Report 7, AGPS, Canberra, 1989, p. xv.
3. Folster, op. cit., pp. 38-40.

Table 10.1 **Ratio of R & D Generated by Subsidies to the Value of the Subsidies**

Type of Subsidy	Large Firms	Small Firms
General subsidies, such as tax deductions for R & D and grants towards personnel costs	0.16-0.19	0.07-0.08
Selective non-self-financing subsidies, such as project grants and loans at low interest rates or repayable only if the R & D is successful	0.40-0.47	0.52-0.64
Selective self-financing subsidies, such as fee-based loan guarantees, royalty grants (royalties paid to the state on sales from grant-supported inventions) and stock option grants (stock options offered to the state in return for grants)	0.48-0.72	0.47-0.92

Source: Folster S. *The Art of Encouraging Invention: a New Approach to Government Innovation Policy*, The Industrial Institute for Economic and Social Research, Stockholm, 1991, pp. 39-40.

10.9 Some of the factors that impact on the cost-effectiveness of R & D programs can be identified. Selective schemes are more expensive than non-selective schemes to administer. They also depend on the wisdom with which peer review groups and public servants choose among the applicants. As the IC pointed out in relation to the NPDP:

> A degree of subjectivity in the approval process is inevitable. Whatever the knowledge and experience of members of the NPDC [National Procurement Development Committee], they cannot be fully informed about the technology, finance circumstances and market prospects facing the wide variety of firms and products to which the NPDP may apply.[4]

10.10 A further consideration is the impact of targeted subsidies on the industries to which they are directed. Porter draws a gloomy picture:

> Subsidy is rarely associated with true competitive advantage. ... Subsidy delays adjustment and innovation rather than promoting it. ...
>
> Ongoing subsidies dull incentives and create an attitude of dependence. Government support makes it difficult to get industry to invest and take risk without it. Attention is focused on renewing subsidies rather than creating true competitive advantage. One subsidized industry propagates its noncompetitiveness to others. Once started, subsidy is difficult to stop. What is worse, subsidies to one ailing industry encourage others to seek them.[5]

10.11 Porter advocates the use of selective support if it covers only part of the cost and is used as 'signals of directions for appropriate corporate behaviour'. In other cases, non-directed support is more appropriate because it does not interfere with firms making decisions on the basis of estimated returns.

10.12 It is clear to the Committee that, in addition to needing to know more about the impact of government assistance on private sector R & D as discussed in paragraph 10.2, much more work is also required to understand the ways in which the Government can most effectively assist private sector R & D and its

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4. IC. *National Procurement Development Program*, Report No 20, AGPS, Canberra, March 1992, p. 59.
5. Porter M E. *The Competitive Advantage of Nations*, Macmillan, 1990, p. 640.

commercialisation. Increasing and using this knowledge demands that the process by which innovation occurs is recognised. The Committee believes that research, such as that being carried out by the BIE and some university departments, should be continued and extended.

10.13 **The Committee recommends that:**

> **the Government provide additional funds for research into the process of innovation, the effect of government assistance on private sector investment in innovative activities, and the efficacy of different forms of support for private sector investment in research and the development and commercialisation of this research.**

Current Programs

10.14 The current system for providing targeted assistance for innovation comprises a variety of programs, each of which focuses on a particular aspect of innovation. For example, precompetitive research is supported by programs such as the Generic Technology Grants Scheme, the National Industry Extension Service promotes management and marketing skills and the National Procurement Development Program seeks to link emerging government requirements with industries capable of developing appropriate solutions. The taxation measures, particularly the 150% tax concession for R & D, stimulate investment in innovative activities, while Austrade's programs assist firms to export and thereby help innovative companies attempting to penetrate overseas markets.

10.15 Various views have been expressed about the efficacy of the suite of programs available to support private sector R & D. The MTIA indicated to the Committee that it:

> ... strongly supports the current government programs for R and D assistance. A combination of broadly based support through the 150 per cent tax concession, with targeted support through the grants for industry research and development scheme, ensures the best possible coverage across industry sectors. The more recent introduction of the

national procurement development program, to promote the development and use of locally produced goods by government bodies, complements these arrangements.[6]

On the other hand, an independent working group on manufacturing technology commented that 'many of the infrastructural building blocks have been put in place but the overall structure is incomplete, leading to low visibility in the marketplace'.[7] The working group made a number of recommendations for improving the production of high value-added goods in Australia.

10.16 The Committee believes that, on the whole, the range of programs provided by the Government cover the various aspects of bringing commercialisable research to the global market place. The two areas where problems have been experienced with the Government's programs relate to assistance with the provision of development capital, as discussed in Chapter 3, and the linkage of government purchasing with innovation through the National Procurement Development Program, which is covered in Chapter 7. The problems identified with various programs suggest the need to pay continuing attention to reforming and fine tuning them. Furthermore, the Committee acknowledges that gaps may exist in the support needed by particular industries and welcomes the guidance provided to the Government by the reports of various working groups that have dealt with these industries.

What Criteria Should be Employed When Targeting Assistance?

10.17 Two areas appear to recommend themselves for support. Professor D Samson suggested to the Committee that they are the established industries with a natural competitive advantage, such as mineral and rural resources, and industries and product and market segments in which there was a chance of success.[8] Assessing whether there is a chance of success for particular products depends on judging the future development of global markets, the quality of the research and the existence of firms able to exploit it in terms of experience, size, and access to markets and capital. In May 1992, the Government decided to extend the role of the IC to investigating opportunities for growth and employment in specified industries where Australia ought to have a comparative advantage, and to expose and analyse

6. Evidence, p. 878.
7. Office of the Chief Scientist, Department of the Prime Minister and Cabinet. *The Changing Role of Manufacturing Technology*, a Paper Prepared by an Independent Working Group for Consideration by the Prime Minister's Science Council at its Sixth Meeting, 18 May 1992, AGPS, Canberra, May 1992, p. 7.
8. Evidence, pp. 501, 505.

impediments to the growth of those industries. The first areas to be examined by the IC under this new approach cover manufacturing, services, high technology and value adding in environmental waste management equipment and systems, further transformation of metals, meat processing, new materials and alloys, fibre processing, medical and scientific equipment, biological technology including genetic patenting, telecommunications equipment and uniquely Australian products, such as horticulture. The Committee welcomes the guidance that the IC's studies of these industries will provide.

10.18 A further criterion to consider in targeting assistance is the stage in the process of innovation at which a firm or industry has least capability or faces the greatest impediments. The Government has responded here in providing programs that address different stages in the commercialisation of R & D, and the IRDB is moving to a more flexible system of providing assistance to firms. Another point that deserves consideration is the generally superior creative capacity of small firms, which tend to face greater difficulties in taking their R & D to the market place than larger companies. Special measures may be appropriate for smaller firms. The Committee notes and commends the efforts that are now being directed towards small and medium-sized firms.

10.19 **The Committee recommends that:**

- **agencies, which provide grants for research and its development and commercialisation, continue to concentrate support for areas in which Australia has a competitive advantage, and tailor the assistance provided to the particular needs of industries and firms.**

Is Sufficient Assistance Being Provided?

10.20 International comparisons are often used as a basis for judging the adequacy with which governments promote particular actions. In the case of support for private sector R & D, however, comparisons are difficult because comparable data are not available for many countries.

10.21 The IRDB argued for an increase in the funds available for it to disburse as grants over a guaranteed period of time on the grounds that:

- the current level of funding is inadequate in relation to the number of applications of high quality made for support;

- the growing recognition by the business community of the successes resulting from innovation needs to be sustained and further developed; and

- 'increases in grants to a stable high level for the rest of the 1990s would signal to industry that it has certainty of support to grow the most promising innovative businesses'.[9]

The Committee notes that the IRDB's funds were increased in the 1992-93 Budget. It welcomes the Government's action in this respect and urges the Government to *continue to increase the IRDB's budget.*

10.22 As noted in paragraph 4.22, the term of some grants has been criticised as being too short by comparison with the time needed to take research results through the various stages up to their eventual commercialisation. In their report on innovation in Australia, Pappas Carter Evans and Koop observed that:

> ... defending international competitiveness is a continuous race without a finishing line. Ongoing innovation effort within a company is necessary because the probability of success increases with experience. Therefore continuous government support may be required.[10]

10.23 While accepting that a three year grant may be too short to lead to the completion of any particular phase of an innovation, the Committee considers that there is no compulsion on the part of grant-giving bodies to cover the full cost of any particular operation, provided the firm is able to contribute the remainder of the cost.

Is Assistance Being Provided as Efficiently as Possible?

Do Firms that Could Benefit from Assistance Know of its Availability?

10.24 The Committee notes, from the evidence it received in 1989-91, that the various grants schemes may not be known to all those that could benefit from

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9. IRDB. *IRDB Position Paper*, submitted to the Interdepartmental Committee Preparing the Science and Technology White Paper, 8 April 1992, p. 9.
10. Pappas Carter Evans and Koop. *Innovation in Australia*, a Report for the IRDB, AGPS, Canberra, July 1991, p. 26.

them. Furthermore, some of those that did know of them are uncertain about the differences between the schemes and the most appropriate choice among the schemes for their firms' needs. This point has been reiterated more recently by an independent working group on manufacturing technology: 'the proliferation of schemes and services has resulted in a lack of overall coordination and focus which lead to marketplace confusion and an under-utilisation of available resources'.[11] It is clear that information about the support available should to be disseminated more widely and steps should be taken to reduce the apparent complexity due to the number of existing schemes.

10.25 The Committee notes that, while most grants for private sector innovation are administered by the Industry, Technology and Commerce portfolio, others are the responsibilities of the Australian Research Council in the Employment, Education and Training portfolio and of the National Health and Medical Research Council in the Health, Housing and Community Services portfolio. The taxation concession is administered jointly by the Australian Taxation Office and the IRDB. The Committee considers that, just as there is confusion and a lack of awareness about the variety of assistance provided by DITAC and the IRDB, that may also be true across all the schemes operated by different agencies. The Committee believes that a central compilation of information about support for R & D and its commercialisation is needed and should be widely publicised as a first point of contact for firms seeking assistance.

10.26 At present, the most comprehensive information available is contained in the *Scitech Technology Directory*, which is published annually by Scitech Publications Pty Ltd at a cost of $135.[12] No central government record of its programs exists. The Committee notes that the NIES has employed a consultant to 'provide and maintain a database of Commonwealth and State supported industry assistance programs to be used by the State/Territory NIES offices in providing quick and accurate information to NIES clients'.[13] The Committee commends the NIES on this initiative and considers that it could form a useful basis on which a more comprehensive database could be built.

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11. Office of the Chief Scientist, Department of the Prime Minister and Cabinet, loc. cit.
12. Ford J and Harman D. *Scitech Technology Directory: a Comprehensive Guide to Technology and Industry Development Assistance in Australia*, Scitech Publications Pty Ltd, Canberra, 1992.
13. Australian Senate. *Estimates Committee A: Additional Information Received*, Vol. 5, November 1992, p. 92.

10.27 **The Committee recommends that:**

- **agencies providing support for research and its development and commercialisation give priority to producing a single compendium of information about all available forms of support.**

10.28 The IRDB, which is responsible for the administration of several programs, has taken steps to simplify the granting process. Members of the Board told the Committee at an informal briefing that, within the constraints of the legislation under which the Board operates, it will establish a one-stop shop to which applications are sent. Rather than the individual firm having to decide for which type of grant it should apply, the IRDB will determine the most appropriate one for each application. Ultimately, the Board is considering awarding grants by industry, with the criteria attached to each industry's grants being related to industry policy. The proposed changes to the method of providing grants will be aided by the one line allocation of funds to the Board in the 1992-93 Budget. The Committee welcomes the Board's move to simplify the process of applying for its grants and to tie it closely to industry policy. A similar approach might be suitable to other grant-giving bodies.

10.29 With responsibility for assisting R & D and its commercialisation shared between several agencies, it is important that there is extensive communication between them and coordination of their programs where appropriate. As noted in paragraph 4.41, a member of the IRDB sits on the MRC and provides a cross portfolio view of industry support and development. The Committee regards this as a valuable arrangement.

10.30 The need to monitor and coordinate the operation of the existing range of programs is also underlined by the instances that were brought to the Committee's attention of potential or actual overlap between programs. Examples of these were the National Teaching Company Scheme and the Postgraduate Awards (Industry), and NIES and other Commonwealth and State measures for assisting enterprises.[14] In commenting on this issue in its evaluation of the NIES, Price Waterhouse suggested that the NIES should allocate only moderate levels of resources to rationalising and coordinating government programs for industry because of the 'obvious difficulties inherent in removing overlaps and the State/Federal issues that are sometimes involved'.[15]

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14. See paragraphs 4.32 and 6.23.
15. Price Waterhouse, *An Evaluation of the National Industry Extension Service (NIES)*, Vol. 1, Canberra, April 1992, p. 14.

10.31 While it may be difficult for individual agencies to deal with overlaps between their and other agencies' programs, the Committee considers that it is essential that overlaps are as small as possible. Furthermore, the Committee believes that, when the establishment of new programs is being considered by departments, they should make every effort to establish whether there are already existing programs which could be modified for particular sectoral interests, rather than setting up separate programs.

10.32 **The Committee recommends that:**

- **a review body be established by the agencies that provide support for research and its development and commercialisation to ensure on an ongoing basis that:**
  - **overlap between programs is minimised;**
  - **any gaps in the support provided are identified and rectified; and**
  - **information flows readily from agency to agency.**

Multiple Assistance

10.33 In its report on the NPDP, the Industry Commission drew attention to the possibility of firms receiving assistance from multiple sources:

> For example, a manufacturer of computers could undertake a project and receive assistance from the 150 per cent tax concession, the NPDP, the National Industry Extension Service (NIES), Partnerships for Development Program and the Export Market Development Grants Scheme.[16]

10.34 Surveys by both the Industry Commission and the IRDB showed that up to 75% of the firms surveyed had indeed benefited from more than one form of

16. IC. *National Procurement Development Program*, Report No. 20, AGPS, Canberra, March 1992, p. 35.

assistance, as they progressed from research to commercialisation and applied for grants focused on different stages of the process. The Industry Commission suggested that:

> Possibilities for gaining assistance under a number of programs creates an incentive for firms to concentrate on developing products that can qualify repeatedly, rather than focusing on cost-effective ways of developing goods and services that consumers want.
>
> With the current multiplicity of schemes to assist the various stages of production, there is a risk that comparatively small sections of Australian industry enjoy effective assistance well above the levels indicated by a more general sectoral analysis.[17]

10.35 The Commission pointed out that, at present, there is no publicly available, centralised record of the assistance given to individual firms. The information about support for firms is held by a number of agencies and is sometimes difficult to obtain. The Commission commented that:

> As a result, assistance to the early stages of project[s] (eg the CSIRO) is not readily associated with assistance provided at later stages of R&D or commercialisation (eg GIRD, 150 per cent tax concession, NPDP, export assistance). Such a record of public support for firms is necessary to increase transparency and community scrutiny of the extent and *frequency of assistance.*[18]

10.36 The Committee concurs with the Industry Commission's view and notes that, in its mail survey for its study of the 150% tax concession, the BIE is collecting information about the multiple use of government assistance for R & D The Committee urges the agencies responsible for the administration of programs supporting R & D to investigate the feasibility of cooperating to maintain a centralised, public record of the assistance provided to individual firms.

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17. ibid., pp. 37-38.
18. ibid., p. 38.

10.37 **The Committee recommends that:**

- **agencies that provide support for research and its development and commercialisation give high priority to establishing and maintaining a centralised record of the assistance provided to individual firms.**

Lack of Feedback to Unsuccessful Applicants for Support

10.38 Criticism was directed at the IRDB by unsuccessful applicants seeking support. They claimed that they were not adequately debriefed about the reasons for their failure to obtain grants. Given that the preparation of grant applications is time consuming, it is important that the opportunity is provided to applicants to learn from their failures so that their next applications are put together better or they have better information on which to decide whether further applications should be attempted.

10.39 **The Committee recommends that:**

- **agencies providing assistance for research and its development and commercialisation provide reasons for their lack of success to failed applicants.**

Assessing Programs Against Desirable Attributes

10.40 In paragraph 2.49, the Committee indicated the characteristics which it considered government programs supporting private sector investment in R & D should possess if they are to have maximum effect. On three of these characteristics, the Committee has insufficient information to form an opinion. The Committee asked:

- do the programs concentrate on support for innovation that is market driven?
- do the programs support innovation in industries subject to stiff competition?
- are the programs well matched to the Australian industrial environment?

On these important points, the Committee lacks information. It believes, however, that they require consideration.

10.41 The Committee notes that the BIE is currently investigating the contribution of the 150% tax concession on the performance of R & D in Australia and comparing it with similar schemes overseas. Furthermore, the IC expects to review the IRDB's suite of programs in 1994. The Committee believes that all existing schemes that support private sector R & D should be examined critically and in more depth than the Committee has been able to. The Committee regards the BIE as an appropriate body to carry out such an assessment, and therefore recommends that the BIE comment on the effectiveness of the range of targeted assistance available to firms.

10.42 **The Committee recommends that:**

- **the Bureau of Industry Economics examine the programs that provide firms with targeted assistance for research, development and commercialisation with a view to:**
  - **assessing the extent to which the programs support the company and industry attributes needed for successful international commercialisation of research;**
  - **establishing how effective the programs have been in bringing products onto the domestic and overseas markets; and**
  - **indicating any changes that should be made to the Government's suite of programs to improve their performance.**

10.43 Among the other characteristics nominated by the Committee as important for successful innovation were the formation of linkages of all kinds and educating business in better ways of operating. The Committee considers these two topics in more detail in later sections of this chapter.

10.44 IRDB members pointed out to the Committee, in relation to the Board's approach to awarding grants, that the emphasis it adopted had altered over the years as more understanding had been gained of the process of innovation and the impediments to commercialising research in Australia.[19] The Board has sought more recently to target the part of the commercialisation process that it sees as being the weakest link in the chain. In taking this approach, the Board lays itself open to criticism by grant applicants for the confusion that they experience when the criteria used for selecting awardees appear to have changed. In its review of the NPDP, the IC was also critical of the Board, claiming that the Board had abandoned the original, specified intent of the Program. The Board responded that 'these incremental changes have not, however, diverted the IR&D Board from the Ministerial Directions setting out the objectives of NPDP. Rather, they are measures adopted to improve its effectiveness'.[20]

10.45 The Committee concludes that there is a need for a clearer definition of the IRDB's mission and the criteria by which its various programs operate. If the role and functions of the Board were more clearly specified, the direction that the Board should pursue would be better understood by both the Board and the public and the confusion that at present exists would be reduced. The Committee considers that the redefinition of the IRDB's mission and the criteria on which its programs are based should take into account:

- the Board's experience of providing support for the commercialisation of R & D;
- advice from the BIE about the relative effectiveness of different forms of support for the commercialisation of research; and
- a review of the IRDB's operations.

10.46 From its review of the evidence before it, the Committee has formed the view that the Board's current emphasis on the later stages of the commercialisation process is essential. The Committee also believes that the Board

19. Evidence, pp. 1265-66.
20. House of Representatives Standing Committee on Industry, Science and Technology. Inquiry into Government Purchasing Policies and Promotion of Australian Made Goods and Services, Exhibit No 22, p. 6.

should have the flexibility to target the stage of commercialisation it judges to be most in need of support and to assist in the process of building appropriate linkages for Australian firms wherever possible.

10.47 **The Committee recommends that:**

- **a review be carried out of the role and operation of the Industry Research and Development Board, with a view to recommending how it might play a more central and effective role in the commercialisation of Australian research; and**
- **the mission of the Board and the objectives of its programs be revised and very clearly specified.**

Linkages

10.48 The importance of linkages in stimulating R & D and its commercialisation is now well accepted. The AIRG pointed out to the Committee that:

> ... to make industrial development ... happen, to encourage it and to make it grow, you need a number of elements, all linking together. ... You need, in effect, a cluster-type arrangement, not necessarily on the same site, but all linking in with each other - the universities, the research units, leading edge customers, enterprises, skilled work force and various infrastructure arrangements.[21]

10.49 Linkages may be on an individual level, within industries as exemplified by industry clusters and associations, and through networks of unrelated companies. The availability of research fellowships for graduates and researchers to work in industry in Australia and overseas recognises the importance of interaction at an individual level and the value of demonstrating this to industry. On an industry level, as Pappas Carter Evans and Koop pointed out, the ideal structure for an innovative industry is one in which companies and their suppliers are in fierce competition with one another to supply large, experienced exporters and leading edge, preferably locally controlled, customers. However, Australia has few, if any, clusters that possess all of these characteristics; the mining industry comes

21. Evidence, p. 579.

closer to the ideal than any other. Various schemes serve to stimulate linkages that will expand the operational abilities of Australian companies; many of these schemes depend on 'networking'.

Networking

10.50 The term, networking, is used to describe cooperation and collaboration between firms which allows them access to resources which would be beyond their individual means. Networks typically involve such activities as the bulk purchasing of supplies, joint production, and the sharing of training facilities, research and marketing information. Successful networking depends on the trust and reputation of the network partners, and represents an informal adjunct to more formal market and intra-firm arrangements.

10.51 In its study of networks, the BIE distinguished primary networks, that focus on close-to-market activities like production and marketing, from support networks that cover activities like training, research and purchasing. The latter may be firm-based; industry-based and involve business, industry and professional associations; or government-based and include provision for information exchange between industry and the Government.[22] There are already several effective networks of these types in existence in Australia. The minerals industry research association, AMIRA, which undertakes precompetitive research on behalf of member companies, is an example of an industry-based network. More broadly based networks are provided by bodies such as the Confederation of Australian Industry and the Australian Chamber of Manufacturers. Government-based networks have also been established which:

- allow for consultation with industry, for example, through the Australian Manufacturing Council and the National Small Business Forum;
- promote links between publicly supported research and industry, as in the Cooperative Research Centres; and,
- with the NIES and Austrade, assist the development of business skills and export markets respectively, especially for small and medium-sized businesses.

22. BIE. *Networks: a Third Form of Organisation*, Discussion Paper No. 14, AGPS, Canberra, 1991, p. 21.

10.52 In 1991-92, the NIES supported 17 networks involving 574 firms that did not have the critical mass to export by themselves. The scheme provided limited funding to assist with search conferences, strategic and business planning, including market identification and facilitation. In the same financial year, 22 networking proposals were refused. Austrade has established 12 networks of companies and industries with strong export potential. An evaluation of existing networks by NIES in 1992 found that successful networks are those which have clear objectives and strategic and business plans, and are formed at the initiative of the member firms and owned and controlled by them.[23] Network formation is also greatly assisted by neutral facilitators and the backing of industry associations.

10.53 However, as the Task Force on the Commercialisation of Research pointed out:

> While networking arrangements allow firms to reduce effort in undertaking certain activities, spread risk and undertake other activities which are beyond the reach of individual firms, this does not guarantee their formation. Firms may not be aware of the benefits of networking, particularly when they have no prior experience and are uncertain about the likely benefits relative to the costs of collaboration. Network establishment is also a difficult and time consuming process.[24]

10.54 The Task Force suggested that:

> ... networks need to be formed on a much more substantial basis than is currently the case if small companies are to achieve the critical mass necessary for effective production and marketing, particularly in relation to exporting.[25]

23. NIES. *Enterprise Network Pilot Program*, Report to the NIES Advisory Board Sub-Committee on Networking, May 1992, p. 19.
24. DITAC. *Bringing the Market to Bear on Research*, Report of the Task Force on the Commercialisation of Research, AGPS, Canberra, November 1991, p. 11.
25. ibid., p. 11.

10.55 On this basis, the Task Force recommended:

- increased funding for demonstration networks specifically focused on market access impediments and for brokerage for these networks;
- encouragement to industry to create research, development and innovation groups based on existing successful models; and
- the provision of export finance only to companies participating in networks.

10.56 The BIE's analysis of the use of networks in stimulating innovation also suggested a need for governments to support cooperative activities within industries. In addition, the BIE identified support for the acquisition of information on barriers to the development of networks and on the opportunities provided by networks as another area for government action.[26]

10.57 The evaluation of networks for the NIES identified a continuing role for the NIES in networking in relation to providing catalytic funding, information, national coordination and other program support. It supported the need for continued demonstration of the advantages of networking, a training program for network brokers and coordination between the agencies with networking programs. It suggested that 'the NIES enterprise network group could help by arranging low-key interdepartmental contact to facilitate exchanges of information on the various enterprise development programs available to networking firms'.[27]

10.58 The Committee considers that support for networks is critical to improved economic performance by Australian firms and believes that more emphasis should be given to them. Additional funds are required if more networks are to be established, information about them disseminated and network facilitators trained.

26. BIE, op. cit., p. 42.
27. NIES, op. cit., p. 22.

10.59 **The Committee recommends that:**

- **increased funding be provided for networking so that the number of networks supported can be increased, training of network facilitators pursued and information disseminated about networks.**

Other Arrangements

10.60 The ability to form useful linkages depends on knowing where to look for potential links and this requires that information be available. Networks clearly play a role in contributing to the information flow. In addition to the networks discussed already, DITAC's Australian Industry, Science and Technology Counsellor Overseas Network and Austrade's activities in bringing market information to Australian businesses assist in making and developing contacts Furthermore, the Australian Technology Group (ATG) is charged with forging contacts between public sector research organisations and the market, and a proposal has been made by the IRDB that it operate a brokerage program that would complement the ATG's by having:

> ... a market driven approach that would see the Board assisting in the building of inter-firm arrangements including sectoral networks and strategic alliances ... It would involve the identification of major private sector research users and the targeting of Board programs to strengthen their links with both private and public sector research providers.[28]

10.61 The Committee commends these developments and considers that they should be extended. The Committee believes, for example, that one of the most important contributions that the Australian Technology Group could make would be in helping to form alliances and putting Australian companies in touch with other brokers that might assist them.

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28. IRDB. *IR&D Board Submission to IDC Preparing S&T White Paper*, 9 April 1992, p. 10.

10.62 **The Committee recommends that:**

- **the Australian Technology Group concentrate its activities on forging alliances and building networks for Australian researchers, companies and industries.**

Changing the Culture

10.63 This Report covers the need for the education and training of managers and exporters and the programs that assist them to gain the necessary expertise through formal courses, extension services, demonstration projects and learning by doing. It also calls for better understanding of the process by which innovation occurs and dissemination of that knowledge. These moves stimulate a change in the attitudes of industry and the community at large to their role in contributing to their own and Australia's future economic prosperity. Such changes are essential but can be expected to take some time.

10.64 From its examination of the information brought to its attention, the Committee considers that there are other moves that might be made to signal the need for different attitudes if the nation's innovative success is to grow. One such move would be to accord a higher status to engineering and, through a national technology policy, emphasise the contribution that technology plays in developing and commercialising research. The Committee notes the calls that have been made by, among others, the Institution of Engineers, Australia for a national technology policy and a more rigorous and focused effort in engineering research and development.[29] The Committee is supportive of these developments.

10.65 *The Committee recommends that:*

- **the Government increase the role played by organisations representing engineers and technologists in providing advice to the Government and assisting in framing policy relating to innovation.**

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29. The Institution of Engineers, Australia and Australian Academy of Technological Sciences and Engineering. *A Discussion Paper on a National Technology Policy*, December 1991; Institution of Engineers, Australia. *Engineering Research and Development in Australia: Priorities and Future Directions*, February 1992.

10.66 Also needed is a greater readiness on the part of investors to take risks and accept a longer time frame for returns in the interest of establishing a more effective national economy. The tendency to look for a quick return on investment is characteristic of Australian markets and not conducive to their supporting innovation. In a private meeting with the Committee, Mr R Block suggested that 'exaggerated praise' should be given to those leading change in the community. Such praise should go to individuals and organisations that support innovation. The Committee notes that, through the Australia Prize, scientists receive recognition for their work in R & D, and considers that it would be appropriate to recognise in a similar manner those who make a sustained effort to commercialise R & D, whether by investing in it or building particularly effective means of marketing.

10.67 **The Committee recommends that:**

- **the Government institute a system of public reward for individuals and organisations that contribute in an outstanding manner to promoting Australia's success in commercialising its research and development.**

10.68 Another means of signalling directions for industries and the nation is to set goals for output, for example, export volume and value, which would indicate to firms and industries what is expected of them and provide an additional incentive to achieve superior performance. The AIRG pointed out to the Committee that 'Australia needs an overall objective, say [to] increase exports by 5% per annum for the next ten years'.[30] If such a goal as this was accepted, plans could be made to achieve it, based on widespread consultation between industry and the Government, and incentives could be designed to encourage the achievement of planned targets.

10.69 To set goals, however, requires a good knowledge of the industrial scene and a clear notion of what is needed. According to members of the IRDB:

> ... we have to think about philosophy; we have to start to talk about what is out there; what are the markets; what are the opportunities; what are the growths; what is the strategy?
>
> We really do not have a fundamental philosophy on which we can base something. ... that is the big deficiency.

30. Evidence, p. 565.

> All [the] elements are there but there are no really holistic views and we do not seem to be able to find a way to develop them.
>
> ... DITAC [should] lay out what Australian industry is. Who are the players? What is the structure? Let them make it very clear and understandable ... The first place is to define where you are and once you do that, you can think about where you are going to go.[31]

10.70 In earlier sections of this chapter, the Committee has advocated applying greater resources to understanding the process of innovation and the best means of supporting it. The Committee believes that, on this basis, the Government should consider setting goals for improving national production and export of value-added goods and services.

10.71 **The Committee recommends that:**

> **the Government consult widely with all sections of the community to establish concrete targets for increased production and exports of value-added goods and services.**

Hon G F Punch, MP
Chairman
16 December 1992

31. Evidence, pp. 1282-83.

SUBMISSIONS RECEIVED

Listed below are organisations and individuals that provided the Committee with submissions to the Inquiry. Some departments and agencies made more than one submission to the Inquiry.

Organisations

Agricultural Research Development Education and Planning
Attorney-General's Department
Australian Academy of Science
Australian Bureau of Agricultural and Resource Economics
Australian Consumers' Association (joint submission with the Australian Federation of Consumer Organisations)
Australian Federation of Consumer Organisations Inc.
Australian Government Analytical Laboratories
Australian Industrial Research Group
Australian Institute of Aboriginal Studies
Australian Institute of Health
Australian Institute of Marine Science
Australian Medical Devices and Diagnostics Inc. (joint submission with the Medical Engineering Research Association)
Australian National Rail
Australian Nuclear Science and Technology Organisation
Australian Patent, Trade Marks and Design Office
Australian Pharmaceutical Manufacturers Association Inc.
Australian Sugar Milling Council
Australian Trade Commission
Australian Wine Research Institute
Best Knowledge Systems Pty Ltd
Betatene Limited
Broken Hill Proprietary Co. Ltd
Bureau of Immigration Research
Bureau of Sugar Experiment Stations
Business Council of Australia
Cattleman's Union
Codan Pty Ltd
Commonwealth Industrial Gases Limited
Commonwealth Serum Laboratories
Crocker Research
CSIRO Australia
CSIRO Corporate Services Department

CSIRO Division of Fuel Technology
CSIRO Division of Geomechanics
CSIRO Division of Tropical Animal Production
CSIRO Officers Association
D B Sugden Consulting Engineers Pty Ltd
Department of Aboriginal Affairs
Department of the Arts, Sport, the Environment and Territories
Department of the Arts, Sport, the Environment, Tourism and Territories
Department of Community Services and Health
Department of Defence
Department of Finance
Department of Foreign Affairs and Trade
Department of Industrial Relations
Department of Industry, Technology and Commerce
Department of Primary Industries and Energy
Department of the Prime Minister and Cabinet
Department of Social Security
Department of Transport and Communications
Department of the Treasury
Department of Veterans' Affairs
Export & Commercial Research Services Pty Ltd
Great Barrier Reef Marine Park Authority
Greenwoods & Freehills Pty Ltd
Harry Sebel Consultancy
Horticultural Research and Development Corporation
Incitec Ltd
Industry Research and Development Board
Institution of Engineers Australia
Joint Coal Board
Montech Pty Ltd
Metal Trades Industry Association
National Board of Employment, Education and Training
NSW Agriculture & Fisheries
New South Wales Coal Association
New South Wales Nurses Research Interest Group
New South Wales Science and Technology Council
NSWIC Pty Ltd
Nucleus Limited
OTC Limited
Pacific Biotechnology Ltd
Peptide Technology Limited
Plant Variety Rights Office
Public Service Commissioner
Royal College of Nursing, Australia
Sheddon Technology Management Ltd
State Chemistry Laboratories
Supervising Scientist for the Alligator Rivers Region
Sydney Business & Technology Centre

Technology and Innovation Management Pty Ltd
University of Melbourne
Centre for Manufacturing Management
Department of Mechanical and Manufacturing Engineering
University of Sydney
University of Western Australia
University of Wollongong
Urban Water Research Association of Australia
Viewnex Pty Limited
Western Australian Product Innovation Centre Pty Ltd

Individuals

Mr R Butler
Mr Leung Chen
Mr Kevin Davies
Mr J A Godwin
Dr Richard Hartley
Mr M Mueller
Mr M A Nettleton
Miss M C Peake
Ms P A Williams

PUBLIC HEARINGS, INSPECTIONS, BRIEFINGS AND WITNESSES TO THE INQUIRY

PUBLIC HEARINGS

Date of Hearing	Witnesses
21 September 1990	Commonwealth Scientific and Industrial Research Organisation
	Dr A D Donald Director, Institute of Animal Production and Processing
	Dr R M Green Director Institute of Natural Resources and Environment
	Dr W Hewertson Acting Director Institute of Plant Production and Processing
	Mr P H Langhorne Director, Corporate Services
	Dr M J Murray Acting Director Institute of Industrial Technologies
	Dr A F Reid Director Institute of Minerals, Energy and Construction
	Dr R L Sandland Acting Director Institute of Information Science and Engineering
	Dr J W Stocker Chief Executive

Dr M J Whitten
Chief
Division of Entomology

22 October 1990

Institution of Engineers

Dr J B Allen
Research Officer

Rear Admiral W J Rourke
Chief Executive

Department of the Arts, Sport, the Environment, Tourism and Territories

Dr P Bridgewater
Director
Australian National Parkes and Wildlife Service

Mr P Kennedy
Deputy Secretary

Mr R L Moncur
Director
Antarctic Division

Mr R J Pegler
Assistant Secretary
Environment Planning Branch

Mr N J Quinn
First Assistant Secretary
Environment Protection Division

CSIRO Officers Association

Mr P M Fleming
President

Mr J F Stephens
Vice-President and Chairman of the Science Policy Committee

Mr M Willoughby-Thomas
General Secretary

	Bureau of Meteorology
	Mr J Zillman Director
23 October 1990	**Australian Nuclear Science and Technology Organisation**
	Dr D J Cook Executive Director
	Mr D R Davy General Manager Scientific
	Mr D E Wilson General Manager Corporate
	Mr P Wright Acting Director Occupational Health and Safety Program
16 November 1990	**Sirotech Ltd**
	Dr C M Adam Director
	Mr P D Francis Legal Manager
	Dr J Stocker Board Chairman
	Bureau of Industry Economics **Department of Industry, Technology and Commerce**
	Mr G Hollander Assistant Director
	Mr T Moleta Senior Economist
22 November 1990	**Australian Industrial Research Group**
	Mr H C Coe Member

Dr P J Harvey
Vice-Chairman
Southern Division

Dr A R Kjar
Vice-President

University of Melbourne

Professor D A Samson
Director
Centre for Manufacturing Management

8 March 1991

Department of Defence

Mr J S Allison
Acting Chief Defence Scientist
Defence Science and Technology Organisation

Dr G F Ashton
Assistant Secretary
Development Projects Branch
Defence Science and Technology Organisation

Mr T Carthigaser
Director
Industry Involvement and Offsets

Mr F R Harvey
Inspector-General

Mr P J Lush
Assistant Secretary
Science Corporate Management Branch
Defence Science and Technology Organisation

Dr O J Raymond
First Assistant Secretary
Science Policy Division
Defence Science and Technology Organisation

Mr A R Taylor
Director-General
Science Policy Development Branch
Defence Science and Technology Organisation

19 March 1991

Australian Bureau of Agricultural and Resource Economics

Dr B Curran
Senior Economist

Dr B Johnston
Senior Economist

Dr L P O'Mara
Assistant Director

Land and Water Resources Research and Development Corporation

Mr F Meere
Acting Assistant Secretary

Rural and Industries Research and Development Corporation

Professor B W Davis
Chairperson

Mr K W Hyde
Managing Director

Bureau of Mineral Resources

Dr N Williams
Associate Director
Minerals and the Environment

Dr D Falvey
Associate Director
Petroleum and Marine Geoscience

Department of Primary Industries and Energy

Mr A J Glenn
Assistant Secretary
Crops Division

Mr B J Hill
Executive Director
Agriculture and Forestry Group

Mr S W Lack
Acting Director
R & D Corporations

Mr W W Leitch
Acting Manager
Levies Management Unit

Ms A G Quinn
Director
Research and Development Policy

Mr J Rhodes
Rural Access

Bureau of Rural Resources

Dr R T Williams
Corporate Planning Office

Dr M Williams
Acting Executive Director

3 April 1991

Metal Trades Industry Association

Mr P G Boland
Member

Mr B Cox
Member

Mr R K Harris
Member

Mr R A Matheson
Member

Mr I D McArthur
Member

Mr P J Morris
Manager
Industry Policy Projects

Mr L Purnell
Director
Trade and Commercial Services

Mr K Rankin
Member

Mr R Wiseman
Member

Office of the Supervising Scientist for the Alligator Rivers Region

Mr D Cottam
Manager
Corporate Services

Mr R M Fry
Supervising Scientist
Alligator Rivers Region

Dr A Johnston
Director
Alligator Rivers Region Research Institute

Dr G H Riley
Deputy Supervising Scientist

19 April 1991

Department of Industry, Technology and Commerce

Mr D J Ashmore
Deputy General Manager
National Industry Extension Services (NIES)

Dr J D Bell
Deputy Secretary

Mr R C Bourke
Director

Mr A F Caddy
Assistant Secretary

Mr K L Croker
Assistant Secretary, Research and Development
Grants Branch

Mr G A Hallinan
First Assistant Secretary
Light Industries Division

	Mr M J Holley Assistant Director Construction Industry
	Mr J Williams Manager Manufacturing Technologies Section
	Dr D H Williamson Assistant Secretary Science and Technology Policy Branch
15 May 1991	**Australian Institute of Marine Science**
	Dr J T Baker Director
16 May 1991	**University of Canberra**
	Professor D A Aitkin Vice-Chancellor
	Industry Research and Development Board
	Mr D Hanley Member
	Mr W A Kricker Chairman
	Dr P O Miller Member
	Mr R Sauer Member
Observers	
	Australian National Audit Office
	Mr R Alfredson Mr B Boland Mr J Bowden Mr P Farrelly Mr M Gillespie Mr D Lennie Mr J Martin Mr D McKean Mr M Ryan

Department of Finance

Ms S Gillett
Mr B Forner

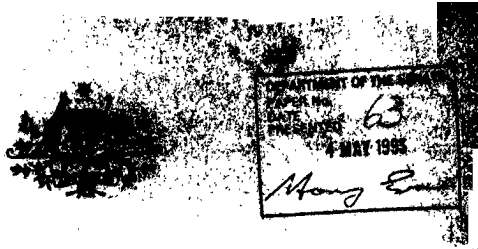
INSPECTIONS

14 August 1990 - Canberra	CSIRO Facilities at Black Mountain and Australian National University:
	Division of Soils
	Division of Water Resources
	Centre for Environmental Mechanics
	Division of Plant Industry
	Division of Forestry and Forest Products
	Division of Entomology
	Division of Information Technology
28 August 1990 - Sydney	CSIRO Facilities at North Ryde:
	Division of Food Processing
	Division of Food Technology
	Division of Exploration Geoscience
	Division of Coal and Energy Technology
	Division of Radiophysics
29 August 1990 - Sydney	Australian National Organisation for Nuclear Science and Technology at Lucas Heights, Sydney

5 November 1990 - Melbourne	Aeronautical Research Laboratory of the Defence Science and Technology Organisation at Fishermens Bend, Melbourne
27 November 1990 - Townsville	Great Barrier Reef Marine Park Authority at Townsville
28 November 1990 - Townsville	Australian Institute of Marine Science at Townsville
11 and 15 March 1991 - Wollongong	Illawarra Technology Centre at Wollongong

BRIEFINGS

5 November 1990	Briefing on the operations of Materials Research Laboratory of the Defence Science and Technology Organisation
7 September 1992	Briefing by Mr Ray Block of SBC Dominguez Barry Ltd
16 September 1992	Briefing by Officers of the Australian National Audit Office and the Bureau of Industry Economics, Department of Industry, Technology and Commerce
7 October 1992	Briefing by Officers of Australian Industry Research and Development Board



PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

JOINT COMMITTEE OF PUBLIC ACCOUNTS

REPORT 325

The Midford Paramount Case and Related Matters

Customs and Midford Shirts - the Paramount Case of a Failure of Customs

1992