INDUSTRY COMMISSION

NATIONAL PROCUREMENT DEVELOPMENT PROGRAM

REPORT NO. 20

31 MARCH 1992

Australian Government Publishing Service

Canberra

ISBN 0 644 24746 0

Printed in Australia by P.J. GRILLS, Commonwealth Government Printer, Canberra

INDUSTRY COMMISSION

31 March 1992

Honourable J Dawkins MP
Treasurer
Parliament House
CAN

Dear Treasurer

In accordance with Section 7 of the *Industry Commission Act 1989*, I have pleasure in submitting to you the report on the National Procurement Development Program.

Yours sincerely

M L Parker

Presiding Commissioner

COMMISSIONER

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Acknowledgment

The Commission wishes to thank those staff members who contributed to this report.

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ABBREVIATIONS

AGPS	Australian Government Publishing Service
AMT	Advanced Manufacturing Technology
ANZ	Australian and New Zealand
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAS	Department of Administrative Services
DITAC	Department of Industry, Technology and Commerce
EMDG	Export Market Development Grants (scheme)
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GIRD	Grants for Industry Research and Development
IR&D	Industry Research and Development
IAC	Industries Assistance Commission
IC	Industry Commission
MIC	Management and Investment Company
na	not available
NIES	National Industry Extension Service
NPDC	National Procurement Development Committee
NPDP	National Procurement Development Program
R&D	Research and development

OVERVIEW

The National Procurement Development Program (NPDP) was established in 1987 as a government-funded selective assistance scheme. It seeks to stimulate a greater level of collaboration between government and industry in the development of innovative Australian products to meet future government requirements. The objective is to improve the international competitiveness of Australian industry.

Under the NPDP, grants are provided for up to 50 per cent of eligible project expenditure (including salaries, prototypes, trialing, pilot plant and materials). The program is administered by the Industry Research and Development (IR&D) Board which has delegated much of the task to the National Procurement Development Committee (NPDC).

The Commission has been asked to assess the effectiveness and efficiency of the NPDP; analyse the intended and unintended impacts of the program; examine its contribution in relation to other schemes directed at research and development and the purchasing policies of governments; and recommend any changes to the program which may improve its effectiveness and efficiency should the Government wish to extend funding for the program beyond 30 June 1992.

What has the program achieved to date?

By February 1992, 87 project agreements had been signed, involving almost $25 million in grant commitments.

The NPDP is viewed very favourably by grant recipients. It gives a financial boost to firms and in many cases leads to collaboration with government agencies which can be of commercial value to NPDP-supported firms. Constructive collaboration depends critically on the strength of the government partner's commitment. Such a commitment has not always been forthcoming.

The NPDP differs from other R&D assistance schemes largely by providing help at the later stages of product development (the commercialisation stage). Over half of the projects supported to date

have completed their trialing and demonstration phase, but not all of these have completed commercialisation.

In its 1990-91 annual report, the IR&D Board estimated that supported projects had achieved sales of around $55 million, including $5 million in exports. This is considerably more than reported by grant recipients in a survey conducted by the Commission (Appendix C).

Of the 40 grant recipients responding to the Commission's survey, 23 have completed their project, with 10 achieving sales. These sales totalled $12 million, including $7.8 million in exports. The 23 firms had received NPDP grants totalling $9.8 million.

Actual sales contrast starkly with projections made at the time applications were lodged. Of the 23 firms with completed projects (in the Commission's survey), 16 anticipated commercial sales by the end of 1991 to exceed $200 million. The remaining seven applicants gave sales targets for the first five years in excess of $500 million.

It is too early to gauge the ultimate effect of the NPDP on most grant recipients. However, justification for the NPDP cannot rest simply on grant recipients having improved their commercial viability, as this would amount to an argument to subsidise any business with potential to achieve sales. Successful commercialisation alone will not ensure that the program yields community benefits commensurate with its cost.

Evaluating the NPDP

In responding to any reference the Commission is required to have regard to the government's desire to encourage the development and growth of Australian industries that are efficient in their use of resources, self-reliant, enterprising, innovative and internationally competitive, and to have regard to the broader interests of consumers and the community generally. The Commission has therefore considered not only the intended and unintended effects of the NPDP on the firms and government agencies directly involved, but also the effects on the Australian economy as a whole, and thus the community generally. It is an approach which ideally calls for information on:

- *all* assistance given to the projects under review -- including tax concessions, assistance with finance, other R&D subsidies, technology transfer from publicly funded institutions (eg CSIRO), manufacturing and export assistance;

- the cost of the grant itself, which is ultimately paid for by taxing other economic activities;

- the competitive *advantage or disadvantage* imposed on non-assisted firms in attracting resources (capital, labour, technology) and winning markets;

- the resource cost of administering the program, including the costs of lobbying by applicants; and

- the additional domestic value added induced by the NPDP.

Much of this information is not available in any quantifiable way. *Consequently, in assessing the prospects for community benefits from the NPDP it is important to go back to its objectives.*

Program objectives

Many objectives have been ascribed to the NPDP. In its Draft Report the Commission argued that each objective suggests a different strategy for assisting international competitiveness and that, with disparate and potentially conflicting objectives, there is a danger that the program will fail on all counts, or at least succeed at very high cost in relation to any one of them. The IR&D Board and NPDC members strongly oppose the view that there are conflicting objectives.

The impetus to establish the NPDP came from the findings of the Inglis Committee of Review on Government High Technology Purchasing Arrangements which concluded that bias -- particularly risk aversion -- in government purchasing was inhibiting the development of local industry. However, the NPDP differs significantly from the scheme recommended by Inglis. For example, unlike the Inglis proposal the NPDP has no provision for repayment of grants if supported projects are successful.

Risk aversion remains a stated rationale for the program. In its 1991 Annual Report the IR&D Board said:

> The objective of the program is to improve the efficiency and international competitiveness of Australian industry by the provision of financial support for research, development and trialing and demonstration projects which have substantial local content, are directed towards meeting government purchasing requirements, and are aimed at producing internationally traded goods and services.
>
> The National Procurement Development Committee believes that the key to achieving this objective is to overcome attitudes of risk aversion of government purchasing agencies by providing them with an opportunity to develop and trial Australian products and services (IR&D Board 1991, p.85).

Following the Draft Report hearings, some NPDC members expressed surprise and concern that the Commission had focused on government procurement needs and risk aversion -- considerations which had been at the heart of the Inglis review and the establishment of the NPDP.

Members of the NPDC said that the Committee's procedures and approaches are continuing to undergo change. The emphasis was said to be more and more upon commercialisation and on the managerial and marketing abilities of recipient firms. The benefits which firms and government agencies derive from partnerships under the NPDP were said to be important, but the over-riding objective is to increase the international competitiveness of Australian firms involved in developing innovative products. Other considerations such as risk aversion were said to be part of the NPDP package, but not a priority.

Members said that, given the blend of experience, skills and information available to the Committee, it can play an important role in selecting firms and projects which, with assistance from the NPDP, can go on to be internationally competitive and bring community gains in terms of exports, employment and flow-on benefits. Members of the Committee believe the Ministerial Directions of November 1990 (see Box 1.1) to be consistent with a 'picking winners' approach.

Such an approach involves an assessment of which firms, technologies etc. offer the best commercial potential, followed by government intervention to give favoured activities preferred access to finance and other resources. It begs the question of why the market cannot be relied upon to back 'winners'.

In the Commission's view, there should be more to a publicly funded assistance scheme than a 'picking winners' strategy. The focus of this report is therefore on the rationales that have been advanced to justify government intervention, in particular, the extent to which the program has been able to:

- overcome market failures in private sector investment in research and development (Chapter 2);
- assist the development of internationally competitive industries (Chapter 3); and
- redress perceived biases against little-known innovative Australian firms by government purchasers, particularly insofar as such attitudes arise from risk aversion (Chapter 4).

Assistance for research and development

There is now universal acceptance of the importance of innovation to the competitive advantage of firms. Innovation takes many forms. Apart from conventionally defined R&D, it also includes workplace reform, design refinement and even new ideas in marketing. The 'Walkman' and containerisation are widely regarded as lucrative innovations, but they did not embody new technology.

In pursuit of profits, innovation generally occurs without any government intervention. A case for government intervention may exist where it can be demonstrated that there is a `market failure' inhibiting the development of what would otherwise be socially desirable activities. One such market failure occurs where an innovation generates benefits for which a firm may not be sufficiently rewarded to compensate for the costs involved. (Chapter 2 looks at this question of externalities.) However, it appears that many take for granted that market failure accompanies all R&D.

Market failure is not a feature of the NPDP's eligibility and assessment criteria as applied. Projects are primarily assisted on the basis of the benefits to project partners, rather than potential additional benefits to the community generally (which could justify government support out of the public

purse -- see Box 2.2). That is, rather than compensating only for genuine externalities, the program mainly subsidises benefits to the project partners.

Given the lack of rigour in the current approach to externalities in the NPDP, any contribution to community welfare would be largely a matter of chance.

In any event, the NPDP is one of a number of programs directed at industrial R&D. It is common for a firm and/or project to benefit from several of these programs (for some examples, see Appendix D). It is therefore not possible to gauge the effect of the NPDP in isolation -- there is no way to link outcomes to particular programs.

International competitiveness

The NPDP is intended to assist the development of internationally competitive Australian industries. However, the pursuit of international competitiveness (which implies self reliance) through the use of subsidies raises a contradiction which has not been reconciled in the program.

The selective subsidies provided by the NPDP can disadvantage competitive firms attempting to win contracts and attract resources (especially finance) without assistance; it protects inefficient development by reducing the competitive pressure to become more efficient at innovation itself; and it can contribute to a subsidy-dependent culture. (Chapter 3 examines these issues.)

There is insufficient information to trace the full extent and effects of government support for individual firms and projects. There are 30-odd Commonwealth agencies involved in providing research grants alone, and further selective assistance may be provided for manufacture or export. Lack of comprehensive information on assistance to individual firms/projects is a serious problem that should be addressed as a matter of priority.

Multiple (sequential) assistance can have the damaging effect of bringing to the market the output of poor R&D investments encouraged by earlier subsidies (refer Section 3.3). Insofar as this avoids market realities, it will not promote efficient R&D.

While the NPDP can enhance the competitive position of selected firms, this comes at the expense of the competitiveness of other firms.

Government procurement

The NPDP can promote collaboration between government agencies and their suppliers. However, in most cases, collaboration occurs without the need for outside facilitation/assistance. Recent purchasing reforms actively encourage government program managers to participate in joint developments when it is in their interest to do so, and these reforms are beginning to work.

The program facilitates consideration of supported projects by government purchasing authorities. There is no evidence that the program has raised confidence in the general capacity of local firms to successfully commercialise new products/processes.

The program was established in the belief that government purchasing officers tend to bias decisions against potential Australian suppliers, largely for reasons of risk aversion. Risk aversion is easily alleged but difficult to substantiate. It appears to be a condition that many have taken for

granted from the inception of the NPDP, without adequate validation of its existence or causes. It is easy to misconstrue sound risk management as undue risk aversion.

As currently administered, the NPDP does not seek to address risk aversion in government procurement. Instead it subsidises the development of products of some 'interest' to their government sponsors. The possibility of risk aversion on the part of the relevant government agency is of questionable relevance in the case of such projects.

The IR&D Board has not targeted areas where risk aversion, if it exists, is likely to be greatest (eg local government). Over time, project selection procedures have come to resemble the risk-management practices of many agencies whose purchasing behaviour prompted the allegations of risk aversion in the first place. (Chapter 4 explores the concept of risk aversion as it applies to government procurement.)

The Commission agrees that there are problems in public sector procurement, including the costs faced by new entrants in dealing with government, a focus on price (rather than whole-of-life cost), and barriers to contracting out development.

These problems are best addressed by maintaining pressures for reform of government budgeting and procurement policies generally, rather than by programs such as the NPDP.

Administration of the program

As a selective grants scheme, the NPDP is subject to considerable administrative discretion. In combination with the limited public information on how the program's eligibility and selection criteria are applied in practice, the effect is to send confusing signals to potential applicants, as well as encourage 'speculative' applications.

A common misunderstanding is that the program only assists projects that would otherwise not have gone ahead. In fact, assistance can be provided for a project if it would not otherwise "proceed satisfactorily". The Commission's survey suggests that about half of all projects assisted under the program would have proceeded without a grant.

The operation of the NPDP has not been driven by the rationales on which it is based. Industry interests, rather than government procurement needs, have dominated. Firms have to be `partnered' by a government agency (broadly defined), but this can be often at little or no cost to the agency -- and not been motivated by a determination to acquire the product, if trialing and demonstration activities prove successful.

Transparency

Program administrators do not give reasons for the acceptance or rejection of applications.

The Commission sees no purpose in maintaining this secrecy. A statement of reasons of the Committee accompanying each decision would provide a better basis for preparing applications, and give all participants a better insight into the NPDC's priorities.

Administrative efficiency

At the time this report was finalised, the NPDP Secretariat had provided only partial information on the administrative expenses of the NPDP. An amount of $1.5 million was provided to cover the running costs for the first three years of the program (1987-88 to 1989-90), and it is probable that firms have incurred expenses in applying for, and participating in, the program of similar or greater magnitude than that incurred by the NPDP administrators. In that case, a substantial share (perhaps upward of 20 per cent) of the total cost of the program is dissipated in the form of administrative costs. While selective schemes (of which the NPDP is an example) tend to be costly to administer, arrangements which are part of the current administration of the NPDP unduly add to costs.

Members of the NPDC take an ongoing interest in some projects. However, comments from participants, and the experience of several projects, suggest that active interest is more the exception than the rule. It is generally recognised that most innovation failures occur for commercial (rather than technical) reasons. Accordingly, the continuing commercial viability of supported projects should be the focus of monitoring. It is wasteful to force a project through to completion if better alternatives have become available on the market, or other factors emerge which have the effect of undermining a project's commercial viability.

Options

The Commission's preferred option is to terminate the NPDP.

However, the terms of reference require the Commission to recommend changes to the NPDP which may improve its efficiency and effectiveness should the government continue to fund the program.

In such an event, the first priority should be to clarify the objectives of the program. This is because the objectives determine the firms and activities targeted, and the ways in which projects are managed. Depending on the objective to be targeted, options are:

Option A: A National Procurement Development Scheme

A procurement-based scheme, if justified, would be primarily driven by government procurement requirements. It would involve public sector investment in increasing its own efficiency through innovative solutions to demonstrated needs. That is, the focus of the scheme would be on the interdependence between government (as purchaser) and local industry.

The scheme would need to be consistent with other purchasing policies and visibly operate within them. The main impact would be through demonstration -- its success would be measured by how effectively it reduces its own reason for existence.

Eligibility should be restricted to meeting the procurement requirements of government. Accordingly:

- establishing a case for assistance should lie with the government partner;
- wherever possible, assistance should be by way of loan (to the government agency -- repayable if the project succeeds) or in return for a share in the rights to any intellectual property generated by the project;
- the program should aim to be self funding (in the sense that successes compensate for losses); and
- project funding should be arranged through the government partner who should bear responsibility for discharging payments for the project.

Such a program should rest with the Department of Administrative Services (DAS). This would strengthen links with government procurement and ensure that the scheme is demand (rather than supplier) driven.[1]

However, the Commission is not convinced that this option would confer a net benefit on the community.

[1] DAS does not support such a transfer, but has suggested instead that the program tighten its links with procurement requirements. This would imply a return to the approach of the Inglis Committee, and is not consistent with the direction preferred by the IR&D Board -- which places less emphasis on procurement in favour of commercialisation. The DAS suggestions would clarify the purpose of the program, but would compromise the extent to which technology sponsored by the program is user driven.

Option B: A Government Innovation Program

This scheme would be aimed at assisting the development of internationally competitive innovative Australian products for which government procurement is incidental.

In such a scheme, an agency like the IR&D Board should be responsible for the selection of projects. The scheme would target projects where it can be demonstrated that there is a divergence between national and private benefits such that they would not proceed without assistance. Further:

- where assistance is sought to accelerate or enhance a project, only the cost of the acceleration or enhancement should be subsidised -- not, for example, the cost of the entire demonstration and trialing phase;

- the agency should maintain the current emphasis on the capacities of the partners to complete the project and exploit the results;

- the agency should be represented on project management committees, except where it is clear that the agency's reasons for giving assistance and the government partner's interests coincide;

- the process of verifying project expenditure and effecting payments to the recipient should be handled by the agency delegate (or the government partner) as appropriate;

- the role and responsibilities of the government partner should be clarified and compensated for as appropriate -- some projects would entail the `purchase' of services from the government partner; and

- ideally, the subsidy should be just sufficient to induce the desired activity.

However, no new scheme to assist innovation should proceed in advance of a wider review of schemes which currently provide assistance to R&D.

RECOMMENDATIONS

The National Procurement Development Program benefits grant recipients, but does not target community-wide benefits which could justify public subsides. Consequently the Commission recommends that:

- The National Procurement Development Program not be extended beyond 30 June 1992.

Should the Government wish to continue with a scheme along similar lines to the National Procurement Development Program, the first priority should be to clarify the objectives. Depending on the objective to be targeted, two options are described above.

- If the aim is to address remaining government procurement problems, they are best addressed by maintaining pressures for reforms of government budgeting and procurement policies generally, rather than by a scheme like Option A.

- If the aim is to selectively assist innovation, a scheme like Option B would maximise the chances of net benefits. Even so, the Commission doubts that such a scheme could do so in practice.

- No new scheme to assist innovation should proceed in advance of a wider review of schemes which currently provide assistance to research and development.

The Commission draws attention to its comments on the dearth of information needed to trace the full extent and effects of government support for individual firms and projects.

1 THE PROBLEM

The focus of the National Procurement Development Program (NPDP) is on the demonstration and trialing of innovative Australian products assessed as relevant to the future procurement needs of government agencies and having the potential to lead to internationally competitive products.

1.1 Origins of the program

In his economic statement of 11 June 1986, the Prime Minister announced:

> The Government will appoint an independent Committee to review government purchasing arrangements and practices. It will be required to report to the Government within six months. The Committee will be charged with recommending action to overcome barriers affecting the ability of local industry to compete on an equitable basis with overseas suppliers as well as identifying means of utilising the forward purchasing requirements of government agencies to identify industrial development opportunities.[1]

Shortly after, the Minister for Industry, Technology and Commerce and the Acting Minister for Local Government and Administrative Services issued a joint statement announcing establishment of the Committee of Review on Government High Technology Purchasing Arrangements (the Inglis Committee).

The Committee presented its report in February 1987 (DITAC 1987) in which it recommended, among other things, that the Government set up a fund to encourage government agencies to use Australian suppliers where appropriate:

> For new and developing products and services, it was the view of the Committee that where departments and authorities do not have specific budget provisions for research and development and are able to identify proposals arising from their forward purchasing plans that meet defined criteria for innovation and technical benefit to Australia, and are likely to have significant export potential, they should have access to a central research and development fund (p.67).

The Committee also proposed that:

> ... recipients of development contracts should, wherever possible, contribute towards the maintenance of the fund through royalties, equity or other forms of repayment, where commercial success is achieved.
>
> To this end each research and development contract awarded under [the] program should be negotiated in such a way that the intellectual property should be retained in full or in part by the Government depending on the circumstances.

1 Supporting Statement to Address to the Nation by the Prime Minister, Canberra.

> The long-term aim would be to create a self-funding research and development program. Special arrangements may be necessary for the marketing of products resulting from the development contracts and arrangements with an organisation such as SIROTECH may be appropriate (p.68).

A further feature of the scheme recommended by the Inglis Committee was the treatment of expenses of the government partner. These were to be met by the developer/manufacturer and only in exceptional circumstances were they to be subsidised by the proposed scheme.

The Committee's recommendations were partly modelled on a proposal contained in a joint submission to it by the Departments of Industry, Technology and Commerce and Local Government and Administrative Services.

In a dissenting view, Mr Conron (a member of the Committee) argued against such a fund. His grounds were basically that, outside of the Department of Defence and Telecom,[2] there was not a significant demand for research and development (R&D) into new products, and that, in any event, most could be handled within the then existing framework:

> In the rare cases where development opportunities arising out of purchasing plans cannot be accommodated within existing arrangements, there appears to be no reason why finance should not be sought through the normal budgetary process (p.138).

In response to the Committee's report, the Commonwealth Government announced the creation of the NPDP in its 1987-88 budget. However, there were major departures from the scheme as envisaged by Inglis:

- the NPDP is a grants scheme, with no provision for repayment;
- projects supported under the program are generally oriented towards financing trialing for the benefit of potential suppliers to government, rather than helping government agencies fulfil a pre-existing demand for specific products;
- only seldom under the NPDP does the government partner share in ownership of new technology assisted under the program; and
- developing internationally competitive products became a primary criterion for the program, thereby reducing the original emphasis on the nature and strength of government demand.

These changes effectively reoriented the scheme from one of primarily addressing the demand side

2 At the time these two agencies accounted for around 80 per cent of Commonwealth technology-intensive purchases, and both had special industry development policies in place.

of government procurement (technology pull) to assisting potential suppliers (technology push).[3] Thus, under the NPDP government agencies need only show interest in or support for a project for it to be eligible for assistance -- far short of requiring the project to be a potential response to a demonstrable government need.

1.2 Operation of the program

The program was established by direction of the Minister for Industry, Technology and Commerce under Section 19 of the Industry, Research and Development Act 1986 (IR&D Act) as an additional function of the Industry Research and Development Board (IR&D Board). In this direction, the Minister outlined the function of the NPDP as being to:

> ... support, within Australian industry, product development and demonstration projects directed towards meeting forward government purchasing requirements and generating internationally competitive goods, services and systems.

The program was originally allocated $17.5 million (including $1.5 million earmarked for administrative purposes) for the three years from 1987-88 to 1989-90. In its 1990-91 Budget, the Commonwealth Government extended funding for a further two years, with an allocation of $7.2 million for 1990-91 and $7.4 million for 1991-92. The program was also expanded to include State and Territory governments which, in 1990-91, contributed around $650 000 to the program.

By February 1992, 87 project agreements had been signed under the program, involving some $24.6 million in grant approvals (Table 1.1).

The NPDP provides grants for the joint development and demonstration of products by firms in partnership with government agencies. Grants are provided on a contractual basis for up to 50 per cent of expenditure on project development and demonstration (including salaries, prototypes, trialing, pilot plant and materials).[4]

Applicants for NPDP grants must submit a joint application, with at least one government and one industry partner. The government partner(s) may belong to any level of government (ie federal, state or local) and may be a government business enterprise.

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3 In a study, 'Invention and Economic Growth', Jacob Schmookler analysed nearly 1000 major inventions in four industries (farming, railways, oil-refining and paper-making) around the world between 1800 and 1957. Where a stimulus for the invention could be identified, it was in nearly every case an economic one (ie the invention was needed for some industrial purpose - technology pull); in no case was the stimulus a particular scientific discovery (technological push). See article entitled 'Economic Growth', *The Economist* (4 January 1992).

4 A comparatively minor part of the program has involved contributions to other promotional activities for local sourcing of products by government agencies.

Table 1.1: **Grants approved under the NPDP to 30 September 1991, by technology groups** [a]

Technology	*Value of grants*	*Proportion of total funding*
	($'000)	(%)
Computer software	6 061	24.6
Communications technology	4 007	16.3
Scientific instrumentation	3 792	15.4
Medical technology	2 917	11.8
Computer-based equipment	2 332	9.5
Energy systems	1 114	4.5
Automotive applications	1 014	4.1
Robotics	823	3.3
Advanced manufacturing technology	638	2.6
Laser systems	339	1.4
Microwave technology	300	1.2
Advanced materials	104	0.4
Other	1 200	4.9
Total	**24 641**	**100**

a Includes projects which were approved and subsequently withdrawn

Source: IR&D Board (Sub. 15, p.36)

The Minister for Industry, Technology and Commerce has, under the IR&D Act, provided the IR&D Board with directions for assessing grant applications (see Box 1.1).

In 1991, legislation was passed amending the IR&D Act to specifically include the NPDP as a statutory function of the IR&D Board. Amendments to section 34A of the Act incorporate a requirement that:

> (2) Except in special cases, the Board must not enter into a national procurement development program agreement unless it is satisfied that the project concerned:
>
> (a) is directed towards the development of internationally competitive goods or services; and
>
> (b) involves adequate trialing and demonstration activities.

The IR&D Board established the National Procurement Development Committee (NPDC) to administer the program and has delegated many of the Board's powers in respect of the NPDP to the Committee. The Committee is made up of professionals from a number of private sector firms within the technology and finance fields, and includes members of the IR&D Board. The Department of Industry, Technology and Commerce (DITAC) provides a secretariat for the NPDC, which serves as the initial point of contact and assistance for those interested in the program.

Box 1.1: **Ministerial Directions with respect to the National Procurement Development Program**

I, JOHN NORMAN BUTTON, Minister of State for Industry, Technology and Commerce, acting pursuant to Section 20 of the *Industry Research and Development Act 1986*, hereby direct that in assessing an application from a government department or agency and any commercial partner for support under the National Procurement Development Program, the Industry Research and Development Board shall:

1 have regard to the Commonwealth Government's objectives of promoting the development of new internationally competitive Australian goods, services or systems, including prototypes, to meet government requirements; and

2 enter into an agreement for a development or demonstration project from a government department or agency and any commercial partner only where the Board is satisfied that:

- the project is directed to the development of internationally competitive and internationally traded goods, services and systems;
- specific budget provision for research, development or demonstration is not normally available within the government department or agency;
- the project would not proceed satisfactorily without a procurement development grant;
- the project will be completed within three years;
- the project will be undertaken in Australia and the results of the project will be commercialised to the benefit of the Australian economy; and

3 in assessing the merits of such a project, have regard to both the Commonwealth Government's industry policy objectives, including specific wish to assist Australian companies to compete in the international market place, and the following criteria:

- the ability of the commercial partner to exploit the project results, particularly in overseas markets;
- the potential impact of the project in terms of flow-on benefits to the economy;
- the level of innovation in the project and the extent to which the project will lead to the development of a new or improved product or service; and
- the capability of the project team to undertake the project.

4 require the applicants to provide a business and marketing plan which satisfies the Board that the applicants have the potential to carry out the project; and

5 in entering into an agreement in relation to a grant in respect of the project, limit the duration of the grant to a maximum of three years.

These Directions supersede my Directions given to the Board on 22 December 1987.

Dated this 5th day of November 1990

John N Button
Minister of State for Industry, Technology and Commerce

The NPDP Secretariat initially receives and examines applications for NPDP grants, referring them with an assessment to the NPDC for decision. The Committee meets once a month to consider applications and deal with other program business. It has occasionally deferred a decision pending more information, or requested applicants to modify their proposals. Applications involving more than $500 000 must be referred to the full IR&D Board for decision.

> The NPD Committee assesses the information in each application and makes a decision in its collective wisdom, rather than using a quantified formulaic approach. The Committee has a policy of not giving reasons for its decisions (DITAC 1989, p.43).

Contact between successful applicants and either DITAC or the NPDC after a grant has been approved is generally limited to the routine forwarding of quarterly reports by a project committee comprising representatives of both government and commercial partners. These reports deal mainly with progress of the project and expenditure monitoring.

Appendix B describes the NPDP in more detail.

1.3 Inquiry issues and methodology

The terms of reference for this inquiry (Appendix A) require the Commission to assess the effectiveness and efficiency of the NPDP in assisting the development of internationally competitive industries via support for the trialing and demonstration of innovative Australian products; positively influencing the attitudes of government purchasing authorities towards such products; and raising their credibility in the eyes of other potential customers.

In responding to any reference, general policy guidelines set out in the *Industry Commission Act 1989* require the Commission to have regard to the desire of the Commonwealth Government to:

- encourage the development and growth of Australian industries that are efficient in their use of resources, self-reliant, enterprising, innovative and internationally competitive;
- facilitate adjustment to structural changes in the economy and to ease social and economic hardships arising from those changes;
- reduce regulation of industry (including regulation by the States and Territories) where this is consistent with the social and economic goals of the Commonwealth Government; and
- recognise the interests of industries, consumers, and the community, likely to be affected by measures proposed by the Commission.

Thus, in responding to this reference, the Commission has taken an economy-wide perspective. The focus is not just on the intended effects the program may have on grant recipients, but also the intended (and unintended) effects of the NPDP on the Australian economy as a whole (and thus the community generally).

At the level of the economy as a whole, a scheme like the NPDP is entitled to be judged a success -- from the point of view of representing a sound -- if that part of increased welfare over time (eg as proxied by GDP)[5] attributable to the program exceeds the program's costs. For example, if NPDP grants (including administrative costs) to the value of $25 million lead to increased real GDP of at least $1.85 million a year in perpetuity, the program could be regarded as a success assuming a (real) discount rate of 8 per cent, since the benefits would exceed the costs (see footnote 5). However, whether such an investment should be judged a success when public money is involved -- as is the case with a non-repayable grant scheme like the NPDP -- depends on who the beneficiaries are of the increased GDP attributable to the NPDP. If the extra value added accrues to the community at large there is an argument for using public monies. But if the returns are largely appropriated by the owners of the technology being assisted (or their customers), the argument for using the public purse to assist in generating what are largely privatised benefits becomes difficult to sustain.

The problem with undertaking this type of analysis in the case of the NPDP is that it is difficult, if not impossible, to unequivocally assign cause and effect in the sense of determining that element of increased GDP which is properly attributable to the program. To illustrate, many studies of growth suggest that more than 50 per cent of increases in output can be attributed to the pervasive influences of technological change (eg World Bank 1991, p.45). Given that technology transfer can take many forms,[6] it would be nearly impossible to assign any particular proportion of increased Australian GDP over time solely to the effects of the NPDP. Compounding the difficulties in the present case is the problem that many NPDP grants have yet to lead to their full effects. For example, many assisted projects have not, as yet, completed their trialing and demonstration phases -- let alone achieved commercial viability.

5 Expressed in real (ie inflation-adjusted) terms and with future benefits discounted back to a common point in time to enable proper comparisons to be made. For example, the present value of a stream of increased real GDP of $1 851 852 extending in perpetuity would be valued at $25 million assuming a real discount rate of 8 per cent.

6 Including foreign investment, foreign education, technical assistance, licensing patentable processes and products, transmitting knowledge via labour flows and exposure to foreign markets for goods and services.

Box 1.2: **CHK Engineering -- a case of public risk and private benefit?**

CHK Engineering (CHK) is a small NSW-based firm with a history of importing fault indicators for electric power grids. Following recurring problems with imported units, CHK recognised a need for a new more reliable device and decided to develop a design for local manufacture. The South-East Queensland Electricity Board (SEQEB) had expressed interest in such a project and was involved from an early stage In addition to the benefits of obtaining the NPDP grant itself, CHK has pointed to its close working relationship with SEQEB as a major benefit of the program. The device designed by CHK has substantial advantages over existing 'stand-alone' fault indicators but competes with `intelligent systems' in less-remote applications. The development and trials have proven the design. The product has been taken up by almost all Australian supply authorities and is undergoing evaluation in the United States. Some 3000 units, valued at $1.6 million have been sold to date. CHK anticipates sales of $11 million by 1995.

The project has been a success for CHK, but does not provide a strong case for public assistance. It is difficult to argue that there have been any benefits for which the community does not pay CHK. Accordingly, the project has no stronger claim to government assistance than any other business investment undertaken with the aim of securing a return commensurate with the resources committed to a project. At the very least, there is a very strong case that the assistance should have taken the form of a loan, perhaps secured by some claim over the technology.

CHK has signalled an intention to apply for further assistance under the NPDP. SEQEB, despite having an active development program has already participated in two other NPDP grants. This raises a concern about the longer-term effects of the program on the innovation process itself. The NPDP has the potential to reward firms and government agencies for not committing their own resources to finding innovative solutions to clear needs. At the same time it places those attempting to develop similar solutions without assistance at a distinct disadvantage in mobilising capital and other necessary resources.

At the level of the individual firm, a scheme like the NPDP could be judged to be a success if attributable benefits over time exceed the grant (including associated administrative costs). Benefits could manifest themselves in several ways. For example, they may take the form of net increases in value added (ie after subtracting the value of the NPDP grant) either accruing to the firm or to the government partner (or some combination of the two) -- in which case the grant should be run as a loan scheme (Box 1.2). Alternatively, they could manifest themselves primarily in the form of benefits to third parties which cannot be charged for (called externalities) -- in which

case a grant scheme may be appropriate, so long as it can be demonstrated that the magnitude of the prospective community-wide gains exceeds the grant.

Again, it is difficult to undertake this 'case study' type of analysis, especially where projects have not come to fruition. The Commission has included some case studies in this report to illustrate particular points.

Another way of addressing the issues raised by this inquiry is to examine the major rationales advanced for the program and to try to reach a position on whether or not the NPDP has served those objectives in an effective and efficient fashion. This is what the Commission has primarily attempted in this report. It draws on the major rationales advanced for the program, namely:

- as a program directed at overcoming market failures in private-sector investment in R&D (Chapter 2);

- as a means of assisting the development of internationally competitive Australian industry (Chapter 3); and
- to redress perceived biases against little-known innovative Australian firms by government purchasers -- particularly in so far as such attitudes arise from 'risk aversion' -- thereby raising the credibility of Australian products in the eyes of other potential users (Chapter 4).

The Commission has examined the relevance of these claims, whether they amount to a case for assistance in the form of the NPDP, and what the impact of the program has been (whether intended or unintended).

1.4 Inquiry procedures

The Commission received its reference for this inquiry on 30 October 1991 and immediately released an issues paper calling for submissions and drawing attention to key issues for the inquiry to address.

The short time for the inquiry precluded the Commission from conducting public hearings in conjunction with the first round of submissions from interested parties. However, to encourage greater public input, the Commission mailed the issues paper to every known government and commercial applicant to the NPDP, together with questionnaires seeking project details. Information sought included details of each partner, the project, views on the NPDP and project outcomes. In all, 84 organisations responded, including 40 NPDP grant recipients, 10 firms which made unsuccessful applications, and 34 government agencies (partners).

A summary of results from the survey appears in Appendix C. While the number of survey responses allows broad statistical observations about the program, it should be remembered that

response was voluntary and limited to those who had an interest in receiving a subsidy from the NPDP. Furthermore, the NPDP Secretariat selectively encouraged certain participants to respond. There are, no doubt, some biases in the responses.

Appendices A and C list submissions and survey responses received. The Commission also visited industry, initially focusing on significant NPDP-assisted projects (Appendix A).

A draft of the Commission's report was released on 5 Februar 1992. Submissions were invited on its content and public hearings on the Draft Report were held on 2-3 March 1992 in Sydney and on 4 March 1992 in Canberra. The Commission continued its program of visits and collection of case study material following release of the Draft Report.

At the time of the public hearings the IR&D Board had not forwarded its full submission addressing the Draft Report. The Commission sought and received from the Board formal responses to a number of issues subsequent to the public hearings and on 24 March, discussed those responses with the Chairman and three members of the NPDC and representatives of the Secretariat.

2 RESEARCH, DEVELOPMENT AND INNOVATION

The National Procurement Development Program (NPDP) is one of many ways that governments encourage research and development (R&D) and other innovative activity in Australia. This chapter examines arguments to justify public support for R&D and related innovative activities (such as trialing and demonstration) under the NPDP, and the impact and effectiveness of the program in terms of R&D-related objectives.

2.1 Private incentives for investment in R&D

Firms commit resources to innovative activities in much the same manner as they invest scarce human and financial resources in other potentially rewarding areas -- such as acquiring new plant and equipment, or training their people. Thus, firms can be expected to undertake R&D in situations where attempting to innovate is judged to be the most productive use of resources, bearing in mind the risks involved. There is now world-wide acceptance of the importance to the firm of innovation, as wealth creation becomes less associated with what have been termed 'congealed resources' (like the coal and iron that go to make steel), and more associated with newer products -- like computer software or advanced aircraft -- which have been termed 'congealed knowledge'.

One argument for government support for R&D (and innovative activity more generally) is that firms may not devote enough resources to this area from a community-wide perspective, because of difficulties in appropriating adequate returns from such investment. One reason for this is that it may prove difficult to prevent others stealing good ideas or copying innovative products (ie it is difficult to safeguard intellectual property rights). Another reason is that the benefits of R&D generally do not accrue exclusively to those who undertake it. Developing new products and processes often confers benefits on consumers and producers who cannot be made to pay for them. Economists call such effects 'externalities' (Box 2.1) because they impact on people and firms who were not parties to the transactions or activities which produce them.[1]

1 A conundrum for government industrial policy is how, and how far, to protect innovators from imitation. American studies have shown that the gains to a company that innovates are generally modest compared with the gains to society as a whole. From society's point of view, the faster others adapt and develop their own versions of a new technology the better. But there is a trade-off. The less the innovator profits, the less the incentive to innovate. See article entitled 'Innovation' in *The Economist* (11 January 1992). The IC's predecessor body, the IAC discussed market failure with respect to R&D activity at some length in its report on *Medical and Scientific Equipment* (Report no. 402 released in April 1987 -- see Chapter 5 and Appendix J).

Box 2.1: **Externalities**

Sometimes known as spillover costs/benefits, externalities are the incidental detrimental or beneficial effects on others that arise from an activity, and in respect of which no corresponding compensation is provided to or paid by those who generate the externality.

Pollution provides a classic illustration of a negative externality, where the costs imposed on others generally go uncompensated; neither are they reflected in the prices charged for outputs produced by the polluting activity.

An example of a positive externality would be discovering a drug that cures AIDS. Sales would directly benefit both the drug company and those with HIV. In addition, by reducing the presence of HIV, and therefore the likelihood of the virus spreading further, the activities of the seller and purchasers would also produce a positive externality for the rest of the community. These external benefits would mean that returns to society as a whole would greatly exceed the returns the producer could achieve through drug sales. This hypothetical HIV example illustrates why governments often subsidise vaccinations (and sometimes provide them free).

When arguing for government support, it is common for interest groups to claim that their activities produce positive externalities. For example, exports are commonly claimed to produce externalities. However, there is no externality where the benefits of exporting (eg in terms of earning foreign exchange) accrue to the exporter. There are many circumstances which might look like examples of positive externalities, but on closer examination are effects that are paid for in some way, perhaps in another transaction. For example, a contract awarded to a firm which then increases its workforce does not represent an externality from the point of view of the labour hired, because workers will only enjoy the benefit (wages) by contributing their labour.

The existence of externalities means that the social benefits of some R&D activities (ie the total of all benefits -- both public and private) may exceed the private return the firm can capture from selling its new product or service or licensing some new production process.

In these circumstances, the normal operation of market forces may fail to provide appropriate private incentives for innovative activity. A case may be made for government intervention to encourage innovative activity which involves externalities to proceed (although there remains the possibility that the cost of intervening to correct the situation may exceed the expected returns from addressing such 'market failure').

In its first submission the Industry Research and Development (IR&D) Board, which administers the NPDP, stated:

> There is a substantial *a priori* reason why various forms of market failure will lead to under-investment in technology-creating activities, thus justifying some form of government involvement (Sub. 15, p.1).

Because in some circumstances it can make sense for governments to encourage innovative activity, calls for all R&D to be assisted are common -- whether there are externalities or not. Such an approach to R&D assistance can be costly if it jeopardises the chance of support being directed only to cases of genuine externalities (ie where it can be unequivocally established that the community stands to benefit from public support for particular activities).

Externalities justifying government intervention do not arise from all R&D or related innovative activity. Moreover, even where there are externalities in the offing it would be a mistake to subsidise any innovation if prospective returns are sufficient to make the activity viable without government assistance. In such cases, projects could be expected to procede without subsidy, even though the innovator is not able to capture all the benefits that may ultimately flow from them.

In its submission following release of the Draft Report, the IR&D Board referred to several NPDP projects that may produce externalities:

> - diagnostic kits for HIV testing and for early detection of breast cancer
>
> - improvement in waste management and treatment practices
>
> - a mobile testing station which has improved the capacity of State Road Transport Authorities to test heavy vehicles ... achieving improvements in road safety for the general public (Sub. 34, p.11).

The prospect of public benefits should be the focus of the NPDP selection process in so far as the program seeks to address market failure in R&D. However, the current selection process emphasises the private benefits to applicants, rather than public benefits. Applicants are required to provide estimates of expected private benefits, and the Ministerial Guidelines only require the National Procurement Development Committee (NPDC) to "have regard to" the potential flow-on benefits of projects to the rest of the economy. Applicants are not required to identify potential externalities which would make their project desirable from the viewpoint of the community. The case study below (Box 2.2) illustrates how a commercially successful NPDP project may nevertheless not entail benefits for the wider community.

The focus of the NPDP is not upon projects with the greatest potential to produce benefits for the wider community. Hence the program contributes to community welfare only by chance. There is no return to the community if all benefits accrue to the private innovator or their customers. This is a crucial flaw of the NPDP, and is addressed in the Commission's Option B (see Overview).

Box 2.2: **The Preston Group -- where is the benefit to the taxpayer?**

The Preston Group's (TPG's) Terminal Management System (TMS) has proven to be a commercial success. The government partner, the Federal Airports Corporation (FAC), purchased a copy of the system, and has achieved considerable efficiency gains at Sydney airport. This has provided TPG with a useful 'stamp of approval' in pursuing other orders for its software. Contracts worth $3 million to install systems at Heathrow, Manchester and Amsterdam have recently been announced. These are prestigious sales which TPG believes will constitute a strong lever into the US market. The FAC would not contribute development funds at the early stage of the project. TPG spent over $600 000 on the project, and it said it could not get the extra $400 000 for the project to procede satisfactorily. Accordingly, the NPDP played a catalytic role of financier, without which the project may not have produced the results it can now boast. This case is a good illustration of how many see the NPDP should work -- the project is a commercial success and the NPDP played a major role.

Most of the benefits of the project flow to the parties directly involved. Exports will increase company profits, which will benefit TPG's shareholders. Sydney airport can handle more planes with existing facilities, and process more passengers. The FAC therefore benefits from increased user revenues and its charges will ultimately be borne by travellers who now enjoy more efficient facilities. The point is that taxpayers have contributed $400 000 to a project which does not provide significant spillover benefits to the wider community. The NPDC acting as a financier made a decision to fund the TMS project -- a decision that the banks were unprepared to make at the time. Is this a legitimate role for government and is it a legitimate use of public money?

In its first submission, the IR&D Board said:

> There is strong evidence of externalities and spin-off benefits being enjoyed by the government partner and other government agencies. These benefits can be broadly identified as being :
>
> - access to technical expertise and new technology in a trial environment ultimately with an opportunity to acquire the proven technology; and
>
> - opportunities for future collaborative activity with the private sector either directly associated with the subject innovation or in wider areas (Sub. 15, p.iv).

These benefits are not externalities because they are largely confined to government agencies and will usually entail considerable payments to be made to the private sector partner. Few, if any, of the benefits cited relate to genuine externalities.

There seems little doubt that the NPDP supports projects where firms should be in a position to capture sufficient returns to justify risking their own (rather than public money) in innovative activity. Indeed, the IR&D Board said (Sub. 15, p.16) that the NPDC seeks to give preference to firms with an ability to commercialise innovations successfully. This is consistent with the criterion contained in the Ministerial Directions relating to the assessed ability of the commercial partner to exploit project outcomes.

But the rationale for government intervention is to augment private incentives where firms *cannot* command sufficient returns to undertake socially desirable activity. In all of the successful applications for NPDP grants examined by the Commission, large private benefits have been expected. In these cases firms would have had sufficient incentive to undertake projects without the inducement of a grant.

The level of assistance

The maximum rate of 50 per cent of eligible expenditure has been applied to most projects. However, there is no reason why 50 per cent should be the appropriate level. Where applicants can privately command the resources and have sufficient incentive to undertake innovative projects, the entire grant merely serves to transfer wealth to the private sector, with no additional benefits to the community. There is also an element of transfer when a lesser grant would have sufficed. Responses to the Commission's survey (Appendix C) included 12 instances where applicants had received a grant that was larger than they had initially applied for (although this may be explained by cost over-runs during the course of the project).

In the last year, fewer projects have been supported at the maximum rate. The Commission understands that this occurs where the NPDC is of the view that the commercial partner could afford to fund a greater share of the project, or that projected sales are too low.[2]

Some projects may require a subsidy of more than 50 per cent to induce firms to go ahead. If such a project held out the prospect of commensurate community-wide benefits (in the form of positive externalities), its automatic exclusion from consideration under the NPDP may be detrimental to national welfare.

Thus, some socially desirable projects may justify more support than the 50 per cent NPDP limit, others less (and some none at all). Ideally, a selective subsidy for any aspect of R&D should be pitched at the minimum amount necessary to induce socially desirable innovative activity.[3] The NPDC does not attempt to do this. Rather, the level of assistance for each project is effectively

[2] The Board uses a 'rule of thumb' working ratio of $1 of assistance to $20 of anticipated sales.

[3] In principle, the rate of assistance to each project should be set against the anticipated returns to the community and ranked against other claims on the public purse. Those proposals promising the highest returns to the community per dollar of assistance should then be given priority for support.

determined by the resource-mix. This favours R&D activity which relies more heavily on inputs treated as eligible items of expenditure under the program.

2.2 Availability of capital for innovative activity

Many innovative ideas originate within small firms which may find it difficult to muster sufficient resources to exploit them. Indeed, many small businesses are established with the express purpose of capitalising on an original idea. Their viability often then turns on their ability to attract loan and/or equity capital -- which involves convincing others of the commercial potential of the new product/process.

When the necessary financial backing cannot be arranged, it is frequently implied that there is some gap or failure in local capital markets. In turn, government intervention to 'correct' the situation is then often called for, as in the recent report of the Standing Committee on Industry, Science and Technology (Beddall 1990):

> A significant obstacle to growth and development of small businesses has been access to finance under appropriate terms and conditions (p.xlviii).

The Commission recently considered the provision of finance for small business in its inquiry into the availability of capital (IC 1992). It concluded that the Australian capital market is reasonably competitive and that there are few impediments to the provision of finance to small business. It is true that small firms often face interest rate premiums when borrowing, but this can usually be explained by the additional risk and extra information requirements associated with lending to such ventures (with firms often having no previous 'track record' they can appeal to).

It is also true that small businesses can have difficulty in attracting equity finance. Again, this can often be attributed to the assessed risks involved. Mechanisms exist for small businesses to raise funds through specialist financial intermediaries (eg Management Investment Companies) which provide "a useful blend of capital, managerial and other assistance to emerging firms" (IC 1992, p.188).

Any difficulty experienced by small- and medium-sized firms is more likely to be attributable to inherent risks and information requirements associated with providing finance to smaller enterprises, than it is to any imperfection in capital markets.

Investors can be expected to rank projects according to the assessed risks involved in relation to the potential returns. Minor innovations that require few resources, promise immediate returns and involve a low level of risk to commercialise are clearly more capable of attracting resources from the capital market than is likely to be the case with more basic research characterised by long lead times and uncertain returns. This is why much basic research is directly funded by government.

The IR&D Board argued that government intervention is sometimes justified on grounds of failure of capital markets:

> Imperfections in financial markets clearly restrict the supply of risk capital for technology/innovation. Thus, there is a role for government in either minimising the distortions which actually limit that supply or playing some funding role itself (Sub. 15, p.26).

However, it cannot be claimed that the NPDP addresses any such failures. If it were so targeted, applicants would have to demonstrate an unwarranted failure of financial institutions to support potentially commercial projects (either in terms of outright refusal or in terms of unjustifiably high risk premiums attaching to loans). In fact, applicants are not required to demonstrate that they could not have raised the required capital to undertake the project; they are only asked to describe why the project "would not proceed satisfactorily without a development procurement grant." Indeed, the IR&D Board stated in its first submission that the NPDC prefers to provide:

> ... support for firms seeking grants as supplementary finance, not finance on a "last resort" basis (Sub. 15, p.16).

In grant applications examined by the Commission, the majority of applicants were concerned with the impact of possible delays if alternative finance had to be found. For example, one successful applicant claimed that, without a grant, a rival firm could gain some of the applicant's market share. Nineteen out of 40 grant recipients who responded to the Commission's survey could identify a likely alternative source of finance for their project had their NPDP application failed (see AppendixÿC, Table C2). It seems that the NPDP has supported many projects where there was not even prima facie evidence of failure in capital markets, since many firms would likely have secured adequate funding from existing financial institutions. The case study below (Box 2.3) provides an example of an NPDP grant awarded to a project that clearly would have gone ahead without a grant.

The IR&D Board sees a role for NPDP grants in allowing a firm to speed up a project to take advantage of a `window of opportunity' (eg to secure a key contract which will help a product win wider markets). Supporting firms simply to accelerate the commercialisation of new products/processes is not an appropriate role for government. Such `windows of opportunity' confront firms throughout the economy, and it is not in the interests of the community for the government to selectively assist firms to achieve their marketing goals.

Box 2.3: **SWD -- a case of wealth transfer?**

The original Sequential Waveform Distortion (SWD) technology was developed and patented by an engineer working for the Electricity Trust of South Australia (ETSA). The technology allows two-way 'communication' between electricity authorities and their customers, using the power lines as the medium of communication. Oliver J Nilsen Limited (Nilsen) is a relatively large Australian company with a history of product innovation. The company recently developed a meter which facilitates time-of-use tariff measurement, time switch and ripple control of off-peak loads. These features are well suited to the metering requirements of the SWD system. The State Electricity Commission of Victoria (SECV) currently uses a clock mechanism to charge different tariffs for electricity used in peak and off-peak periods. The SECV supported the development of the SWD technology after a survey of its clock system in 1986 revealed many defects. Nilsen approached ETSA with a view to developing the technology, which led to a joint venture -- SWD Pty Ltd -- to take the project through to the development stage. The venture is owned by Nilsen (50 per cent), ETSA (25 per cent) and the SECV (25 per cent). One year after the joint venture was formed, Nilsen applied for funding through the NPDP.

Given the nature of the partners and the technology involved, it is unlikely that this project required any assistance (and therefore, whatever community benefits promised by the project were always going to be delivered). Nilsen is a company with considerable resources and experience. Established in 1916, it currently employs about 1100 people, has assets of $60 million and annual sales of $120 million. The world market for the technology is large, with many potential applications. The government partners were already committed, having contributed resources prior to the NPDP grant and holding 50 per cent equity in SWD Pty Ltd.

2.3 Commercialising R&D results

In general, innovation may contain elements of research, development and commercialisation. The NPDP differs from other schemes which aim to assist various aspects of innovation, because it assists trialing and demonstration (elements of commercialisation) as well as supporting more traditional research and development activity.[4]

[4] Akio Morita, chairman of Sony maintains that too much emphasis on basic science prevents companies from being competitive -- see article entitled 'Industry does not need research' in the New Scientist (15 February 1992). Morita also points out that, although the Walkman has been called an 'innovative marvel', it did not contain any new technology. Its secret was new packaging and marketing. Another view reported in the article included: 'There is not much of a relationship between the quality of research and the product.'

Targeting research and development

Assistance to the R&D stages of a project may be sufficient to induce socially desirable externalities (irrespective of whether 'the originating' firm follows through to the commercialisation stage). Examples abound of large corporations commercialising the R&D results of smaller firms, which may have limited ability to take their ideas further than the prototype stage. It does not matter to the community which firms commercialise R&D, the benefits come from the process of diffusion.[5] However, it may not always be effective to assist only the R&D stages of innovation. It may be that some socially desirable externalities only eventuate if a product is researched, developed and commercialised as a single undertaking, rather than prosecuted as separate activities (Box 2.4).

Box 2.4: **Computer software -- an example where R&D and commercialisation are particularly interdependent?**

The successful implementation of a computer software package may require that commercialisation remain within the originating firm. Often, applications need to be customised to suit particular users, requiring knowledge of how to adapt and apply generic solutions to individual problems. Indeed, the package itself may continue to be developed (eg to suit a progressively wider range of potential applications) as lessons are learnt from applying it to each new application.

An NPDP project that illustrates this is the Terminal Management System developed by the Preston Group (presented as a case study earlier in this chapter). The TMS is a graphic software package that needs to be tailored to individual constraints of each airport. Differences in airport rules, scale and layout require considerable adjustment of the package for each user. For example, Sydney airport has 15 'fingers' for aircraft access, while Heathrow has 170.

Assisting the commercialisation phase of a project can only be justified when completion of this phase in Australia is necessary for more than offsetting externalities to be generated. However, it should be noted that subsidies to R&D -- such as CSIRO and university funding, the 150 per cent tax concession and Grants for Industrial Research and Development (GIRD) -- also constitute indirect assistance to commercialisation. This is because such measures generate more R&D than would otherwise be the case, and R&D is usually, but not always, a major input to commercialisation of a new product or process.

[5] As observed in the article in the Economist (op cit), innovation does not automatically lead to competitive advantage; pioneers often go bust before they can capitalise on their inventions; and the history of innovation is littered with examples of pioneers who devised a technology only to see it exploited by the 'fast second'.

This is not an acceptance of assistance for commercialisation for its own sake (which is dealt with in the next section). Socially desirable external benefits of R&D, such as the generation of basic scientific knowledge, do not necessarily depend on commercialisation.

Targeting commercialisation

Recent reports and commentaries have emphasised the need to commercialise the results of R&D in order to justify initial investments (including any government assistance which may have been involved). For example, the Task Force on Commercialisation of Research (Block Report 1991) considered that:

> ... there are four major factors which affect the capability of companies to integrate research and development with their operations. These are:
>
> - the small size and limited technological sophistication of our manufacturing base;
>
> - the relative absence of large technology oriented companies;
>
> - the small domestic market; and
>
> - the limited availability of capital.
>
> The Task Force believes these factors are not going to be overcome if left to the operation of the market alone (p.6).

In their report entitled 'Innovation in Australia' for the IR&D Board, consultants Pappas, Carter, Evans and Koop (PCEK 1991) stated:

> It is commercial inexperience rather than limited technological expertise that most frequently prevents companies from realising returns from their investment in R&D (p.20).

Implicit in the above is the belief that government intervention is required to encourage commercialisation to occur in Australia (that is, given a choice, it is in our interests to commercialise here, rather than import new products and processes which may be based on ideas originally developed here). This argument was also advanced in the IR&D Board's first submission to this inquiry:

> There is reasonably conclusive evidence that the main reasons for failure of Australian firms in the innovative process are not so much technical failure (much of the technology is reasonably well established and often sourced from outside the firm), but commercial failure in the translation of the invention to innovation. In this case, there is a strong case for the role of government to be directed not just to technology creation but to market failure in the commercialisation process - that is in firms successfully taking an invention to the innovation stage in order to enhance competitiveness (Sub. 15, p.27).

The typically high cost of commercialisation compared with other phases of the innovation process is a common theme in a number of commentaries on the nature and costs of R&D. Many firms experience difficulty in commercialising R&D results because of the resources required to successfully negotiate this stage. The ratio 1:10:100 was suggested by several participants to illustrate the relative costs of research, development and commercialisation. That the commercialisation phase of the innovative process is typically by far the most costly is not, however, sufficient reason to warrant assistance.

Many firms are reluctant to commit the considerable time, effort and money required to commercialise the results of their R&D activity. However, this can represent a realistic appraisal of the situation they face, rather than evidence of market failure. It can be sensible for firms to decide that the resource requirements for commercialisation do not justify such a commitment, particularly if rights to the fruits of their R&D efforts can be sold to others better placed to undertake this phase (eg via licensing the technology and earning royalties).

Another argument is that it represents a waste of resources devoted to industrial R&D -- the target of several Commonwealth and State government initiatives -- when projects are abandoned at the commercialisation stage.[6] Instances of assisted R&D projects faltering when assistance is no longer available demonstrate the waste that can arise when private investment decisions are distorted by interventions. This argument for assisting commercialisation often amounts to a call for continuing assistance on grounds that early inputs were assisted. Under such an approach, what may have been poorly conceived and executed projects in the first place would continue to be propped up and utilise resources that could be more productively employed in other economic activities. Ongoing assistance of this type will only serve to reduce national welfare and place ever-increasing demands on the public purse. As in all other forms of investment and business strategies, when R&D fails to provide returns as high as the next best use of resources, it should be abandoned.

2.4 Efficiency implications of assistance methods

Government assistance to R&D is intended to influence the decisions of private firms in order to achieve outcomes that confer net benefits on the community at large. The effectiveness of such assistance will be determined by where and how governments intervene. Intervention can be costly (in terms of misallocating scarce resources to other than their best uses) if the type and extent of assistance does not address the source of any problem.

6 Rather than constituting a case for further assistance, when this happens it provides prima facie evidence that previous assistance was unwarranted -- since it clearly did not culminate in the hoped for outcome.

Sometimes it may not be possible to overcome market failures without incurring costs which exceed the benefits. In such cases, it would be better to accept the failure of normal market forces to produce desirable outcomes, so avoiding further losses to the community.

The NPDP is a selective scheme with limited funds. As a selective subsidy scheme, it may be possible to target instances of market failure without wastefully subsidising projects which would proceed in any event. However, the administrative costs are higher per dollar of assistance than under a general subsidy scheme.[7] Proposals have to be examined in an attempt to distinguish those of greatest merit. The considerable informational requirements for informed decision-making by program administrators inevitably introduces scope for error. The costs to firms of applying for assistance, and subsequent compliance costs, must also be considered. This issue is taken up in the chapter on administration of the NPDP (see Chapter 5).

What are inevitably subjective and arbitrary eligibility criteria apply to the NPDP. For example, projects are restricted to those that are directed towards the development of internationally traded goods and services; firms must be able to commercialise results, particularly for overseas markets; projects must be undertaken in Australia; and they must be completed within three years.

These criteria influence the allocation of grants and confer advantages on firms that exhibit particular characteristics. Selective schemes run the risk of excluding meritorious projects which, if they proceeded, would deliver more community benefits than those chosen. By applying inappropriate criteria (or even appropriate ones in the context of what is inevitably incomplete information), the NPDC will fail to address cases of genuine market failure where the benefits of intervention would outweigh the costs.[8]

Few firms seem to be aware of government-run R&D assistance schemes. For example, information included in the Department of Administrative Services submission (Sub. 18, p.18) shows that only 11 per cent of 259 firms surveyed were aware of the NPDP. Only 41 per cent were aware of the 150 per cent tax concession for R&D, and 54 per cent were aware of GIRD.

Firms most knowledgeable of the NPDP are likely to be those with representation on the various IR&D Board committees (Appendix E) and those firms that have received some other form of assistance administered by the IR&D Board. Many such firms participate in more than one assistance scheme (see Appendix D for some examples). Other firms with projects of equal merit

[7] General subsidies are usually less costly to administer than selective subsidy schemes. However, they do not discriminate between instances where there is market failure and where there is not.

[8] Projects most deserving of public support at the early stages of commercialisation may not be those apparently promising success on foreign markets, nor those considered as having potential to become suppliers of high-tech products to Australian governments.

may not know of the assistance schemes available. It cannot be expected that there will be a match between firms that are able to contribute most to community welfare and those that have the best track record in attracting government assistance.

Porter (1990) notes that competition (in both output and input markets) seems to be the most powerful force when it comes to stimulating innovation.

> Firms facing strong competitive pressures are forced to invest in improving technology, so that others do not gain an edge that will allow them to improve market position. Even though innovations are imitated, diffusion is incomplete and occurs with a lag. The innovator often reaps durable gains in reputation (p.636).

Referring to the use of selective subsidies in Germany, Denmark and the United Kingdom, Porter (1990) concluded:

> This approach is questionable, and experience with it has been largely unsatisfactory. It is difficult enough under the best of circumstances to evaluate the true commercial prospects of a research project. Without having to bear the financial risk, firms often propose bad projects or do not manage them well. They also use government funds to pay for projects they would have conducted anyway, or overstate the amount of research actually performed. Both Germany and the United Kingdom have rightly moved away from this approach (p.634).

3 INTERNATIONAL COMPETITIVENESS

The National Procurement Development Program (NPDP) seeks to meet several goals in relation to trade in technology-intensive products. Specifically, the program aims to improve the international competitiveness of selected firms, decrease Australia's trade imbalance in high-technology goods, and enhance the credibility of exporters and their products in the eyes of potential overseas customers.

The Industry Research and Development Board (IR&D Board) is required, by the Ministerial directions in relation to the program, to extend grants only when "the project is directed to the development of internationally competitive and internationally traded goods, services and systems" (Box 1.1). In particular, the Board must have regard to:

> ... both the Commonwealth Government's industry policy objectives, including its specific wish to assist Australian companies to compete in the international marketplace, and ... the ability of the commercial partner to exploit the project results, particularly in overseas markets.

The NPDP application form provides an indication of the significance that program administrators attach to reducing Australia's trade imbalance in technology-intensive products. One of the assessment criteria used by the National Procurement Development Committee (NPDC) to select projects requires applicants to identify how their product will "produce exports or replace imports". Applicants must also provide a five-year projection of expected domestic and export sales, as well as anticipated domestic and international market shares over this period.

3.1 The importance of being internationally competitive

International trade enables a nation to expand its production and consumption opportunities (ie increase its living standards), as compared with a situation in which the nation had to be self sufficient. This is because trade allows a country to specialise in the production of those goods and services it can produce relatively cheaply, and to export surplus production in order to pay for goods and services in which other countries enjoy a comparative advantage. As Porter (1990) puts it:

> No nation can be competitive in (and be a net exporter of) everything. A nation's pool of human and other resources is necessarily limited. The ideal is that these resources be deployed in the most productive uses possible. The export success of those industries with a competitive advantage will push up the costs of labour, inputs, and capital in the nation, making other industries uncompetitive ... At the same time, the expanding exports of competitive industries put upward pressure on the exchange rate, making it more difficult for the relatively less productive industries in the nation to export (p.7).

The provision of government assistance (eg in the form of a subsidy) clearly makes it easier for favoured firms to increase production and exports. However, this method of achieving exports is undesirable if targeted industries are relatively high-cost users of resources and are able (by virtue of the help they get from government) to attract labour and capital from other parts of the economy where they can be put to better use. For example, if an Australian firm is producing a good that embodies $100 of inputs (including labour, capital and materials), but the product is trading on world markets for $90, it is unlikely that the Australian producer will achieve export sales (unless the product is of superior quality). If government subsidises one of the product's inputs by $10, such support may make it possible for the good to achieve export sales at the prevailing world price (ignoring transport costs). Even so, the Australian producer would then be selling a product on world markets for a price that is lower than the value of the factors of production embodied in it. The Australian producer and overseas consumers benefit, but only at the expense of taxpayers, rival firms and industries, and overall national income/welfare.

The Commission supports the view of the Committee for Review of Export Market Development Assistance (Hughes Committee 1989) which stated that:

> Contrary to widespread beliefs in the Australian business community, there is no inherent merit in exporting. A dollar's worth of goods or services for the domestic market is just as valuable as a dollar's worth of exports if both are sold in competitive markets without protection or subsidy (p.5).

The Committee also argued that:

> To be competitive internationally Australian industries have not only to have economies of scale but also, under competitive pressure from other domestic firms or from competing firms in other countries, have to ensure rapid productivity growth. Some of Australia's most effective exporters are firms for which the entire Australian market is too small. Others began to export because intensive competition at home precluded significant growth in the domestic market (p.6).

Governments are often pressured to provide special incentives -- such as procurement policies which favour local firms -- to match those operating overseas. It is argued that if Australia does not offer similar incentive packages we will be letting other governments determine our industrial structure, as well as take the lion's share of international investment and trade. However, even granting that some 'successes' can be achieved by selectively supporting promising technologies, such a case for preferment has to be assessed in the context of the costs inevitably imposed on the rest of the economy. For example, in the case of a non-repayable grant scheme some of the wealth created by others (in the form of returns to labour and capital generated by other economic activity) has to be appropriated (in the form of taxes) and diverted to support the favoured few. The question then becomes: what is in it for the taxpayer? Hopefully, the answer is that the entire community benefits in some way, for example through the positive externalities that are generated by supported activities. This should not remain an act of faith, but be demonstrably the case for a scheme like the NPDP.

Box 3.1: **Strategic trade theories**

There are two main strands to strategic trade theories. The first relates to circumstances where firms' activities generate (unpriced) benefits to other firms. Proponents distinguish two types of circumstances: technological spin-offs where a firm's activities generate knowledge or technical know-how which benefits other firms; and so-called 'pecuniary' or 'linkage' externalities, arising when the price of inputs used by a firm declines as the firm's output grows, due to the existence of economies of scale in the supply of those inputs. Pecuniary effects have not been regarded as an externality, but rather as a normal consequence of market behaviour.

A crucial consideration in advancing such arguments is the presumption that the benefits will largely flow to the intervening nation, otherwise the principal outcome may be merely to subsidise foreigners. Krugman (1987, p.229) concludes that the available evidence does not suggest that special promotion of sectors characterised by the application of advanced technology is warranted, even though these sectors may generate significant externalities.

The second strand is based on the view that firms in some industries can earn returns which exceed the costs of production (including a 'normal' return to owners of capital) due to the existence of economies of scale/scope and barriers to entry. It is argued that government assistance can allow some firms to establish dominant market positions in industries which are more profitable than others. Thus, government assistance is seen as a mechanism for capturing excess returns (sometimes termed 'economic rents').

The potential for this strategy to benefit the country concerned depends on its ability to help domestic firms increase their market shares at the expense of foreign rivals. This theory is weakened by the presumption that government intervention which increases a domestic firm's production will cause overseas producers to reduce or cease their production, rather than retaliate by also engaging in strategic behaviour.

Dixit (1984) argued that any excess returns which are not eliminated by competition probably reflect the higher return necessary to compensate market participants for higher-than-average risks in the market -- and so are merely a component of production costs, rather than constituting economic rents. Krugman (1987) concludes:

> ... the stakes in international competition for excess returns are probably not large. Actual or potential entry limits excess returns, and remaining levels of excess returns, although possibly large relative to the profits of firms, are probably not large enough to make their capture or defense a major national priority (p.230).

In recent years, arguments other than the generation of externalities (see Section 2.1) have been advanced for supporting prospective exporters. For example, some trade theorists have argued that special circumstances may arise to justify use of 'strategic' interventions by governments in order to secure a permanent advantage as a supplier of a particular good to the rest of the world. Box 3.1 outlines the basis of these arguments and their practical limitations.

3.2 Does the NPDP contribute to Australia's competitiveness?

While there has been much debate about the determinants of international competitiveness, few have ventured a clear explanation of the concept (Box 3.2). In its initial submission, the IR&D Board provided some indication of how the concept is applied to the NPDP:

Importantly, the ability of an individual firm to compete effectively in international markets, whether by way of exports, against import competition, international production (investment) or the direct sale or lease of its technology (licensing), depends to varying degrees on the success of the firm in the innovation process (Sub. 15, p.19).

The Board provided a variety of performance indicators as evidence that the NPDP has enhanced the international competitiveness of participating firms. Based on a survey of grant recipients, the Board detailed improvements in areas such as firm turnover, government sales, research and development (R&D) activity, asset backing and profitability. For example, over 50ÿper cent of surveyed firms reported growth in turnover of at least 10 per cent in 1990-91, and over one third reported a growth of more than 50 per cent. However, to claim these results as pointing to an improvement in international competitiveness ignores some important qualifications that need to be taken into account:

- regardless of the impact of the grant, the selection criteria favour firms with high growth prospects;
- supported firms often benefit from other assistance programs, so that there is a potentially serious attribution problem; and
- the NPDP grant itself benefits firms, regardless of any improvement in international competitiveness.

The IR&D Board's survey provides a guide to the types of firms supported under the program. It does not establish the effects of the program.

A significant omission from the Board's analysis is the impact of government intervention. Governments can intervene through various economic, social and legal policies to enhance the profitability of any particular firm or product. However, such intervention can be at the expense of other parts of the economy. To ignore adverse effects which have the potential to undermine

the competitiveness of other activities is to arrive at a fairly meaningless concept of competitiveness -- one that does not distinguish between competitive self-reliant activities and uncompetitive activities made viable only as a result of government support.

In many circumstances, effective innovation and government assistance are alternative strategies for firms seeking advantage in meeting the challenge of competition for sales, capital and other resources. The former is a competitive strategy for creating wealth, the latter a vehicle for redistributing wealth (usually as part of a package which distorts resource use, to the detriment of national income and welfare).

Box 3.2: **What is international competitiveness?**

International competitiveness usually refers to the ability of industries or firms in one country to compete with their counterparts in other countries for sales on both domestic and world markets. Increased competitiveness usually means increasing national income and a higher living standard for a country's inhabitants. But if increased competitiveness is achieved only because of government assistance (eg via subsidies) it is less clear that a country is becoming more wealthy, since the subsidies will have to be financed by taxing the wealth produced by others. It is, therefore, in the interests of everyone to ensure that Australian industries are as internationally competitive as possible, ideally without the need for government support.

Continuing improvements in productivity (ie in the output that can be produced per unit of inputs) -- often achieved via innovation -- is the key to achieving increased competitiveness. At the level of the individual firm, productivity improvements are generally achieved without government assistance. But improvements in competitiveness can also be achieved by virtue of government help. However, extending assistance to one firm will be at the expense of other firms and sections of the economy (eg because taxes have to be increased to finance subsidies). In turn this adversely affects the ability of other economic activities to compete in the marketplace. When given to correct a market failure -- that is, when firms do not automatically take into account the community-wide benefits and costs of their production and investment decisions -- government assistance can lead to improvements in national income and hence higher living standards (if the benefits outweigh the costs imposed). However, assistance is often inappropriately provided to firms and industries that do not face any significant market failure. In such cases, the assistance will reduce national income because resources are not being used to best effect -- even though the international competitiveness of favoured firms may increase.

The provision of public funding to firms will improve their ability to compete internationally. It does not follow from this that the NPDP increases national income. In this report, the Commission has sought to determine the worth of the NPDP by assessing the arguments which underlie the programs role in improving international competitiveness:

- the need to encourage technology-intensive industries in Australia; and
- the `accreditation' that a firm obtains from working with (and selling to) a government agency.

Encouraging technology-intensive industries

A common perception in the Australian community is that the we rely too heavily on commodity-based products and simply-transformed manufactures. The concern stems in part from: the belief that Australia's terms of trade are in decline; the higher income-elasticity of demand for technology-intensive goods and services; and the subsidisation of agricultural production and exports by the European Community and the United States.

These considerations were identified in a recent report by the Task Force on the Commercialisation of Research (Block Committee 1991). The Committee recommended that the NPDP be extended to include private sector companies as purchasers, and that funding to the program be doubled. An underlying reason was the importance that the Committee placed on technology-intensive industries. The Committee argued that Australia needs:

> ... an adjustment which will require greater emphasis on the production and export of new and more sophisticated manufactured goods. This is the area of world trade which is experiencing the most rapid growth at the present time and this trend seems likely to continue (p.2).

Similarly, the Office of the Australian Science and Technology Council claimed that:

> An innovative and technologically advanced industry sector is essential to Australia's future as an advanced industrial nation. Because of the small local market and the industry structure, the role of government purchasing in assisting industry development in this respect is particularly important (Sub. 10, p.2).

To provide selective assistance to one industry (eg a `high-tech' one) at the expense of others can lead to lower levels of national income (Box 3.2). This can occur even when there are unemployed resources (eg in a recession). In Australia, for example, the pool of skilled labour and capital equipment used to produce technology-intensive goods and services is relatively small, and the cost of undertaking a project that draws on such resources is accordingly relatively high. As a result, any bureaucratic misjudgment of the prospective market for a particular product -- no one can

claim perfect foresight -- can be expected to impose net costs on the community. This situation was recognised by Mr Conron in his dissenting view in the Inglis Committee report (DITAC 1987):

> ... government policy should encourage growth in any sector of the economy and should not single out particular areas such as high technology. The lesson taught by the import replacement policies of the 1960s should not be forgotten. Special assistance to one area adds to the costs of others (p.138).

Box 3.3: **EOS -- intervention can confuse priorities**

Electro Optic Systems (EOS) received an NPDP grant of $186 000 to enhance a Laser Ranging system using the facilities of the Australian Survey and Land Information Group (AUSLIG) in Orroral valley near Canberra. Although the project would have largely proceeded without NPDP support, the grant enabled a more sophisticated system to be built than planned (by reducing the need to economise on options).

This case illustrates how government intervention can operate to confuse priorities in technology investment. Although the impact of the grant appears to be the development of a more sophisticated product than would otherwise be the case, it is not clear that this has been an economic advance. In fact, the evidence so far suggests the opposite. The development of the more sophisticated version was at the expense of other profitable activities within EOS. In EOS's judgment, the enhancements were not commercially justifiable and therefore would not have proceeded without the NPDP grant. There is no evidence of any significant special non-market benefits accruing to the economy generally from this project. Accordingly, there is no reason for the community to place a greater value on the enhancements than that placed by EOS. The net effect of the subsidy has been to induce EOS to pursue less commercially rewarding activities from the point of view of the community (although, on balance, more commercially rewarding for EOS -- taking the NPDP subsidy into account). EOS has argued that the return to the taxpayer has been the acquisition by AUSLIG of equipment at a subsidised price. However, the value of this benefit depends on the value to AUSLIG of obtaining the enhanced version of the system. This in turn can only be objectively judged by the funding priority the option had in AUSLIG's budget. Even if the Government wished to increase AUSLIG's resources, it would clearly be more efficient and consistent with public sector management practices to have simply increased AUSLIG's budget. In such a scenario, the additional investment in the EOS system would have competed with other options for enhancing services provided by AUSLIG.

The argument that government has a role in directing investment towards industries with high growth potential assumes bureaucrats (or industry representatives) can anticipate more profitable uses of resources than businesses exposed to market disciplines (Box 3.3). At their monthly

meetings, the NPDC selects projects that have the apparent potential to be successful, based on what is inevitably imperfect information: projects considered cover a wide range of technologies; international demand for and supply of products utilising such technologies cannot be known in advance; and applicants have an incentive to provide information which casts their proposals in the most favourable light. Against this, the main advantage of the market mechanism is that it encourages firms to gather the best possible information, since failure will involve losses that will not be subsidised by taxpayers. The incentive to succeed is reduced to the extent that governments accept some of the commercial risk (by in effect underwriting some of the costs).

The case against a 'winner picking' strategy is supported by a study by Klodt (1987) of five countries and six industries. The study found an inverse relationship between direct government R&D support and a country's trade balance in high-technology products. The study concluded that:

> Imitating the strategy of the technological leader still seems to be the major guideline of public R&D expenditures. This strategy is well-known as 'picking the winners'. According to the empirical evidence, however, it appears not to be a very successful one. Since governments do not know the winners of tomorrow, they usually pick the winners of yesterday. As a result, public R&D subsidies give support to excess capacities in some industries and discriminate against R&D activities in other industries (p.57).

The problems associated with picking winners are not new. The Industries Assistance Commission (IAC 1989) noted that:

> Australian governments have had little success picking winners. The passenger motor vehicle industry is testimony to this. The substantial costs of such failures must be set against the benefits derived from any successful intervention. Australian experience is that the removal of assistance rather than its provision is the important catalyst to improved industry efficiency (p.84).

Winning a stamp of approval

Some inquiry participants identified acceptance of a product by the home government as a critical factor in raising the credibility of Australian products in the eyes of other potential overseas customers (both here and overseas). For example, Ausonics said that:

> ... government agencies are one of the primary organisations which can provide a high level of credibility as a referee. This has resulted in increased sales to both the private domestic sector and to the international market. When selling into an international market, having a reference from a creditable and recognised institution has considerable commercial advantage. In fact, sales would be considerably handicapped without such accreditation (Sub. 11, p.6).

The IR&D Board made a similar point:

> Government purchasing, playing a 'leading edge' customer role, can be especially important in the technical certification or endorsement of the technology, particularly where sales to overseas governments are potentially important (Sub. 15, p.33).

The Commission's survey of grant recipients also showed that firms value the credibility obtained from the partnership with a government agency entailed in an NPDP grant. Of the 16 firms that provided a complete survey response and have a technically completed project, 13 indicated that the accreditation obtained from working with a government agency has increased their prospects of achieving international sales.

Government accreditation of a product is important in terms of the ability of some producers to sell a good or service to other buyers -- be they private, government, domestic or international. This seems especially to be the case in the medical equipment field. It follows that government accreditation has a commercial value to some companies. Therefore, an incentive exists for firms to discount the price charged to the government agency, or to compensate the agency for any product trialing and demonstration. The extent of the discount a firm is willing to offer to government purchasers could be expected to reflect the value of the accreditation expected to be conferred by such a sale.

3.3 Overlap between programs

The Commonwealth Government has numerous schemes that encourage firms to research, develop, commercialise and export technology-intensive products. Inevitably there is a degree of overlap in the assistance that a firm can obtain from these programs. For example, products that are trialed and demonstrated with the help of an NPDP grant can also benefit from other government programs which encourage the development and export of technology-intensive goods and services.

The Commonwealth Government provided direct assistance to exporters totalling about $550 million in 1990-91 (Table 3.1). For example, the Export Market Development Grants (EMDG) scheme aims to encourage Australian exporters to establish and develop overseas markets for goods, services, industrial property rights and technical know-how which are substantially of Australian origin. The scheme funds 50 per cent of a firm's eligible expenditure on export promotion and development. In 1990-91 some 3000 EMDG claims to the value of $162 million were paid.

The International Trade Enhancement Scheme is a discretionary program which provides funds to companies which already have a record of exporting. Participants are required to contribute at least half the financial resources needed to generate new international business activity. Expenditure of

at least $100 000 is required to qualify for funding. In 1990-91, $4.5 million was disbursed under the scheme, and this figure is expected to increase to $43.9 million in 1991-92.

In 1990-91, the Commonwealth provided support for the production of specific technology-intensive products through its Metalworking Machine Tools and Robot Bounty ($15.2 million), Photographic Colour Film Production Bounty ($12 million) and its Computer Bounty ($51.3 million).

The Commonwealth also administers several programs that provide an incentive for technology-intensive firms to increase exports. Major programs are the Civil Offsets Program; Partnerships for Development and Fixed Term Agreements; Customer Premises Telecommunications Equipment; and the Pharmaceuticals 'Factor f' Scheme (Appendix F).

Table 3.1: **Assistance to exports, 1990-91 and 1991-92**
($ million)

Program	*1990-91*	*1991-92*
Australian Trade Commission		
Marketing operations	99.9	124.4
Special purpose programs		
Textiles clothing and footwear	0.9	0.5
Engineering internationalisation	1.8	1.3
Investment promotion	5.4	7.9
Export market development scheme		
Operating expenses	5.9	3.5
Payments under the EMDG Act 1974	162.0	134.0
Trade enhancement schemes		
Innovative agricultural marketing	4.1	8.4
Other trade enhancement schemes (including the international trade enhancement scheme and the international business development program)	4.5	43.9
Export finance and insurance		
Interest subsidy for financing eligible export transactions	7.9	14.7
Payments in respect of national interest business	234.8	264.4
Product development		
Operating expenses	6.0	5.4
Asia-Pacific fellowship scheme 0.0 4.1		
Total	**533.2**	**612.5**

Source: IC 1991

Apart from direct assistance to exports of $500 million, the Commonwealth Government provides assistance to R&D (the equivalent of over $2 500 million in 1990-91, see Appendix F). Inevitably, there is a degree of overlap in the assistance that a firm can obtain from these programs. 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.

NPDP grant recipients receive government funding for specific expenditures on research, development, trialing and demonstration. Under the NPDP, government subsidies for any eligible expenditure cannot exceed 50 per cent -- irrespective of the source of the funds. Section 37 of the *Industry Research and Development Act 1986* states that:

> Where a researcher has received financial assistance otherwise than under the Act (whether or not from, or out of money provided by, the Commonwealth) and it appears to the Board that the financial assistance has aided the researcher to carry out a project that is the subject of an agreement under this Act, the Board may reduce the amount of any subsidy to the researcher in respect of that project to such extent as it thinks appropriate because of that financial assistance.

While it is not possible for NPDP grant recipients to obtain funding that exceeds 50 per cent of eligible expenditure, it is possible that a firm can receive funding for other activities or other phases of the same project (Boxes 3.4 and 3.5).

Box 3.4: **Interscan -- multiple public support**

CSIRO's Microwave Landing System (MLS) research project was completed in 1984 (see Appendix D). Interscan International was established to develop the MLS. In the absence of investment interest by companies which had been involved in the project, the Australian Industry Development Corporation (AIDC) undertook full responsibility for the project on 1 July 1984. Interscan is wholly-owned by the AIDC, which in turn is owned by the Commonwealth Government. Interscan is the only company in which the AIDC holds all the equity. AIDC equity holdings total $13 million -- 10 million authorised capital shares at $1 each and 3 million issued shares at $1 each. Interscan International has obtained $738 116 in Export Market Development grants over the last 8 years. In addition, the company has benefited from a Defense Offsets agreement with an Italian company to supply air navigation antennae to the RAAF worth approximately $1.8 million. In 1989-90, Interscan received an NPDP grant of $2 040 800, the largest grant allocated under the program.

The Commission's survey found that, of the firms that have received grants, 75 per cent indicated involvement with a least one other government program, 38 per cent have used at least one other

IR&D Board scheme, 20 per cent have obtained EMDG funding, and 13 per cent have had involvement with the NIES. Some firms have benefited from numerous government programs.

Box 3.5: **Memtec -- who can take credit for what?**

Memtec Limited has developed a continuous microfiltration membrane system to filter large volumes of fluid to specified standards. The membrane technology (Memcor) was developed at the University of New South Wales and purchased by a US pharmaceutical company (Baxter-Travenol). The current chief executive of Memtec bought the patented technology in 1983 and developed it in Australia. Memtec has operations in the UK, Germany, France, the US and Japan; and total assets exceeding $150 million. Memtec has invested $52 million in plant and manufacturing equipment and $20 million in research and design technology. The NPDP grant was used to develop and install a sewerage filtration system at Blackheath in Sydney. Blackheath was discharging partially treated effluent before the Memtec system was trialed. The system was commissioned in October 1991 and has since provided good test results.

The Memtec example highlights the difficulties of isolating the impact of the NPDP compared with other forms of government assistance. As shown below, Memtec has received assistance from a variety of sources to develop its membrane technology. If the Memcor system proves to be a commercial success, how valid would it be to attribute that outcome to the NPDP -- when a GIRD grant of almost $2 million also contributed to the product's development. The lack of information to disentangle cause and effect makes it an impossible task to determine the influence of each assistance program on the overall success of Memtec and the Memcor system.

	NPDP	Project grant	Commencement grant	GIRD	EMDG
1984-85		$1 006 200	$40 000		
1985-86			$40 000		$140 774
1986-87		$196 250	$34 242		$199 483
1987-88				$780 312[a]	$200 000
1988-89					$100 589
1989-90	$627 200			$1 979 764	$200 000
1990-91				$500 000[a]	

[a] Partnership with CSIRO, AWA, Bioclone and Nucleus

The IR&D Board survey also showed that NPDP participants were using other assistance schemes --for example the 150 per cent tax concession for R&D, Grants for Industrial Research and Development (GIRD), the National Teaching Company Scheme, EMD grants, NIES sponsoring and the Computer Bounty.

Use of other assistance programs for different aspects of the same project seems to be encouraged by the IR&D Board. As part of the final cost review of an NPDP project the NPD Secretariat requires answers to the following questions:

> Do you consider the results of the project warrant further involvement by this office in assisting the company to commercialise? If not, why not?
>
> What present connections does the company have with other government assistance agencies, Commonwealth, or otherwise?
>
> What forms of assistance would benefit the company in stepping towards, or better commercialising project results?
>
> Is the company receptive to our arranging contact etc with other such agencies?

In its second submission, the IR&D Board commented on possible overlap in assistance programs available to the same firms and projects in the following terms:

> The Commission fails to articulate the complexity of the innovation process, and the relationship between the different programs which are complementary in assisting to build internationally competitive firms. The support provided to the individual firms targets a specific phase of the innovation process. Whilst firms have the ability to obtain support from a number of different programs this is provided for different activities.
>
> It is therefore not surprising that firms receive appropriate support at different stages in their development. The Board's research shows that success in innovation is frequently the result of learning gained from cumulative experience by companies. In Australia, companies with experience in commercialising R&D are scarce. We must recognise that support should be provided not only to start up companies, but to established companies that have clearly demonstrated the ability to commercialise R&D and to grow export businesses (Sub. 34, p.15).

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 (Appendix E).

Where a project receives assistance under more than one government program, this can compound the costs of resource misallocation. For instance, a firm may only arrive at a point where it can qualify for export assistance because its earlier steps (such as R&D, trialing and demonstration) were assisted. If the initial assistance creates a resource misallocation, continuing assistance is likely to magnify it.

This inquiry has highlighted the difficulty in making assessments about one program when claimed outcomes are also affected (and claimed) by other assistance schemes. 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. There is an incentive for firms to specialise in 'subsidy attraction' for as long as the fragmentation of reporting on each scheme works against any informed attempt to match costs and benefits.

At present there is no publicly available record of total assistance provided to individual firms. The Commission has found such information to be located in many different places and at times difficult to obtain. As a result, assistance to the early stages of project (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.

4 GOVERNMENT PROCUREMENT

The scheme was about helping to change the culture of government procurement agencies.

Minister for Industry, Technology and Commerce, February 1992

Governments are major purchasers of goods and services. This chapter considers the part played by the National Procurement Development Program (NPDP) in the relationship between government procurement and industry development. The effects the program may have had on the risk management and purchasing practices of governments are also discussed.

4.1 Procurement policies

Commonwealth Government

Commonwealth Government purchasing has recently been the subject of major reforms. Changes have followed a review by the Financial Management Improvement Program (FMIP 1988), which found that the procurement system as it existed to 1989 was highly inefficient:

> The focus is on administration of process, not management for results. The rules and regulations have grown piecemeal over some 300 years (some have their origins in British Admiralty rules) and can be confusing, contributing to misconceptions. There are, moreover, discrepancies between the intention of the rules and perceptions on the part of officers. For example, anything not expressly sanctioned in the Finance Manual and/or the guidance provided by the CPM [Commonwealth Purchasing Manual] is most often considered forbidden (p.5).

According to the Department of Administrative Services (DAS), the over-riding objective of Commonwealth purchasing policy is now simply "to support government programs by obtaining value for money in the acquisition of goods and services" (Sub. 18, p.2).

Ministerial Guidelines for Government Purchasing issued by DAS are intended to "provide guidance on, but not prescribe, sound purchasing practices, tools and techniques". The Guidelines require Commonwealth Government agencies to "have regard" to:

- obtaining value for money (basically by emulating commercial purchasing practices);

- the benefits of encouraging open and effective competition among suppliers (in order to obtain value for money); and

- the relationship between procurement and the Government's objective of supporting Australian and New Zealand industry.

DAS maintains that the reason for ensuring that Australian and New Zealand (ANZ) suppliers are given maximum opportunity to compete for government business is to support efficient procurement:

> ... it makes sense in terms of value for money in that a larger and more competitive local supplier base will benefit agencies. This is in fact the theme of the ANZ suppliers policy (Sub. 18, p.11).

As well as enunciating principles, the guidelines address purchasing practices. The main issues in this area include drawing up effective specifications, maintaining appropriate standards of ethical conduct, and behaving professionally in the planning and carrying out of procurement programs.

DAS noted in its submission that a review by the Australian National Audit Office found that many Departments have been slow to act on the reforms. A survey commissioned by DAS also found that Australian industry is largely unaware of the reforms, even among firms supplying to government. Nevertheless, DAS remains confident that the reforms will eventually permeate all government purchasing, that firms which are aware of the reforms are supportive of them, and that this should lead eventually to widespread industry willingness to sell to government.

NPDP contribution to purchasing reform aims

While "not suggesting that the NPDP and other research and development schemes become permanent fixtures in our industrial framework", DAS argued that the NPDP can potentially contribute to the achievement of purchasing reform objectives. It considers that the program can affect the interaction between purchasers and innovative firms based in Australia and New Zealand, as it can potentially:

> ... influence attitudes, raise credibility and change behaviour through a financial mechanism. Procurement policy, administered by DAS and in particular the Purchase Australian Office, seeks to achieve much the same thing through training of Government purchasing officers, promotion of Australian industry, and improved communication (Sub. 18, p.11).

Nevertheless, with an annual budget in the region of $7 million, the impact of the NPDP on government purchasing would be expected to be comparatively minor -- unless it has a large demonstration effect. Commenting on the potential of the program to have such an effect, DAS noted:

> This demonstration effect will work only if NPDP activity works to create good quality success and then publicises it to those it wishes to influence (ie industry and buyers). The NPDP does not presently seem to have such a program in place (Sub 18, p.17).

State Governments

The Industry Research and Development (IR&D) Board stated that the largest number of grants have gone to companies with State rather than Commonwealth Government partners.
Each state has its own procurement policies, which differ from each other and from the Commonwealth.

Queensland

Queensland purchasing policies are currently going through a transition. A year ago any purchase over $3000 was required to be handled through a central purchasing agency. The Queensland Government is now devolving purchasing, but in a more phased manner than was the case when the Commonwealth undertook a similar devolution.

A major focus in Queensland is on training procurement officers in their new responsibilities. If a Department wishes to make a major purchase, it must have personnel who are trained at the appropriate level (eg in risk-management techniques).

The Queensland Government now has a policy of requiring suppliers to obtain Quality Assurance accreditation to international standards.

The Queensland Department of Administrative Services said that the existence of the NPDP is almost unknown among suppliers and that, to date, the program has had virtually no effect on Government purchasing in that state. The Department also believes that Queensland firms generally prefer not to engage in subsidy-seeking behaviour.

Western Australia

The Western Australian Department of State Development stated that three WA companies have participated in NPDP and that it "believes Western Australian Government agencies involved with the program have considered it extremely valuable." The Department considers that procurement officers need to keep a firmer focus on industry development and to change undesirable purchasing practices, which are often "firmly entrenched."

The Department did not consider that procurement reforms could bring about the necessary changes:

> ... changes in management practices are not seen as a valid alternative to the NPDP ... Additionally, lack of progress in reforms to Commonwealth purchasing suggest this proposal would, even if viable, suffer a similar fate (Sub. 17, p.4).

Tasmania

The Tasmanian Government considered that, by providing an incentive for purchases to be sourced from co-operative developments (rather than 'off the shelf'), the main benefit of NPDP is that it enables procurement to become a means of transferring public sector experience, design skills and knowledge to the private sector. Another benefit the Government saw flowing from the program was that it enables a private partner to use the credibility derived from government procurement to help sell its product internationally.

The Government considered that, while it would be hard to claim there was no risk-averse behaviour in Tasmanian Government purchasing, risk aversion is not a very important consideration, because even with an NPDP grant partnerships would not form "if there is any perception of real risk that either partner may be unable to perform."

The Government noted that its comments on issues relevant to the NPDP was limited by the fact that no Tasmanian government agency had applied for a grant under the program.

Other States

The Victorian Government submission did not specifically address government procurement procurement policies and practices in that state. Government agencies in New South Wales and South Australia did not make submissions, but the Commission received some survey responses from government agencies in those states. Most respondents indicated that the NPDP is not the only mechanism available for arranging co-operative developments, but a majority commented favourably on the NPDP in the context of government procurement.

4.2 Government procurement and industry development

Although against the principles of the General Agreement on Tariffs and Trade (GATT) 'Agreement on Government Procurement', governments in many countries use their purchasing power to assist industry growth in selected areas. Australia makes use of various 'offsets' programs (which currently prevent Australia from becoming a signatory to the GATT agreement). To the Commission's knowledge, no other country uses procurement for industry development in quite the same way as the NPDP, although the now-defunct Canadian 'Source Development Fund' operated along similar lines.

Government purchasing encourages industry development in a number of ways:

- the Defence and Civil Offsets Programs (including Partnerships for Development) lead directly to significant sourcing of Australian goods and services to fulfil contracts;

- many other departments and government business enterprises let sizeable contracts with local industry to develop specific goods and services to meet their procurement needs;

- there are a number of Commonwealth and State government agencies designed to encourage procurement officers to purchase Australian goods and services; and

- there is the NPDP.

The Offsets and Partnerships for Development programs require successful overseas suppliers to support the development of Australian industry. `Offsets' are activities of commercial and technological significance directed towards government procurement. These programs channel around $500 million annually from procurement contracts into industry development (DOD 1990, DITAC 1990).

Under the Civil Offsets Program, where a procurement sourced from a foreign supplier exceeds $A2.5 million (and the imported content exceeds 30 per cent), the supplier is required to direct a prescribed level of offsets to Australian industry (see Appendix F).[1]

Firms with offset obligations may choose to participate in the Partnerships for Development Program, administered by the Department of Industry, Technology and Commerce (DITAC). This scheme allows research and development (R&D) activities and/or exports to be substituted for offset obligations.

Defence Offsets are administered by the Department of Defence under its Australian Industry Involvement Program. This is similar to the Civil Offsets Program, however the offsets level is not fixed, but varies according to each project -- being an amount considered to be "consistent with overall defence objectives". Defence also runs two other major procurement programs: Procurement of Capital Facilities; and Procurement of Capital Equipment. There is also a Defence Industry Development Program, which works along similar lines to the NPDP, with approximately twice NPDP's annual budget (see Appendix F).

The funds involved in Defence procurement development are substantial, averaging around 30 per cent of overall Defence expenditure in recent years. However, unlike the NPDP, the main aim is to further long-term defence interests -- industry development is seen as incidental to this objective.

Several government agencies follow the practice of awarding development contracts arising out of procurement needs to local industry. The Inglis Committee found that the principal agencies at the time it was looking at the issue were Telecom and the Department of Defence, and to a lesser degree, the Overseas Telecommunications Commission, the Department of Aviation, CSIRO, the Department of Health, Australia Post and the Australian Taxation Office. Some government

[1] A number of government organisations which supply commercial goods and services in competition with the private sector are exempt for the purposes of discharging offset obligations.

respondents to the Commission's survey of NPDP participants have also made use of development contracts recently (without NPDP assistance).

Under the Commonwealth's purchasing reform policies, Ministerial Guidelines now actively encourage co-operative industry and government development of innovative products to meet procurement needs, for example:

> Guideline 1: Getting Value for Money directs that "innovation in approach by new suppliers should be given full consideration";
>
> Guideline 5: Using Staged Procurement states that when agencies have identified their requirements, they should issue Invitations to Register Interest in order to "identify available or possible products, services or solutions". (This guideline also directs that any costs of trialing and demonstrating potential suppliers' equipment should be borne by the bidder as a normal commercial risk); while
>
> Guideline 12: Australian and New Zealand Suppliers states that potential ANZ suppliers should be made aware of future needs, so that they will be in a position to offer innovative solutions. The intention is to offer "scope for co-operative product development and influence over the supply base, and easier variation of design, delivery or other factors".

The reforms also aim to counter any attitudes (such as risk aversion) which may inhibit co-operative development. For example, the Getting Value for Money guideline directs that supplier attributes such as the ability to deliver (and to provide longer-term support), company financial prospects, technical and managerial resources, and past performance (if relevant), must be assessed when comparing offered solutions. Thus, if an innovative supplier is rejected as being too risky, this should be based on a well-informed judgment, rather than an unjustifiable aversion to risk taking. Further, the guideline directs that guarantees, performance bonds or other security should be sought to cover any risks which might otherwise have to be borne by the government purchaser.

Guideline 2: Open and Effective Competition states that fostering competition is not an end in itself but only a means of obtaining value for money. "Effective competition utilises competitive processes which do not compromise the objective of value for money." This guideline also allows for purchasers to use negotiation as a substitute for competitive pressures if a sole-supplier relationship is considered to provide the best value.

There are a host of other agreements and agencies designed to facilitate government procurement. For example, under the National Preference Agreement, the States, Territories and New Zealand have agreed not to discriminate between each other in their purchasing. Also, there is a Purchase Australian Office, a National Industrial Supplies Office, and several state equivalents.

4.3 Risk aversion

Addressing risk aversion has always been a major stated aim of the NPDP.

In its final report, a majority of the members of the Inglis Committee argued that Australian firms faced barriers in competing for the supply of technology-intensive products to government:

> The most dominant barriers appeared to be those which derived from the attitudes of purchasing authorities favouring products manufactured overseas, or from aversion to risk that might be considered as associated with purchase of unknown or unproven products (DITAC 1987, p.4).

In announcing the NPDP, the Minister for Industry, Technology and Commerce stated:

> To counteract this problem of risk aversion the government will instigate a development program to support selected project development and demonstration projects aimed at meeting the Commonwealth's forward purchasing needs.

At the Commission's public hearing, Dr Parrott (appearing for the NPDC) stated:

> The NPDP arose of the government's actions following the Inglis Report of 1987 and from the outset there was a strong rationale for any program arising out of the Inglis Report to have the objective of enhancing competitiveness of Australian industry through addressing risk aversion in government practice (Transcript, p.37).

Some observers -- such as The Task Force on the Commercialisation of Research (1991) -- have used risk aversion as a reason for suggesting expansion of the NPDP.

In discussing the eligibility provisions of the Ministerial Directions, the IR&D Board's Annual Report 1990-91 confirms that "The real consideration is whether risk aversion is being addressed" (p.244).

However, discussions with members of the NPDC have indicated that, while combating risk aversion may be an objective of the program, it may not be an operational objective. Various members of the Committee said that risk aversion as a rationale is no more specific to NPDP than to other Board schemes and that it is not a key issue for the program.

Indeed, that combating risk aversion is not pursued as a serious operational objective of the program is reinforced by the fact that the Committee has never sought any evidence of the existence of risk aversion. Mr Bentley-Johnson, a foundation member of the NPDC stated:

> Risk aversion clearly is a matter of perception as much as it is a matter of reality and the report rightly says there appears to be no attempt to objectively verify the existence of risk aversion. I agree with that and I think, perhaps with hindsight, it would have been better to have objectively defined that rather than to rely on anecdotal evidence emerging from the Inglis Report and elsewhere (Transcript p.115).

The IR&D Board said that it has no objective evidence of the program's effectiveness in combating risk aversion or even the existence of risk aversion.

Views on the existence of risk aversion can largely be traced to anecdotal evidence from potential suppliers to Australian governments.

Judgments about the nature and consequences of risk attaching to buying from a particular supplier require knowledge of the operational, development and cost pressures faced by the managers responsible for such decisions. It is possible (even likely) that perceptions of risk aversion could reflect ignorance of such considerations on the part of third parties, rather than any deficiency on the part of the purchasing authorities. Accordingly, the Commission has examined the issue from first principles.

What risks affect procurement?

The acquisition of goods and services -- particularly high-technology products -- can be conditioned by a range of considerations. The main sources of risk in considering the purchase of such products from a particular supplier are:

- Performance risk -- the project may not meet expectations in terms of performance (or may involve unanticipated costs in realising promised performance);

- Commercial risk -- the firm may not be well placed to complete development of a product and follow through to manufacture (this may be for reasons unrelated to the project at hand);

- Integration risk -- in some cases a product may be incompatible with the environment in which it must operate (or there may be unforeseen costs in integrating the product satisfactorily);

- Timing -- the project may not be finished at the time when critical strategic decisions need to be made by the buyer;

- Emergence of alternative solutions -- between the time when a purchasing commitment is made and the product is delivered, a more cost-effective solution may become available; and

- Upgrade and post-sale risk -- having achieved a sale, the supplier may not be willing (or indeed able) to maintain product development to keep pace with relevant technological developments, or to provide necessary back-up service.

It is unlikely that buyer and seller will share the same information/views on which to base an assessment of risk. Further, some of the above involve anticipating a potential supplier's likely future behaviour. It is therefore inevitable that assessments of project risk will differ between buyer and seller. To the extent that suppliers do not appreciate the responsibilities of purchasers, and tend to have a more favourable view of their own capabilities and company viability, they will be overly optimistic about their proffered solutions; and the prospective purchaser may well appear to be risk averse if some other supplier is preferred.

These types of deficiencies in suppliers' understanding of purchasers' requirements and the context in which procurement decisions are made were encountered in a study of the Australian Industrial Research and Development Incentives Scheme:

> It is clear that many companies overestimate their understanding of their potential customers' requirements and of their competitors' reactions to any new developments (IR&D Board 1990, p.36).

During the course of this inquiry the Commission found that suppliers to government have varying degrees of appreciation of the requirements and constraints facing government purchasers.

The NPDP principally addresses technical risks -- performance, timing and integration -- by assisting in the trialing and demonstration of locally made products. Generally, the NPDP selection process requires firms to rank highly in terms of commercial risk, although the grant itself shifts some of the cost of this risk to government.

Interviews with government agencies and responses to the Commission's survey (Appendix C) indicate that technical risk is less important than firm-related risks in project assessment. This is supported by studies of Australian R&D performance which have found that technical failure is the cause of only a minority of project failures:

> The study evaluated 42 projects undertaken by companies in Australia. It did not represent a typical sample of R&D projects: these projects were chosen from among the most potentially exciting innovation projects being conducted in the country at that time. 17 of the 42 projects achieved commercial returns. (It can be safely assumed that the overall success rate is much lower, as the sample skewed towards larger and highly visible projects). The remainder were either marginally successful, when success is defined in terms of results that tangibly benefit the company, or failed outright. The failures must be largely attributed to factors at play beyond the invention stage of the process, as 90 per cent of these projects achieved working prototypes (PCEK 1991ÿp.19).

> In the IT [Information Technology] area Australian companies are more than competent to design products. However, they are very poor at producing products the customer wants which have adequate after sales service (Survey respondent).

Risk management in procurement

Most government agencies are sheltered from direct market disciplines. However, public sector reforms and limited budgets have placed an increasing emphasis on achieving value for money in purchasing. Government agencies are required to source inputs cost effectively, having regard to search costs, price, risk and likely performance. That is, for any option to be preferred, avoidable risks of failure, under-performance or cost overruns need to be offset by a potential for gain of at least commensurate value to the purchaser. Such a net gain may take the form of a lower price, lower operating costs or a potential to exceed a 'safer' product in some quality valued by the purchaser.

As part of the procurement reforms, Commonwealth Procurement Guideline No. 8: Managing Risk in Procurement covers the "philosophy, principles and practices for managing procurement risk".[2] The guideline points out that applying sound risk-management procedures in procurement is "essential" because it enables program objectives to be met more efficiently, and is important to suppliers because it will enable them to plan more confidently. However, the guideline also points out that the costs of applying risk-management techniques must be weighed against the importance and nature of the purchase.

The guideline also explains how to analyse potential risks; how to identify what, when, how and why things may go wrong; how to determine how likely it is that they may go wrong; and possible consequences if they do go wrong. Once the level of risk is established, it can be assessed against the benefits expected from the particular purchase.

The guideline discusses how to allocate responsibility for dealing with risks to those most appropriately placed to do so (eg the supplying firm for quality control and the purchasing agency for making sure purchase specifications are appropriate). As detailed risk analysis may require the application of advanced analytical tools and a high level of technical skill, staff dealing with procurement should have training appropriate to the level of their purchasing responsibilities.

On the one hand, the guideline specifically warns that risk avoidance may "result in significant cost penalties and diminished levels of efficiency, with a direct influence on program outlines", while on the other it also states that effective dealing with risk "may still require some risks to be totally avoided by declining the supplier's offer".

The guideline also discusses warranties, insurance and -- in cases of complex or high-cost purchases -- carefully worded contracts; as methods of reducing risk exposure. Performing technical and financial evaluations of potential suppliers is also recommended, as is endeavouring to develop close relationships with potential suppliers.

An important point to recognise is that the potential loss from non- or under-performance could well exceed the purchase price of the product concerned (eg where it is required to integrate into an environment where there is already a large investment in equipment, staff and training). In these circumstances, it makes sense to give due weight to loss-avoidance strategies. Such considerations depend on a detailed knowledge of the technical, managerial and industrial environment affecting the procurement decision, and are germane to the evaluation of options.

[2] Information was obtained from a draft copy as the final document is yet to be completed.

The Prime Minister's recent 'One Nation' statement[3] says that, in order to provide wider opportunities for companies to access public sector markets and enhance the prospects of local industry, in the case of information technology contracts:

> Following an assessment of the risks involved in individual contracts, the Government will consider accepting more of the risk and setting limits to the supplier's liability for damages (p.95).

Risk, uncertainty and the cost of information

In its first submission, the IR&D Board noted:

> In considering market failure problems associated with government purchasing in the technology market, it is important to distinguish between risk and uncertainty. Risk is measurable, while uncertainty *per se* is not. It is not helpful to analyse of the issue at hand to simply say that risk aversion is an aversion to uncertainty. Most businesses are averse to uncertainty; however most businesses will operate within some risk-reward framework in their decision making (Sub. 15, p.1).

Most recognised 'risks' are in fact areas of uncertainty for which some competence or experience has been developed for inferring the underlying probabilities (which are not directly measurable). This is recognised later in the Board's submission:

Further, even if there were an incentive to take account of risk rewards, it is important to distinguish between risk (which is "measurable") and the uncertainty which underlies it. Efficient risk-reward weightings assume that uncertainty is assessed and translated into risk without bias (Sub. 15, p.30).

The distinction between risk and uncertainty is useful in highlighting the role of information and risk-management skills. The acquisition of either of these (or the exercise of the latter) is not costless, and therefore needs to be justified against the potential gain in terms of better procurement outcomes.

It does not automatically follow that a greater reliance on judgment, rather than quantified risk assessments, will lead to bias against products with which potential purchasers are unfamiliar. Indeed, the process of developing skills in risk management often brings to light the existence of risks not previously acknowledged to be associated with a 'safe' option. A purchaser with low risk awareness is more vulnerable to unwittingly taking a risk than one attuned to problems which may arise. That is, acquiring additional information can disadvantage a product:

> ... it is difficult to conclude that one of the benefits gained by the participating firm is an unfair advantage in achieving government sales. Rather, the participating firm appears to have enjoyed the various technical benefits of the NPDP scheme at the expense of exposing the overall strengths and weaknesses of his product to a potential buyer (IR&D Board, Sub. 15, p.62).

[3] Statement by the Prime Minister, the Honourable P. J. Keating, MP, 26 February 1992.

What is risk aversion?

Risk aversion can take a number of forms but is basically a desire to minimise the variability of possible outcomes of a decision (or set of decisions). In this sense it is an aversion to uncertainty itself. For a risk-averse individual to accept a risk, the potential for gain has to be considered more valuable than the exposure to possible loss. More formally, a risk-averse individual would be prepared to pay a premium to avoid exposure to loss which exceeds the probability weighted value of that loss.

It is generally accepted that most people are risk averse when handling their own affairs, and that this is a reflection of underlying preference (typically dislike) for risk. Risk aversion therefore does not, *per se*, represent inefficient behaviour. Put another way, there are no objective reasons to question the value people place on security.[4]

Risk avoidance is a rational response to the problem of uncertainty in a world of limited information. It is not, in itself, an impediment to the efficient operation of a market. Some authors, in particular Arrow (1962), have suggested that risk aversion may interact with other deficiencies in the marketplace associated with limited opportunities to spread risk, or hedge against adverse outcomes. However, it is not the risk aversion which may be the problem, but the way in which markets deal with uncertainty.

While risk aversion motivates individuals to find ways of reducing potentially catastrophic variability in their fortunes, such a preference does not necessarily result in avoidance of all higher-risk options at any price. As noted above, instead of just avoiding risky decisions, people can insure against the risks attached to the decisions they make. People can also adopt a 'portfolio' strategy -- by 'not putting all your eggs in one basket' -- so as to spread risk through diversification.

The extent to which individuals can take advantage of the benefits of diversification varies according to circumstances. Governments, on the other hand, are automatically provided a considerable portfolio protection against risk by the diversity of their activities (even in situations where devolution of responsibilities for expenditures is common); and have substantial scope to further diversify if warranted. They can also spread the consequences of risk over many taxpayers.

Therefore, it is not efficient if a government consistently chooses to avoid high-risk/high-reward options in day-to-day decision making, because it already has a good method of coping with risk by spreading it around its portfolio of activities. By not choosing some options with the potential to yield high returns, it misses out on even the possibility of occasionally benefiting significantly from its purchasing decisions.

4 Risk aversion makes the commercial provision of insurance against many types of risk viable. Through insurance, individuals are able to pool risks by payment of insurance premiums. By taking advantage of the preparedness of individuals to pay in excess of the probability-weighted value of the risks they face, insurance companies are able to more than cover the cost of claims and expenses from premium income, making it a profitable undertaking to offer insurance.

This is perhaps less applicable at the level of local government, where a single contract or activity may be sufficiently large (in the event of a bad outcome) to adversely affect overall finances, because of fewer opportunities to offset or spread risk.

It is managers within government who make purchasing decisions. How they behave when facing decisions between projects characterised by varying degrees of risk depends on the incentive/penalty structure they face as purchasers. Risk aversion will not occur unless managers work in a purchasing environment which allows purchasing decisions to be inefficient, and which also exhibits a bias towards decisions which avoid risk (as opposed to ones which encourage risk-taking, or do not consider risk at all). Even in such environments, for managers to systematically make risk-averse decisions would require the ready identification of failures which are attributable to risk taking, as well as a high degree of personal accountability for failure. Neither of these assumptions rests well with generally accepted perceptions of management in the public sector. While some failures may be difficult to hide, the provision of accurate, relevant information for assessment of the performance of government programs is still a priority area for reform in the public sector. Similarly, over the last several years Australian governments have been attempting to *increase* public sector accountability.

While it is frequently claimed that 'no one ever got sacked for buying IBM', it is probably equally difficult to get the sack in the public sector for any purchase whatsoever. Relative to their private sector counterparts, public sector managers have a greater degree of insulation from the consequences of their decisions. Not only is the ultimate sanction of dismissal or demotion generally weaker, but the threat of unemployment through sending one's employer broke is rare, even in the case of a government business enterprise. These considerations would reduce the incentives for public sector purchasers to be overly concerned with risk.

In its submission responding to the Draft Report, DAS presented an analysis of the types of risk aversion associated with government procurement. The first type of risk DAS called transaction risk, which it described as follows:

> ... reluctance to buy unproven technology is not limited to the government sector. It is clearly a characteristic of all commercial behaviour: companies at all levels prefer to deal with known suppliers, reliable distribution networks and brand name products. The rationale is that the company saves time and money in the purchasing process and reduces risks associated with non-performance, lack of service, or parts ... This we agree is a perfectly rational response to risk or uncertainty, but if we are to change the purchasing culture, we believe there is a need for an incentive to trial an unproven product or a new supplier. The NPDP provides that incentive (Sub 33, pp.12-3).

Having identified minimising *transaction risk* as a rational response (and therefore not risk aversion), DAS went on to describe another form of risk aversion said to be present in government purchasing, which it termed *procedural risk:*

> ... the tendency under the previous procurement regime, to be more concerned with following the rules than achieving the most effective solution. ... The [Financial Management Improvement Program] review goes on to

> describe a prevailing culture of caution and risk avoidance. The risk being avoided though, was not the risk of product failure, but of adverse affects on career prospects. A purchasing officer could be criticised for buying products that failed but this could be deflected by reference to having 'followed the rules'. The underlying purchasing system inhibited initiative and produced inefficiencies, delays to major projects and strained relationships with major suppliers (Sub 33, pp.12-3).

DAS said that *procedural risk* could not be said to exert any particular bias on *transaction risk*. For example, on the one hand *procedural risk* may lead to tenders going to the cheapest (and therefore usually the riskiest products); but on the other hand it may preclude innovative (and often riskier) products, by encouraging rigid tender specifications.

Guideline 10: Benchmarks for Procurement Decisions provides a further safeguard. It stipulates that purchases which are either highly complex, or involve amounts greater than $30 000 (into which category all NPDP projects automatically fall) must receive senior managerial attention:

> For purchases over $30 000 a full understanding of the concepts underlying the Government's purchasing objectives and purchasing policies is required. Any guidance in departmental instructions about choosing procurement methods should allow procurement staff to exercise their judgment in this range. Decision makers will need professional levels of expertise and training in procurement, with well-developed technical and managerial skills. They will need to have expertise in a range of evaluation techniques and to understand the relationship between procurement methods, different forms of tender and contract documentation and planning. It will also be necessary for officers to have a sufficient grasp of the legal implications of the various methods of procurement (and of varying them) to be able to know when to seek advice from the Australian Government Solicitor.

This guideline goes on to state that many procurement methods can be appropriate -- for example, negotiation, confined invitations to tender, or design competitions.

Overall, it seems clear that public sector managers have less incentive to be concerned with failure than their private sector counterparts. Further, there does not appear to be a strong a priori case for risk aversion in the public sector.

Evidence of risk aversion

Risk aversion is easily alleged but difficult to substantiate. It appears to be a condition that many have taken for granted from the inception of the NPDP, without adequate validation of its existence or causes.

In some cases, participants appeared to equate any degree of risk sensitivity with risk aversion. As discussed above, incorporating risk/uncertainty considerations into procurement decisions is essential to efficient decision making. The existence of risk and uncertainty changes the objective from maximising prospective returns from limited resources to maximising the expected return

from the application of available resources (including intangible benefits such as technology spin-offs and improved knowledge of the marketplace).[5]

In interviews with the Commission, representatives of government agencies revealed a generally favourable attitude to Australian suppliers, saying that they valued the advantages of greater flexibility and local service back-up even to the point of citing instances of bias in favour of local suppliers. Some 53 per cent of government partners responding to the Commission's survey provided details of project risk-control strategies, suggesting that such strategies can be (and are) used in sourcing innovative products from local suppliers.

Several submissions noted that, rather than being risk averse, government purchasing practices appear biased towards higher-risk, lower-quality products -- because too much emphasis is placed on achieving low-price purchases, rather than considering whole-of-life costs. As Techway Computers put it:

> Although the government, at a *policy* level, has indicated that it makes its procurement decisions based upon an assessment of *value for money* it is very obvious that at the procurement stage the decisions are often based upon price alone.
>
> [Such a policy] discriminates against those Australian companies who have accepted the government's challenge to *achieve international standards of quality in products*. It is not possible to achieve these standards and provide government with the lowest price. However it is consistent with providing best value for money (Sub. 1, p.1).

The need to emphasise value for money as a basis for purchasing was also emphasised by DAS in its submission:

> This makes it clear that purchasing decisions should not be made on price alone but should take account of all relevant considerations including for example quality, delivery arrangements, inventory and warehousing, contractor capabilities and whole-of-life costs where appropriate (Sub. 18, p.4).

By contrast, some submissions claimed the opposite effect -- quality (or other considerations) dominating price in government purchasing decisions. These claims tended to relate to the purchasing of medical products by government agencies, such as public hospitals:

> Within the Australian medical context, there is a culture of excellence. Public funding of equipment creates an environment where there is a heavy emphasis on buying only the best, without it necessarily being the most cost efficient ... Price/reliability trade-offs and technical back-up and technical support services are often not adequately considered (Ausonics, Sub. 11, p.5).

[5] A purchasing authority which fails to include in its decisions industry assistance objectives is not displaying risk aversion. The question of whether agencies should compromise the efficiency of their operations (and their service to the Australian community generally) by assisting local industry is distinct from that of how those agencies manage risk.

> Testing for HIV infection is a very emotive area with no margin for error and the reluctance to change from a product with known characteristics to an unknown product would be understandable (Amrad, Sub. 13, p.3).

This is consistent with a statement made by the Department of Trade (DOT 1985), commenting on an export capability survey published in January 1985:

> Whilst 'bread and butter' items such as consumables are usually obtained through government tendering systems, ... specialised equipment is generally purchased at the recommendation of the doctors using it. As a result, at the high-technology end, purchases are usually 'state of the art' imports. This preference for highly regarded, usually European or American, brand names can also prevail where tenders are called, by matching tender specifications to those of the preferred equipment ... Conversely, it was noted during an inspection of a private hospital that there was a greater presence of Australian-made equipment even at higher technology levels. This was attributed to stricter budgetary constraints than those applying in public hospitals (p.10).

This suggests that the problem is not risk aversion, but a lack of accountability for the additional cost of acquiring 'top shelf' products. In other words, poor control of public funding can result in inappropriate 'signals' being sent to those making purchasing decisions.

Once again, assertions are being made by parties clearly disadvantaged in their appreciation of the circumstances of the decision-making authorities about whom the claims are made. In a detailed examination of the issue of whether purchasing preferences were being correctly applied, the Industries Assistance Commission (IAC, 1987) as part of its inquiry into Medical and Scientific Equipment, found that:

> ... for many of the goods under reference - especially the 'big ticket' items - it is patently not the case that prospective purchasers regard imported and domestically produced medical and scientific equipment as for all intents and purposes 'equivalent' ... Because of the resulting complexity of the decision-making process in terms of trade-offs among desirable attributes, it will often become well nigh impossible for a third party to judge whether or not preference policies have been properly applied in any particular instance. It is therefore understandable that people in different positions will reach entirely different conclusions about whether or not local industries are benefiting from the operation of government purchasing preferences (p.113).

Policies and practices which bias decisions towards either end of the price-quality spectrum clearly reduce the scope for firms to succeed through product differentiation and the provision of cost-effective products (which may not be the cheapest or the best). The problem here is one of insufficient incentives for purchasers to embrace value for money. As mentioned earlier, this is a continuing focus of attention of the Purchase Reform Group of DAS.

4.4 Effects of the program on government procurement

The Commission found that government agencies commonly express a positive attitude to Australian suppliers. However, hard evidence as to whether the NPDP has made an impact, positive or negative, on these attitudes is lacking. This is perhaps not surprising given the small size of the program and, as DAS pointed out, its ineffective demonstration effects.

Use of non-repayable grants to assist selected projects/firms can operate to reinforce perceptions that favoured activities require help to be viable (especially where firms have a long history of government support).

The Inglis Committee, whose report prompted creation of the NPDP, recommended that recipients of development contracts provide a return to the scheme through royalties or other forms of (re)payment -- at least in the case of successful projects. The commercial performance of the fund would then provide some indication of the overall viability of projects supported. However, such an approach may merely prove that, over the long run, successes do not compensate for failures -- confirming a dependence on assistance.[6]

Overall, the pattern of grants under the NPDP scheme has not been influenced by any underlying analysis of the incidence of alleged risk aversion. As the IR&D Board submission described the process:

> During this establishment phase of the program [1987-88 to 1989-90], some grants were awarded to small firms with projects of limited commercial potential. The Committee subsequently agreed that a more targeted approach of potential participants was needed and planned to adopt a portfolio approach to provide a focus for promotion and support of the Program. The portfolio would include a balance between industry sectors and technologies, R&D and trialing/demonstration, company size, and project size (Sub. 15, p.13).

This approach suggests that the NPDC is now attempting to spread assistance rather than focus on areas thought to be particularly susceptible to 'risk aversion' -- further moving the scheme away from its original intention.

In a survey of NPDP-recipient firms conducted by DITAC, it was found that 80 per cent had made sales to the government and 65 per cent had exported prior to qualifying for an NPDP grant. The program is therefore not directing grants to firms that are either little known or which have not had the opportunity to establish a track record. Quite the opposite. This focus has resulted in a

[6] The disappointing and occasionally disastrous performance of government initiatives to subsidise the provision of venture capital for 'hi-tech' enterprises has signalled a predominantly negative message as to the viability of such markets. The Management and Investment Company scheme was premised on the assumption that then existing institutions systematically avoided financing viable (albeit risky) investments. Instead, the experience is more consistent with a tendency for governments to systematically underestimate the inherent riskiness of these types of projects.

gravitation of risk-assessment criteria to practices similar to those applied by purchasing authorities, and which contributed to the original allegations of risk aversion. Several respondents to the Commission's survey commented on this:

> The original criteria, under the original Committee, were satisfactory. The present criteria are too conservative and appear biased towards large companies.
>
> We believe that the Board's emphasis on financial capacity is somewhat too strong for the types of companies the NPDP is intended to assist.
> At one time during our application we had a potential investor with $300ÿ000. From that day onwards all the department people we spoke to used that investment as a lever: "If you get the investment you should get a grant". If we had got the investment, we would not have bothered with the hassles accompanying your grants.
>
> We are concerned now that, like the rest of the present government policies, NPDP has changed direction to pay homage to the `big is beautiful' dogma and that small companies, such as ours, face inordinate difficulties in winning support.

Access to a government subsidy may discourage firms from refining their risk-management skills. A similar finding was made by the Bureau of Industry Economics (BIE 1988) about the (now defunct) Commonwealth purchasing preference margin:

> If local firms believe that one of the reasons for success was the application of the purchasing preference margin, they are less likely to consider the winning of the contract as a stepping stone to success in international markets (p.37).

The possibility that there is a similar effect operating in respect of government partners was noted by the Australian Artificial Intelligence Institute:

> I do not think these programs create risk aversion, I certainly think it lets organisations off the hook. I mean, the alternative as I see it, is that you do not provide this sort of funding; the organisation learns by its eventual failure to establish its competitive position in the market place; it eventually learns that it was too risk averse and if it can survive that, can go on and become less risk averse (Transcript p.12).

In the case of the NPDP, several firms and government partners have sought (and for some, obtained) grants for more than one project. This suggests that either the first project was not sufficient to convince even the direct participants that the potential returns justified the risks, or that the participants are tapping into the program as a source of costless finance (in the form of transfers from taxpayers).

This is consistent with a finding in the IR&D Board's survey of grant recipients which found that the most popular benefit to firms from the NPDP was simply "cash injection" (see Appendix B).

In practice, the NPDP has operated to subsidise projects where the involvement of a government agency is incidental (and at times contrived) to the progression to market of a new technology. The

program now targets firms for which the risks of failure in commercialisation are low. Accordingly, prospective applicants are informed that the assessment criteria for grants include:

- established track record;
- a strong current and longer term cash flow position; and
- established commercial track record in the domestic market and preferably in the export market

These criteria provide no help towards overcoming any inefficiencies in government procurement arising from purchasing officers being loathe to try products from little-known small Australian firms. DAS, which co-authored the original NPDP concept along with DITAC, has identified the lack of procurement emphasis as a major failing in the scheme:

> ... the program needs to be more targeted in its approach to funding. Projects receiving funds should be closely related to the needs of Government purchasers. This requires a high degree of communication with purchasers themselves ... The present structure and funding of the NPDP does not permit sufficient resources to be devoted to these activities:
>
> ... funding for research and development or product development could be included in the budget allocations of the agencies themselves with the NPDP acting as external assessor. In other words, agencies would be responsible for administering the funds allocated to them through the budget, but funds could not be allocated without the express approval of the NPDP (Sub. 18, pp.23-4).

Specifically, DAS proposed that:

- proposed projects should meet specific procurement needs;
- assistance should only go to those agencies which do not have R&D budgets;
- applicants should be required to list all assistance received currently or in the last five years, and this information should be used in determining the applicant's commercial viability;
- applications should be presented to the Committee "jointly by company representatives and the government partner, not DITAC officials"; and
- the NPDC should be extended to include a large group of specialists, with only a few called in to assess any one group of applications. This should include government representatives with expertise in the area of technology being considered (but these representatives should not be from the government partner).

Some government partners have expressed concern that, as the program is run at present, the commercial partners have almost complete control of the funds and the direction of the project. The DAS proposal would basically reverse the present emphasis.

5 ADMINISTRATION

Any assessment of the efficiency of the National Development Procurement Program (NPDP) must have regard to the resources consumed by the processes of application, selection and administration of projects and the effectiveness of those processes.

Comments from respondents to the Commission's survey on administration of the scheme ranged from the highly favourable the to very negative. Such comment provides some insight into how the program operates in practice, but needs to be balanced by other assessments of how well the program addresses government objectives. This in turn depends on how competently the program has been managed to achieve benefits beyond boasting the profitability of grant recipients.

This review spans the operations of the program since its inception. Over that time, administive initiatives and selection criteria have evolved to generally improve program administration and give greater emphasis to commercialisation. Those changes would be unknown to some survey participants, and therefore would not be reflected in their responses.

5.1 Selection procedures

Applications for grants are initially forwarded to the NPDP Secretariat[1] which refers them, along with an assessment, to the National Procurement Development (NPDC) for decision. The NPDC -- which essentially comprises a panel of industry, technology and finance representatives -- meets once a month to decide on applications.

A degree of subjectivity in the approval process is inevitable. Whatever the knowledge and experience of members of the NPDC, 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. Should the Government wish to continue the program, it would be desirable for applicants to be given the opportunity -- on their initiative and at their expense -- to personally present their proposals to the NPDC (or at least one Committee member) prior to a decision being made.

In any event, lack of contact between applicants and the NPDC caused some applicants to believe that their applications were not given a fair go. Some examples were:

[1] The Secretariat is part of the Department of Industry, Technology and Commerce (DITAC).

Not one of the decision makers saw or made contact with us. A particularly bad (and totally inaccurate) report produced in isolation gave our application no chance of success (Survey respondent).

> Decisions are made by a committee who do not have direct contact with the applicant. This is a most unsatisfactory situation as the state representative does not necessarily fully understand the product (Survey respondent).

This aspect of the program has attracted criticisms of bias from both successful and unsuccessful candidates. Such criticisms are encouraged by the secrecy of the selection process:

> The NPD Committee assesses the information in each application and makes a decision in its collective wisdom, rather than using a quantified formulaic approach. The Committee has a policy of not giving reasons for its decisions (DITAC 1989, p.43).

The NPDC claimed that feedback is currently provided to unsuccessful applicants through the DITAC Secretariat. In giving feedback, the NPDC may be constrained in some cases by the need to protect the confidentiality of (other) applicants when decisions are based on comparative analysis. Nevertheless, this appears to be an area where improvement can be made.

The provision of feedback is also important in the case of projects which are successful in obtaining grants. Not only would it add to public information on the NPDC's priorities, but would lend direction for future management of successful projects.

5.2 Application of the NPDP selection criteria

There is very little (public) information on why particular projects are accepted or rejected. From an examination of applications, the Commission has concluded that the approval process is not strongly linked to any consistent agenda. Confusion in stated program objectives contributes to this, as does the broad nature of the eligibility and assessment criteria in the Ministerial Directions (Box 1.1), and the liberal interpretation given to these criteria. The application of the present criteria is far from straightforward, and few outsiders would appreciate the scope for administrative discretion in the program.

Relevance to government procurement

Despite the origins of the program, buyer interest is not given much weight in the Ministerial Directions, or the 1991 legislative amendments formally incorporating the NPDP into the IR&D Act. The IR&D Board is only required by the directions to "have regard" to government requirements -- in contrast to a mandatory requirement that eligible projects be "internationally competitive".

The Commission's survey and interviews revealed a number of cases in which the role of the government partner has been essentially passive, with little or no interest displayed in the product being developed. Many 'partnerships' between government agencies and firms appear to have been

essentially marriages of convenience to make the project eligible for a grant -- rather than representing an expression of genuine buyer interest. It is not a requirement that government partners either invest in or share ownership of the project.

Of the 52 commercial partners responding to the Commission's survey, only two reported that the government partner had either initiated the project or the grant application. This overwhelming imbalance suggests that the program is not driven by government procurement requirements (or for that matter, to overcome any deficiency in government procurement) but by 'technology push' (Chapter 1).

This issue has already received some attention from the NPDC and assessment procedures amended to give:

> ... a greater weighting towards projects which are strongly supported by the government partner, particularly in terms of assistance in project management and corporate commitment by the government partner (IR&D Board, Sub. 15, p.16).

Development of internationally competitive products

The emphasis now given to the development of potentially internationally competitive products has effectively changed the character of the program from one of addressing perceived deficiencies in government procurement to one of assisting Australian industry.

As discussed in Chapter 3, the NPDC appears not to distinguish between competitive advantage (with potential to add to national income) and the advantage favoured firms may gain from government intervention (at the expense of the competitiveness of other parts of the economy). Uncertainty as to how the NPDC interprets international competitiveness means that there is ambiguity about the real purpose of the scheme.

The demonstrated existence of market failure might justify government intervention to assist activities impeded by such failures. However, as discussed in Chapterÿ2, there is no evidence that market failures are targeted by the NPDP.

Exclusion of agencies with research and development budgets

The main purposes of this criterion appear to be to ensure that the NPDP is not used to fund projects which fail to achieve sufficient priority within sponsoring agencies, as well as to prevent public sector organisations from using the NPDP to supplement already-available research funds.

The list of successful NPDP applications includes a number of projects for government agencies which have (or administer) research programs funded through government budgets (eg the Department of Defence). When queried about this, the NPDC advised that this criterion only affects an application if the government partner has a "specific budget provision" for the project.

However, for the majority of agencies involved in the NPDP, whether a specific provision exists for any given project is at the discretion of the agency. The implication of the NPDC's approach is that government agencies cannot be expected to conduct development activity of the type envisaged for NPDP support if they have not received funds from the budget specifically earmarked for the purpose.

The criterion has even less relevance to a business enterprise, (government or otherwise) which might be expected to subject research, development and trialing to the same disciplines as other investment decisions funded from its budget.

Schemes such as the NPDP can act to discourage the integration of technological developments into the mainstream corporate management processes. The special funding arrangements for NPDP projects could be expected to reduce pressure to satisfy normal investment disciplines, thereby inhibiting the application and development of appropriate evaluation techniques within the organisation. Prima facie evidence of this can be found in the repeated use of the NPDP by some government agencies. In effect, the NPDP could be encouraging the risk aversion it was established to address.

Focus on 'marginal' products

As noted in Chapter 2, 45 per cent of grant recipients responding to the Commission's survey identified a likely alternate source of funding for their project, should a grant not have been forthcoming. Indeed, some projects were well underway before a grant application was made.

The NPDC is required by the Ministerial Directions applying to the program to assess that a project would not proceed "satisfactorily" without an NPDP grant. For a project to satisfy this criterion it is not necessary to demonstrate that the project is dependent on the grant to be viable. Rather, a project may be considered eligible if it is claimed that a grant will change the project in some substantial way including, as appears often the case, to 'speed up' the project.

Once this criterion is satisfied, a firm may receive a grant of up to half the assessed eligible development expenditure. There is therefore a clear incentive to attach 'enhancements' to a project (eg see Box 3.3), or claim a special need for faster development, simply to satisfy this criterion and qualify for a grant -- regardless of the cost-effectiveness of such add-ons. From an economy-wide perspective, this can result in more resources being invested in a project than could otherwise be justified.

Survey responses and a review of applications show that considerable discretion has been used by the NPDC in applying this criterion. Consequently, many grants have simply transferred wealth from taxpayers to participants in the program. Again, if the program has an impact in less-

dependent cases, it is to discourage agencies and companies from investing their own funds in development activity, in favour of increased reliance on outside financing.

Time limit

Projects are required to be completed within three years of grant approval. Presumably, the main purpose of the requirement is to control forward budget obligations.

Few projects appear to have been affected by this requirement. Accordingly, the Commission does not believe that there is a strong case for the NPDC to make commitments beyond three years. As a 'project' can be part of a larger development program, the NPDC clearly has the option of segmenting projects if it sees fit, leaving open the issue of later funding.

Australian benefit

Under the Ministerial Directions, the IR&D Board must be satisfied that a project will be undertaken in Australia and the results commercialised to the benefit of the domestic economy. The assessment criteria also provide for projects to be rated according to the potential flow-on benefits to the Australian economy.

This criterion focuses on the interests of local suppliers, rather than government agencies trying to find cost-effective solutions to their purchasing requirements. The requirement that the activity be undertaken in Australia provides assistance for indigenous development of innovative products and may reduce the need to match the performance of foreign competitors. This serves no purpose in addressing government procurement requirements. Indeed, it may lead to more expensive sourcing.

The issues of research and development and export benefits are discussed in other sections of this report (Chapters 2 and 3). However, an observation worth repeating here is the failure to distinguish between flow-on benefits to the direct stakeholders in a project and those flowing to other economic agents (ie genuine externalities).[2] There is no *a priori* case for the government to attach a greater value to benefits from any given project accruing to stakeholders than that attributed by the stakeholders themselves. This is regardless of whether the benefits arise directly or indirectly, or involve exports, research or development.

[2] For example, the summary of 'spin-off' benefits and 'externalities' presented by the IR&D Board to this inquiry (Sub. 15, p.68) are not externalities as conventionally defined. Rather, they represent indirect benefits internalised by the stakeholders of the project. As a necessary (but not sufficient) condition for government intervention, externalities refer to the positive and/or negative effects of activities on third parties in respect of which there are no practical and efficient means of charging/arranging compensation (Box 2.1).

Accordingly, the criterion requiring supported projects to benefit the Australian economy has not been applied to address why the government should fund particular investments.

Innovation content

The Commission is not well placed to assess the technical (or innovative) merit of projects sponsored by the NPDP. At face value, some projects appear to be breaking new ground in potentially promising fields; others appear to be more in the nature of customising an existing product/process for a given application. That is, innovation appears to have been interpreted to include both the development of new technologies and new applications of existing technology.

Whatever the interpretation, the Commission sees no reason for the government to value 'innovation content' for its own sake. It is not a reliable proxy of any divergence between social and private returns, nor does it appear to be particularly correlated with prospective commercial returns.

5.3 Monitoring

Successful applicants are required to form a project committee comprising at least one representative from both the commercial and government partner(s). After approval of the grant, this committee is required to forward to the NPDP Secretariat three-monthly reports on progress of the project. This places primary reliance for protecting the public interest, once a grant is approved, on the government partner.

In situations where the government partner's involvement does not reflect a genuine (eg a material) interest in the product being developed, and/or the project has other objectives (eg development for export markets), the effectiveness of the monitoring and partnership process can easily break down. As one solution, several participants suggested that the IR&D Board/NPDC be represented on project steering committees.

In responses to the Commission's survey and/or request for submissions, some of the commercial partners expressed dissatisfaction with lack of input from government partners:

> Lack of communication has placed this organisation at risk of failure. ... If we survive this one we will never again seek a similar experience (Survey respondent).
>
> Criteria relating to the commercial partner very comprehensive but not enough consideration given to the Government partner before, during and after the period of the grant (Survey respondent).
>
> The NPDP agreement should stipulate the Government partner must trial and demonstrate the "Acceptable" prototypes (Survey respondent).

By contrast, many of those commenting favourably on the program emphasised the value of the co-operation between government partner and supplier.

> For a successful outcome, the Government and Commercial entities must be in constant communication over long distances (Survey respondent).

The experience of some survey respondents has highlighted the poor understanding by some government partners of their roles on the project steering committees and, in extreme cases, lack of any sanction against government partners failing to meet their obligations under their NPDP agreement.

A number of participants were critical of the 'process orientation' of the quarterly reports. These reports emphasise the fiduciary aspects of ensuring that project expenditure (including grant monies) is in accordance with the relevant agreement, including achievement of milestones. Several participants said that the quarterly reports should also address the objectives and achievements of the project from a broader perspective.

The current *pro-forma* for quarterly reports require project committees, inter alia, to:

> ... provide information on the exploitation of results, expressions of interest, marketing plans and developments etc.

The Commission doubts that this could be relied upon by the NPDC to ensure that events adverse to supported projects are reported, particularly where such events relate to changes in the market, rather than the product being developed. Very few projects have been terminated by the Board for commercial (rather than technical) reasons, yet it appears that few projects have achieved anything like the commercial results anticipated in grant applications (see Overview).

Circumstances contributing to approval of a given project can change, or early trialing may reveal higher costs or lower performance than originally envisaged. Changed circumstances may adversely affect a project's commercial viability. For example, a competitor may introduce a superior or equivalent product which is readily available and suitable for the government application.

As most 'innovations' fail for commercial reasons, rather than insuperable technical problems, there is a need to ensure that the commercial outlook for each project is actively monitored and given at least as much prominence as technical aspects. Projects should be abandoned if they cease to be viable.

5.4 Administrative efficiency

Of the original $17.5 million allocated for the first three years of the program (1987-88 to 1989-90), some $1.5 million was set aside to cover the running costs of the NPDP.

Included in the administrative costs of running the program are:

- Costs of the IR&D Board, to the extent that they relate to NPDP business;
- Costs of the NPDC, which comprises members from all over Australia, including travel and associated expenses of the monthly meetings; and
- The salary and administrative costs of the staff of the Secretariat and other DITAC personnel providing support to the program.

The Commission requested the NPDP Secretariat to provide details of the actual administrative expenses of the NPDP. At the time this report was finalised, only partial information had been provided. It indicated expenditures totalling $1.4 million for the program from inception to 30 June 1992. However, this figure excluded a range of costs, including overtime, accommodation, information technology support and corporate service items.

Apart from administration, efficiency losses arise from the costs (to commercial applicants and their government partners) of participating in the program. It is likely that applicants incur costs in preparing applications and on-going administration of at least the same magnitude as that of program administrators.

The subjectivity of the selection process and uncertainty as to the relevant criteria encourages applicants to rely on personal contact with administrators in completing applications -- a process which drains resources on both sides. This problem has been compounded by the reported high turnover of staff. Several participants commented that they had to familiarise new staff with their applications.

Taking into account the costs to DITAC, other government agencies and industry -- and the likely losses from inappropriate selection of projects under existing criteria -- a substantial share of the total cost of the NPDP appears to be dissipated in efficiency losses.

APPENDICES

APPENDIX A: TERMS OF REFERENCE AND CONDUCT OF THE INQUIRY

Terms of reference

INDUSTRY COMMISSION ACT 1989

I, RALPH WILLIS, in pursuance of Section 7 of the Industry Commission Act 1989 hereby:

1. refer the National Procurement Development Program (NPDP) for inquiry and report by 31 March 1992;

2. specify that, without limiting the scope of the reference, the Commission:

   a) assess the effectiveness and efficiency of the NPDP against its stated objectives of improving the efficiency and international competitiveness of Australian industry by:

      (i) providing financial support for research and development, trialling and demonstration within government departments and agencies of new internationally competitive Australian goods, services or systems (including prototypes) which meet government purchasing requirements, for the purpose of evaluation and endorsement;

      (ii) influencing the attitudes of government purchasing agencies towards positive consideration of Australian products and services for forward procurement requirements; and

      (iii) raising the credibility of Australian products and services in the eyes of potential users;

   b) analyse the intended and unintended impacts of the NPDP; and

   c) examine the contribution of the NPDP in relation to other schemes directed at research and development and the purchasing policies of governments; and

3. request that the Commission recommend any changes to the NPDP which may improve its effectiveness and efficiency should the Government wish to extend funding for the scheme beyond 30 June 1992.

Ralph Willis
Minister of State for Finance acting for and on behalf of the Treasurer
30 October 1991

Industry visits

Discussions were held with representatives of the following organisations (and in some cases involved more people than those listed).

Australian Capital Territory

Australian Construction Services	14/11/91	Mr John Hodge
Department of Defence	10/12/91	Dr Wood
Department of Administrative Services	16/12/91	Mr Ken Erwood
Department of Foreign Affairs and Trade	05/11/91	Mr E S Radclyffe
Department of Industry, Technology and Commerce	12/09/91	Mr Noel Benjamin
Department of Industry, Technology and Commerce	31/10/91	Mr Noel Benjamin
Department of Social Security	12/02/92	Mr Barry Martin
Department of Administrative Services	19/02/92	Mr Ken Erwood
Civil Aviation Authority	21/02/92	Mr Arthur Popple
Department of Industry, Technology and Commerce	05/03/92	Mr Noel Benjamin

New South Wales

Gestetner Lasers Pty Ltd	04/12/91	Mr Neil Tilley
Info-One	04/12/91	Mr Chris Kelly
Interscan International Ltd	04/12/91	Mr John Lee
Memtec Limited	03/12/91	Mr T McCormack
Pavement Management Services	03/12/91	Mr Ian Figtree
Standards Australia	04/12/91	Mr Kanesh
Stanilite Electronics Pty Ltd	03/12/91	Mr Mike Piatek
National Procurement Development Committee	24/03/92	Mr John Grant
		Mr David Zundel
		Mr Garth Wenck
		Dr John Parrott

Queensland

Queensland Department of Business, Industry and Regional Development	20/02/92	Mr Kevin Quinn
Queensland Department of Administrative Services	20/02/92	Mr John Mann

Victoria

ABON Engineering Pty Ltd	12/11/91	Mr Steve Bond
Oliver J. Nilsen (Aust) Ltd	12/11/91	Mr Oliver J. Nilsen
State Electricity Commission of Victoria	12/11/91	Mr John Hart

Submissions received

Submission Number	Participant	Pages
1	Techway Computers Pty Ltd*	2
2	Dynjab Research Pty Ltd	2
3	Nu-Lec Pty Ltd	4
4	Royal Australian Mint	3
5	Unique Software International	1
6	Australian Government Publishing Service	2
7	Department of Premier and Cabinet – Tasmania	3
8	The Preston Group Pty Ltd	2
9	Pavement Management Services	3
10	Australian Science & Technology Council	2
11	Ausonics Pty Ltd	9
12	Nucleus Limited	8
13	Amrad Corporation Limited	5
14	Chief Minister's Department - Australian Capital Territory	3
15	Industry Research and Development Board	127
16	Australian Electrical and Electronic Manufacturers' Association Limited	8
17	Department of State Development – WA	7
18	Department of Administrative Services	27
19	Victorian Government	4
20	Go Medical Industries Pty Ltd	5
21	The Australian Artificial Intelligence Institute	2
22	Australian Electrical and Electronic Manufacturers' Association Limited	5
23	Chemtronics Ltd	2
24	Ausonics Pty Limited	5
25	Computer Power Pty Ltd	4
26	Pavement Management Services	4
27	Mr Jeffery Bently-Johnston	18

28	The Preston Group Pty Ltd	5
29	Information Industries Advisory Council	2
30	BHP Technology and Development	7
31	Techway Computers Pty Ltd*	2
32	CHK Engineering Pty Limited	2
33	Department of Administrative Services	25
34	Industry Research and Development Board	22
35	Australian Science and Technology Council	1
36	Electro Optic Systems Pty Limited	1
37	Genasys II Pty Ltd	3
38	Metal Trades Industry Association of Australia	8
39	Queensland Government	2

* Contains confidential material

Public hearings

Public hearings were held in Sydney on 2-3 March 1992 and in Canberra on 4 March 1992. The following organisations presented evidence at the hearings.

Australian Artificial Intelligence Institute

CHK Engineering Pty Limited

Computer Power Pty Limited

Cramb Consulting Group (representing Ausonics Pty Ltd)

Electro Optic Systems

Industry Research and Development Board

Pavement Management Services

Preston Group Pty Limited

Research Department Pty Ltd

Royal Australian Mint

APPENDIX B: DETAILS OF THE NPDP

The National Procurement Development Program (NPDP) was established in 1987 following the Government's consideration of the Inglis Report on High Technology Purchasing Arrangements. The program aims to improve the international competitiveness of selected firms through the trialing and demonstration of high-technology products that link into the forward procurement requirements of government departments and agencies. The program provides grants of up to 50 per cent of eligible project costs (including research and development (R&D), trialing and demonstration). Total project costs must exceed $50 000.

The Industry Research and Development (IR&D) Board administers the program by entering into agreements with government and commercial partners. The IR&D Board is advised by the National Procurement Development Committee (NPDC), whose members are drawn from industry. The Ministerial Directions for the NPDP (Box 1.1) require that the Board be satisfied that a project:

- is directed to the development of internationally competitive and internationally traded goods, services and systems;
- does not include a government department or agency which has a specific budget provision for research, development or demonstration;
- would not proceed satisfactorily without a procurement development grant;
- will be complete in three years; and
- will be undertaken in Australia and the results of the project will be commercialised to the benefit of the Australian economy.

Table B.1: **Allocation of funds for NPDP grants**

Commitments (approvals)	*Authorised expenditure*	*Actual expenditure*	*Grants*
($ m)	($ m)	($ m)	(no.)
1987-88	2.2	0.7	0.7	12
1988-89	6.6	3.9	3.9	20
1989-90	8.5	6.4	5.6	30
1990-91	6.3	7.5	4.6	23
1991-92	7.4	na	na	na
Total	**31.0**	**8.5**	**14.8**	**85**

na not available
Source: IR&D Board (Sub. 15, p.10)

Applications for an NPDP grant are lodged with the NPDP Secretariat in Canberra (part of the Department of Industry, Technology and Commerce). Applicants are required to provide 15 copies of the application which must include:

- a statement outlining the main reasons for the government partner's involvement;
- *curricula vitae* for the project manager and principal researchers;
- a detailed profit and loss account, and balance sheet for the past three years;
- details on how the commercial partner will fund its share of the project;
- monthly projections detailing the source of funds and how they will be applied over the three years;
- details on how the results of the project are to be marketed;
- a business plan;
- a letter of understanding outlining ownership of any intellectual property rights associated with the project; and
- two reports from independent referees: one on technical and one on commercial merit.

The government partner may be a government department (Commonwealth, State or local), a government agency, a statutory authority, a local government authority, or a corporate entity wholly owned by government (but organisations like the Red Cross have somehow qualified as `government partners'). A project may be demonstrated or trialed in one or more government agencies and the commercial partner may consist of one company or a consortium of companies.

Table B.2: **Grants, by type of government partner**

	Value	*Number*
	($'000)	
Commonwealth Government	10,975	35
Departments	4 045	17
Government business enterprises	6 750	18
State Government	13,846	56
Departments	2 916	12
Government business enterprises	10 930	44
Local Government	0	0
Total	**4,641**	**91**

Source: IR&D Board (Sub 15, p.35)

Projects are monitored by a management committee drawn from the ranks of both partners. This committee is chaired by a representative from one of the project partners (known as the Project Manager). The project committee must report every three months to the NPDC. These reports form the basis for making progress payments.

Table B.3: **Commercial partner's reason for selecting government partner**

Reason	*Response* [a] (%)
Technical Support	36
Market Leader	31
International Standing	28
Commitment to purchase	19
Quality control	3
Other	39

a More than one criteria may be identified by the firm.
Source: IR&D Board (Sub. 15, p.56)

Table B.4: **Government partner's reason for participating in the NPDP**

Reason	*Response* [a] (%)
Purchase product if proven	60
Trial potentially useful technology	57
Establish useful benchmarks	13
Form closer commercial links	10
Provide alternative supply source	7
Other	3

a More than one category may apply.
Source: IR&D Board (Sub. 15, p.57)

Grants include assistance with all costs which, in the opinion of the IR&D Board constitute reasonable expenditure to carry out and complete the project. The NPDC considers the direct costs associated with research, development, trialing and demonstration. These costs include salary expenditure (including on-costs), contract expenditure, plant expenditure, expenditure on prototypes, trial and demonstration units, pilot plant and materials consumed, purchase of technical information directly associated with the project, patent searches, and overseas and domestic travel directly associated with the project.

Not all eligible projects are funded under the NPDP. The NPDC assesses the potential benefits of each project against a variety of criteria, such as the:

- ability of the commercial partner to exploit the project results, particularly in overseas markets;

- potential impact of the project in terms of flow-on benefits to the economy;
- level of innovation in the project, and the extent to which the project will lead to the development of a new or improved product or service; and
- capability of the project team to undertake the project.

Firms and projects are also judged against secondary criteria:

- established financial track record;
- ability to finance a project to completion, including commercialisation;
- a strong current and longer term cash flow position;
- established commercial track record in the domestic (and preferably in the export) market;
- the commercial viability of the project including evidence of market research and a marketing strategy for the project; and
- a business plan for the company which demonstrates the strategic importance of the project.

Table B.5: **Grants, by technology group**

Technology	*Value*	*Number*
	($'000)	
Computer Software	6061	20
Communications Technology	4007	11
Scientific Instrumentation	3792	10
Medical Technology	2917	13
Computer Based Equipment	2332	11
Other Energy Systems	1114	5
Automotive Applications	1014	5
Robotics	823	3
Advanced Manufacturing Technology	638	2
Laser Systems	339	2
Microwave Technology	300	1
Advanced Materials	104	2
Other	1200	5

Source: IR&D Board (Sub. 15, p.36)

The NPDC can approve grants of up to $500 000. Above this amount, the NPDC recommendations must be considered by the IR&D Board. Before an application is considered by the NPDC, a preliminary assessment of the project is undertaken by the NPDP Secretariat.

From 1 July 1990, the NPDP was expanded to formally include the participation and commitment of funds by State and Territory governments. Their commitments to projects approved in 1990-91

totalled some $650 000 comprising: Queensland $359 000; New South Wales $150 000; Victoria $100 000; and South Australia $50 000.

It is common for government agencies to apply for more than one NPDP grant. Table B.6 shows that 134 government bodies have applied for 216 grants.

Table B.6: **How often do government agencies apply for NPDP grants?**

Frequency of application	*Number of agencies which have applied this frequently*	*Sum of applications by agencies which have applied this frequently a*
11	1	11
5	2	10
4	6	24
3	13	39
2	20	40
1	92	92
Total	**134**	**216**

a Some applications involve more than one agency.

Source: Commission estimates

The IR&D Board recently undertook a survey of grant recipients that have technically completed their projects. Tables B.7 and B.8 detail the benefits that were identified by the commercial and government partners from participating in the program.

Table B.7: **Benefits to firms from participating in the program**

Benefit	*Response* [a]
	(per cent)
Cash injection	22
Improved knowledge of product market	19
Improved knowledge of buyer	19
Assistance in marketing	14
Technical input/product modification	14
None	6
Ameliorate adverse trading effects	6
Improved knowledge of govt buyers	6
Test facilities/infrastructure	3
Sales to government	3
Other	17

Source: IR&D Board (Sub. 15, p.60).

a More than one category may apply.

The IR&D Board estimated that, at 30 June 1991, projects supported by the NPDP have achieved $50 million in domestic sales (Table B.9) and $5 million in exports.

Table B.8: **Benefits to government partners from participating in the program**

Benefit	*Response* [a]
	(per cent)
Technical expertise	70
Continuing association with partner	70
Acquisition of new technology	43
Spin-off benefits to host department of other departments	33
Form new business association	30
Entrepreneurial capacity	23
Management and business skills	20
Other	30

Source: IR&D Board (Sub.15, 63)

Table B.9: **Domestic sales of NPDP-supported projects**

Company	*Domestic sales*
	($'000)
CHK Engineering Pty Ltd	
ACET Pty Ltd	
Associated Electronic Services Ltd	
Gestetner	
Domino Industries Group Pty Ltd	
Dynjab Pty Ltd	
Forensic Science Technology P/L	
Teknis Systems (Aust) Pty Ltd	
Industrial Microwave Applications P/L	
Kel Aerospace Pty Ltd	
Quantum Technology Pty Ltd	
Seascan Pty Ltd	
Special Purpose Vehicles Pty Ltd	
Steedman Pty Ltd	
Tristar Systems Consulting Pty Ltd	
Computer Power Pty Ltd	
Interscan International Limited	
Memtec Ltd	
Preston Group Pty Ltd	
Total	**48 826**

Source: IR&D Board

As at 13 September 1991, 216 applications had been made to the program which had resulted in 88 project approvals, 101 project rejections and 27 projects that were either withdrawn or still under consideration. Table B.10 lists all applicants to the NPDP, the short title of each project, the funding applied for, and the final decision on the project.

TABLE B.10: NPDP APPLICATIONS LIST (as at 13 September 1991)

Commercial Partner	Govt. Partner	Project Title	Grant ($)	Grant Results	App'n No
Abberfield Industries	Australia Post	Automatic Stamp Vendor	446600	A	10035
Abon Engineering	SECV	ABON Lignite Sizer	176000	A	10057
Acess Consulting Services	Main Roads Dept WA	APT Product Set	143700	A	10176
ACET Pty Ltd	SECWA	Protection Relay Test System	68150	A	10039
ACET Pty Ltd	V Line, State Transport Authority	Driver Instruction System	663648	R	10044
ACET Pty Ltd	V line, State Transport Authority	Train Driving Similator	627442	W	10031
Advanced Material Enterprise	Defence	Non-Oxide Ceramic Armour	368000	A	10098
Agen biomedical	Red Cross	HIV-1/2 Assays	104300	A	10175
AGL Sydney	State Transit Authority NSW	Gas Bus Refuelling	308255		10143
Aircraft Security International	Qantas	CPMS	409000	A	10170
Airsearch Mapping	Qld Dept of Lands	Airmap III Mapping System	82900	R	10166
Allersearch	Royal Prince Alfred Hospital	Anti-Allergenic Agent	0	W	10019
ALM Dulminson	Electricity Commission of NSW	Warning Flashlight	80000	R	10074
Amatek	Qld Dept of Transport	Frangible Concrete Columns	80520	R	10153
Ametron	Main Roads Dept WA	Soft Start Lamp Life Extender	101459	R	10061
Amrad	Red Cross	Immunodiagnositc Assay Kits	216234	D	10071
Amrad – Trace	Red Cross	Immunodiagnostic Assay Kits	531000	A	10077
ANI Ruwolt	Newcom Colleries	All Terrain Underground Personnel Carrier	93800	A	10185
Anutech	Telecom	Phase Change Material Temperature Control	63700	R	10018
ASIE	Garden Island Dockyard	G I Tool	100000	R	10045
Associated Controls	Australian Customs Service	Intelligent Microwave Sensors	116808	R	10181
Associated Electronic Services	Transperth	SMARTCARD Ticketing System	387419	A	10062
Associative Measurements	University of Technology Sydney	AMLAB	73250	R	10171
Ausonics	Royal north Shore Hospital	Ultrasound Equipment Trial	200000	A	10186
Australian and US Trading Co	City of Port Adelaide	AUSTCO SUPAVAC	72530	R	10097
Australian Artificial Intelligence Inst	Civil Aviation Authority	AI/ATMS Development & Trialling	250000	A	10170

TABLE B.10: NPDP APPLICATIONS LIST (as at 13 September 1991)

Commercial Partner	Govt. Partner	Project Title	Grant ($)	Grant Results	App'n No
Australia Flight Test Services	Defence				1020
Australia Flight Test Services	Dept Transport and Communications	Aircraft Data System	398700	A	10038
Australian Ultra violet Services	Melbourne Board of Works	Ultraviolet Ozone disinfection	262300	R	10120
AWA	Roads & Traffic Authority NSW				10203
AWA	Victorian Ministry of Transport				10208
AWA Transponder	Australian National Railways	Train Location System	262400	A	10136
BHA Computer	Defence	DBQ Windows Interface	274200	A	10189
Biodental Research	United Dental Hospital	NULITE – 90 Commercialisation	245296	A	10104
Biological Control Systems	Building Management Authority WA	Cooling Tower Steriliser	135960	R	10133
CADACS	Kwinana Town Council {WA Exim Corporation	Kwinana IND, AL Area Management S	218172	R	10051
CADCOM	Geelong and District Water Board	Artisan for Water Utilities	486479	R	10187
Cameronics	AGPS	Cameronics- AGPS Micropublishing	478150	A	10080
Canberra Professional Equipment	NEW Dept Technical & Further Ed'n	AXCESS Integrated Video	52000	A	10161
Carter R&D P/L	SEQEB, Sydney City Council	Data Communication Unit	273250	R	10148
Case Communications Systems	Australian Audit Office	AAONET	0	Q	10020
CEA Technologies	Qld Transport Dept	VIS Series 2	1595982	R	10198
Cellabs Diagnostics	Royal Womens Hospital {Westmead Hospital	Chlamydial Infection Detection Kit	259100	A	10154
Chatron Industries	South Australian Government				10206
Chemtronics	Chemistry Centre WA	On-Line Analyser	81850	A	10147
CHK Engineering	South East Qld Electricity Board	Fault Indicator	250285	A	10081
CLEGG Driscoll Consultants	Victoria Police Force				10209
Clyde Industries	SRA	Cargo Containers Transfer	238000	R	10042
Cochlear	St Vincent's Public Hospital	Tinnitus Suppression	919000	A	10167
Codan	Australian Customs Service	Security Radio System	168850	A	10113
Cohen Research	Surveillance Research Laboratory	High Frequency Receiver	2168500	R	10047
Compumedics	Royal Price Alfred Hospital	Ambulatory Sleep Disorders	503935	R	10102

TABLE B.10: NPDP APPLICATIONS LIST (as at 13 September 1991)

Commercial Partner	Govt. Partner	Project Title	Grant ($)	Grant Results	App'n No
Computer Contractors		NYPLAN Development	0	W	10066
Computer Law Services Ltd	AGPS	ILIMS	497500	R	10151
Computer Power	Parliamentary Information Systems Office	Artificially Intelligent Document Abstractor	438800	A	10065
Computer Switch	ABC	VSA Project	660510	R	10110
Crux Educational Technology	Adelaide College of TAFE {Luminis P/L	Educational Video Tapes	248659	R	10136
Centre for Information Technology	Centre for Information Technology and Computing				10146
Dale B Elphinstone	Australian Antarctic Division	Tractor-Hauled sled	113515	R	10192
Defence Science and Technology	Defence	Command Support System Testbed	750000		10138
Delta Technology	Queensland Dept of Transport	POST-HASTE: SUN	300300	A	10165
Delta West	Royal Perth hospital	CLO-SER Rapid Diagnostic Test	219650	A	10188
Dennis G Bates		Kingdom of God	25000	N/A	10043
Denso	Dept of Harbours and Marine	Composite Pile Protection	179000	A	10130
Detakin	Vis Institute Marine Sciences	Tidal Pump for Mariculture	167072	R	10009
DISQ Technologies {Webster and Associates	Commonwealth Bank	Xerox Veniutor	194650	A	10157
DKS	National Building Technology Cntre	Project APOLLO	649812	R	10028
Domino Industries Pacific	Newcom Colleries	Longwall Chock Carrier	212850	A	10034
Dricon Air	The Parkes District Hospital	Indirect Evaporation Cooling	131531	R	10131
Dynavac	Royal Australian Mint	Filtered Arc Deposition System	461500	A	10158
Dynjab Research	Immigration	Passport Reader	341600	A	10008
Eagle Aircraft Australia	Defence	Eagle X-TS	1078129	R	10084
Eastek	Land Titles office	NSW LTO Imaging	202170	R	10116
Electro Optic Systems	Australian Surveying & Land Information Group	ORRORAL Laser Ranger	356323	A	10115
Electrodata	Totalisator Agency Board NSW	Logging Recorder	456250	A	10100

TABLE B.10: NPDP APPLICATIONS LIST (as at 13 September 1991)

Commercial Partner	Govt. Partner	Project Title	Grant ($)	Grant Results	App'n No
Electrologic	SRA	Trach Geometry Control	180150	A	10007
Electronic Drives	Electricity Commission NSW	Automatic EXCTTER Regulator	997000	R	10072
Epidyne	SECWA	High Efficiency Power Generation Units	293500	A	10025
Eracom	Defence	ERACODE Fabrication	129308	A	10124
Execom Systems	SECWA	Execonvert Commercialisation	91350	A	10152
Expertise Australia		ESTCON Expertise Estimating Syst.	0	W	10021
Ferranti Computer Systems	Defence	Link 11 in ADA	303275	R	10049
Food and Beverage Solutions	House Committee NSW Parliament	FABS	198000	R	10156
Forensic Science Technology-International	SA Police	Law Enforcement Communications	113700	A	10029
Forensic Science Technology-International	State Forensic Science	DNA Fingerprinting	204500	A	10149
Fundi Software Services	WA Police, Dept Land Admin	PROTEUS Change Control	276590	R	10201
Futuretech Electronics	V Line, State Transport Authority	Train Location & Detection Systems	197102	R	10014
Futuretech Electronics	State transport Authority Victoria	GANG Automatic Warning System	640582	R	10073
Gaspower Technology	Transperth	Electronic Gas Control	85800	A	10069
Genasys II	Dept Lands Qld				10204
Geological modelling Systems	SA Dept Mines and Energy	Didgital Map Storage System	433870	R	10041
George Moss	Westrail	Rail Guided System	59737	R	10101
Gestetner	DEFAT	Grey Scale Development	248050	A	10117
Gestetner Lasers	AGPS	PDL Development (72)	371461	R	10090
Gestetner Lasers	Australian Taxation Office	Fast Printer / Page Controller	246500	A	10183
Go Medical Industries	WA Health Dept	SPRINGFUSOR	203200	A	10159
Graham Price	NSW Agriculture	Innovative Mushroom Composting Technology	518851		10196
GAS Technology	Defence	Data Encryption System	1536000	R	10150
Haden Engineering	Dept of Health NSW	Interactive Computer Learning	404986	A	10070

TABLE B.10: NPDP APPLICATIONS LIST (as at 13 September 1991)

Commercial Partner	Govt. Partner	Project Title	Grant ($)	Grant Results	App'n No
Halisa International	Australian Customs Service	RUBAC- Customs	476500	R	10053
Harmony Research	Victorian Dairy Industry Authority	Quartet Accounting	350575	R	10103
Heilbronn Geothermics	Dept Mines Qld	Geothermics Trial	500000	R	10121
Honeywell	Telecom	High Security Panel	420000	R	10199
Hudson-Allen	Commonwealth Bank	Hudson Card Technology Trial	306075	A	10052
Hytech Scales	Australia Post	Combined ECS (CECS)	390128	A	10027
Impact Systems	AGPS	New Printer Project	1590127	R	10010
Industrial Microwave Applications	Sydney Water Board	Microwave Sewage Processing	300000	A	10075
Integrated Intelligent Recloser	Department of Attorney General	AVRO high Security and Cylinder System	187750	A	10195
Interscan International	Civil Aviation Authority	MLS Trailing and Development	2104800	A	10082
Intranet	Tourism SA	Intranet "Messaging Database"	140997	R	10068
Irrigation Technologies	City of Wanneroo	Computerised Irrigation controller	89465	R	10191
JTEC	DSS, Telecom	ISDL Trial	717974	A	10139
KEL Aerospace	NSW Fish Marketing Authority	Distributed Action System	0	R	10169
KEL Aerospace	NSW Fish Mkt Auth	Dutch Action System	547000	A	10001
Kewshaw Group	Brisbane City Council	KEBS	193950		10180
Keycorp	Health Insurance Commission	Claims Processing Terminal	384875	R	10108
Kingdow	Dept Geographic Information	Kingdom DGI-MAGIC Demonstration	142450	A	10063
Knowledge engineering	Attorney General Dept	Databank for A.G.	379000	R	10145
Labtam International	Port Melbourne Authority	I.S.D.N Xterminal	221000	A	10168
Laser dynamics	Mt Gravatt College of TAFE	SABRE Laser Project	116980		10178
Laserex Operations	Royal Adelaide Hospital	Evaluation of LUT-904	153050	A	10046
Loder Transport Systems	Federal Airports Corporation	Acceleration Beltway Conveyor	355000	R	10137
Lynwood Pacific	Attorney General	Raidation Emissions Detector	393100	A	10033
Mark Sensing Australia	Sydney Opera house Trust	Thermal Paper Ticketing	0	R	10106
Marquetta	NSW Dept of Health	AUSTOME System	47950	A	410118
McCahon Parker & Associates	Victorian Govt Major Projects Unit	MacFMIS	70000	R	10177

TABLE B.10: NPDP APPLICATIONS LIST (as at 13 September 1991)

Commercial Partner	Govt. Partner	Project Title	Grant ($)	Grant Results	App'n No
Medical Innovations	The Royal Womens Hospital	Cancer Diagnositc Kit	263300	A	10122
Medisys	Royal Brisbane Hospital	ANASTHA-SYS	245350	R	10127
Memtec	The Water Board	MEMTEC Tertiary Treatment	627200	A	10079
Metaltechnology Group	La Trobe Uni	Aust Computer Education Project	547625	R	10016
Metatechnology Group	Knowledge Victoria	ACEP	547625	R	10037
Montronix	Westrail	Fire Protection - Indian Pacific	77000	R	10026
Moss Products Ltd	Royal Melbourne Hospital	Speicalised Plastic Technology	407750	A	10190
Narellan Truck Wheel Align	Defence	Mobile Correction Machine	197300	R	10125
Network Automation	Justice Information System	GOSIP Conformance Extensions	827300	A	10163
NR	Defence	H F Modem System	543005514	A	10017
Nu-Lec	South East Qld Electricity Trust of SA	Integrated Intelligent Recloser	50	A	10191
Nujenko	Health Dept WA	Safe Syringe Trials	70074	R	10112
Office Express	Australian Taxation Office	Personnel Carrier	0		10182
OKA Motor Company	SECWA	OKA 4WD Vechile	775007	R	10144
Oliver J Neilsen	SECV, Electricity Trust of SA	SWD Powerline Communication	1739000	A	10067
Optimise Australia	Australian Taxation Office	Position Analyse	58330	A	10024
Optimise Australia	ACT Electricity and Water	Position Analyse	55750	R	10160
{Towers Perrin Foster & Crosby					
Oxtex Australia	DAS	PI-CON	95950	R	10003
Palette Systems	Dept Geographic Information	PALIs	424561	R	10036
Pavement Management Services	DMR	Aust. Road Evaluation Vehicle	604300	A	10022
Phillip Brittion's Stationery	Commonwealth Bank	TEL-U-WOT Telephone Stand	27650	R	10015
PMA	SA Mones & Energy, WA Mines	AUSWELL	139900	R	10013
Polartechnics	Royal Rpince Alfred Hospital	Cervial Cancer Detector	948764	R	10094
	{University of Sydney				
Polytech Technical Services	Royal Adelaide Hospital	Pneumatic Patient Lifter	155050	A	10173
Precision Stone	Aerospance of Australa	Sheet Stone Production	92000	Q	10132
Pricom	DEFAT	Chinese & Japanese for the OK W.P.	190250	R	10099

TABLE B.10: NPDP APPLICATIONS LIST (as at 13 September 1991)

Commercial Partner	Govt. Partner	Project Title	Grant ($)	Grant Results	App'n No
Prime Computer	WA Dept of Services	SUPPLYNET	405880	R	10059
Prism Technologies	DAS	The Project Plan	2000000	W	10078
Purotech Systems	City of Wollongong {Wollongong Hospital {University of Wollongong {Commonwealth Serum Laboratories	Ozone Generators (Exportable)	188688	R	10105
Quantum Technology	Dept Education	NOMAD/WAY Finder	185850	A	10083
Rapidwall Building Systems	SA Housing Trust	Rapidwall Building Systems	170817	R	10155
Redflex	Civil Aviation Authority	SCADA	605264	R	10119
Redmond Gary	South East Qld Electricity Board	Telescopic 12M Platform (EPV)	265850		10193
Remraf	University of Melbourne	Zoon Indirect Ophthalmoscope	0	W	10095
Reptide Technology	Victorian Agriculture Dept	IHRH Implants in Polultry	261897	R	10004
Rescare	Royal Prince Alfred Hospital				10207
Road Construction Consulting	DMR Qld	ERP	602250	R	10093
Road Recyclers	Roads Corporation	Road Processor	298200	A	10064
Sabance	Crows Nest Shire Council	Pot hole Repairer	138500	R	10048
Seascan	Australian Maritime College	SEASCAN C-Ranger	63500	A	10092
Solomon Corrosion Consulting Serv	Gas & Fuel Corp Victoria	Data Logger	45750	R	10040
Space - Time Research	Angle Park Computing centre	Teching Statisitical Databases	742034	R	10089
Speical Purpose Vehicles	NSW Dept Transport	Vehicle Testing System	91050	A	10002
Standard Communications	Australian Maritime Safety Authority	406MHz EPIRB	237600	A	10172
Standards Association of Australia	Australian Construction Services	Standards on Cd-ROM	166794	A	10111
Standards Association of Australia	Royal Australia Mint	Quality Consultant	87000	R	10129
Stanilite Electronics	Totalisator Agency Board NSW	TABMARK 3 Development	496850	A	10085
Steedman Science and Engineering	Country Fire Authority	CFA MET Network	180400	A	10050
Steelfine Fabrications	Qld Dept of Works	Queensland Prison Cell	88243	R	10128
Storage Technology of Australia	ABS	STORAGETEK MSP HSC	238637	R	10109
Storage Technology of Australia	DSS	EXDM operational Trial	30200	R	10140

TABLE B.10: NPDP APPLICATIONS LIST (as at 13 September 1991)

Commercial Partner	Govt. Partner	Project Title	Grant ($)	Grant Results	App'n No
Synergy Pacific	DSS	Intelligent Access Control System	236650	R	10005
Syring & Factory Engineering	Westmead Hospital	Syringe Technology Project	467600	R	10200
Technetics	DEFAT	HF Receiver Design	182700	A	10032
Technatrics	Royal north Shore Hospital	V.O.I.C.E.	108950	A	10058
Techway Solutions	ABS	Forms Generator	409700	A	10076
{Communications Research Inst.					
Teknis Systems	Queensland Railways	Electronic Flagman	137150	A	10055
Teknis Systems	State Transport Authority SA	Metromiser	131847	R	10096
Teletext Marketing	Dept Industries & Development	Full Field Teletext Transmission	945912	R	10006
Tetley Manufacturing	Westmead Hospital	Lung Imaging Technology	169787	A	10023
The Murdoch Institute	Clinical Genetics Service	OSSUM Development	195000		10164
The Preston Group	The Sydney Airport	Terminal Management System	394000	A	10123
TOG Systems Automations	State Bank of NSW	CAT Terminal	206400	A	10179
Trade Development Corporation	Water Resources Commission	Water Quality Monitor	195350	A	10060
Transnorth	Electricity Trust of SA	Power Line Fittings	179100	R	13135
Travel and Leisure Automated System	Northern Territory Tourist Commission				10205
Tristar Systems Consulting	Australian Defence Industries (ADI)	DISCOM	31700	A	10087
Tyson Hydraulics	Qantas	Cutlery Packer	259000	A	10091
Unique Software Centre	Education Dept SA	School Information Glue	499900	A	10142
Unique Software Centre	SA Govt Computing Centre	Future Case	298000	R	10030
Utilux	SECV	Service Tee-joint	131850	A	10174
Utiliux	Electricity Trust of SA	Powerline Distribution fittings	469790	A	10172
Victorian Soap Co	Royal Prince Alfred Hospital	HYDROL	59500	A	10088
Vismatec	State Rail Authority, Mitec	Bulk Rail Microwave Trial	363277	R	10117
Vismatec	DMR Qld	Bitumen Handling System	560676	R	10054
Vismatec	Queensland Railways	Materials Handling System	693650	R	10162
Western Statistical Computing Associates	WA Dept Agriculture	Advance Statistical Training and Analytical Facilities	100586	R	10056

TABLE B.10: NPDP APPLICATIONS LIST (as at 13 September 1991)

Commercial Partner	Govt. Partner	Project Title	Grant ($)	Grant Results	App'n No
Westinghouse Brake and Signal	DEFAT	Grade One Development	140750	A	10086
Westronic Australia	SECWA	WASP	241750	R	10141
William Hollier	Housing & Construction	Restoration Automation	30000	R	10012
Willing and Partners	ACT Planning Authority	Water Quality Software	246525	A	10197
Woomera Range Develop Group	Defence	Woomera Range Development	546658	R	10126
WRK International	Royal Perth Hospital	Patient Transfer / Transit System	321139	A	10011

Source: information supplied by DITAC
A = Approved
R = Rejected
D = Deferred
W = Withdrawn
N/A = Ineligible

APPENDIX C: SURVEY OF NPDP PARTICIPANTS

The Industry Commission conducted a survey of organisations (commercial and government) that have applied for an NPDP grant. The number of applicants for NPDP assistance made such a survey a manageable exercise. Survey forms were enclosed with the inquiry Issues Paper, which was sent directly to every known government and commercial applicant for an NPDP grant.

Table C.1 lists the organisations that responded to the survey. The response rate of 46 per cent of commercial partners and 38 per cent of government partners (see Table C.2 and C.3) has allowed useful conclusions to be drawn. Most survey responses were returned in time for the Commission to make use of them in the Draft Report, which was released in early February.

The survey forms are included at the end of this appendix. Most of the responses to the survey questions are 'qualitative' and do not lend themselves to statistical collation. However, where it has been practical to do so, the Commission has gathered responses into the tables and figures presented in this appendix.

Table C.1: **Organisations that participated in the Commission's survey**

ABON Engineering Pty Ltd
Access Consulting Services Pty Ltd
Advanced Materials Enterprise
Aircraft Security International (ASI Technologies)
Airsearch Mapping Pty Ltd
ALM - Dulmison
Amrad Corporation Ltd
ANI Ruwolt
Associated Controls (Australia) Pty Ltd
Associated Electronic Services Pty Ltd
Australia Post
Australian Bureau of Statistics
Australian Customs Service
Australian Government Publishing Service (AGPS)
Australian Surveying & Land Information Group (AUSLIG)
Australian Taxation Office
AWA Traffic & Information Systems
AWA Transponder
BHA Computer Pty Ltd
Cadcom Pty Ltd
Cellabs Pty Ltd
Chemtronics Ltd
CHK Engineering Pty Ltd
Computer Power Group
Country Fire Authority
Dale B. Elphinstone Pty Ltd
Department of Defence
Department of Health - NSW
Department of Main Roads - WA
Department of Mines - WA
Department of Social Security
Department of the Attorney General
Department of Transport - Qld
Dept of Foreign Affairs and Trade
Dynjab Research Pty Ltd
Eagle Aircraft Australia Ltd / Composite Technology Pty Ltd
Electricity Trust of SA
Electro Optic Systems Pty Ltd
Electrodata Pty Limited
Eracom Pty Ltd
Execom Software Pty Ltd
Geelong and District Water Board
Gestetner Lasers Pty Ltd
Go Medical Industries Pty Ltd
Hampstead Centre

Industrial Microwave Applications (Australia) Pty Ltd
Interscan International Ltd
Jtec Pty Ltd
Justice Information System
Kel Aerospace Pty Ltd
Kingdom Pty Ltd
Memtec Ltd
Moss Products Pty Ltd
Network Automation Pty Ltd
Newcom Collieries Pty Ltd
Nu-Lec Pty Ltd
Oceanroutes (Australia) Pty Ltd
Oliver J. Nilsen (Aust) Ltd
Parliamentary Information Systems Office
Pavement Management Services Pty Ltd
Polytech Technical Services Pty Ltd
Qantas Airways
Queensland Rail
Rapidwall Pty Ltd
Redflex Pty Ltd
Redmond Gary Pty Ltd
Roads & Traffic Authority of NSW
Royal Australian Mint
Royal Melbourne Hospital
Royal Women's Hospital
South East Queensland Electricity Board (SEQEB)
Standard Communications Pty Ltd
Standards Australia
Stanilite Electronics Pty Ltd
State Electricity Commission of Victoria
State Energy Commission of WA
Techway Limited
The Preston Group Pty Ltd
Totalizator Agency Board of NSW
Towers Perrin Forster & Crosby Inc (TPF&C)
Transnorth Pty Ltd
Unique Software International
Utilux Pty Ltd
Water Resources Commission - Qld

Table C.2: **Coverage of the Commission's survey, commercial partners**

Year	*Number of agreements signed*	*Number of agreements surveyed*	*Proportion surveyed by number*	*Value of agreements signed*	*Value of agreements surveyed*	*Proportion surveyed by value*
			(%)	**($ m)**	**($ m)**	(%)
1987-88	12	3	25	2.20	0.75	34
1988-89	20	8	40	4.68	1. 73	37
1989-90a	25	12	48	9.90	7.54	76
1990-91b	11	6	55	2.09	1.12	53
1991-92c	19	11	58	5.81	3.45	59
Total	**87**	**40**	**46**	**24.69**	**14.59**	**59**

a 1989-90 is adjusted to include a grant to SWD Ltd of $1.7m which was not reported in IR&D Board annual reports.

b 1990-91 is adjusted to exclude a grant to Unique Software of $0.5m which was reported twice (1989-90 and 1990-91).

c 1991-92 is as at 25 February 1992 (data supplied by DITAC).

Source: IR&D Board annual reports and Industry Commission survey

Table C.3: **Coverage of the Commission's survey, government partners**

Year	*Number of agreements signed*	*Number of agreements surveyed*	*Proportion surveyed by number*	*Value of agreements signed*	*Value of agreements surveyed*	*Proportion surveyed by value*
			(%)	**($ m)**	**($ m)**	(%)
1987-88	12	3	25	2.20	0.48	22
1988-89	20	8	40	4.68	3.83	82
1989-90a	25	9	36	9.90	2.41	24
1990-91b	11	5	45	2.09	1.44	69
1991-92c	19	8	42	5.81	2.11	36
Total	**87**	**33**	**38**	**24.69**	**10.27**	**42**

a 1989-90 is adjusted to include a grant to SWD Ltd of $1.7m which was not reported in IR&D Board annual reports.

b 1990-91 is adjusted to exclude a grant to Unique Software of $0.5m which was reported twice (1989-90 and 1990-91).

c 1991-92 is as at 25 February 1992 (data supplied by DITAC).

Source: IR&D Board annual reports and Industry Commission survey

Table C.4: **Alternative sources of funding for NPDP projects**

Survey responses of commercial partners to the question:

"If the NPDP application had been unsuccessful, what would have been the most likely alternative source of finance?"

Responses which have been taken to indicate that the project would not have proceeded without NPDP assistance:

"Nil available."
"Not known. In all likelihood, efforts to establish a financial basis for the project would have been abandoned."
"It is doubtful that the project would have proceeded, but if so, either from another partner or from borrowed funds."
"The project would not have proceeded due to lack of finance."
"It is unlikely that the project would have proceeded without NPDP."
"Program would not have gone ahead."
"The project would not have continued."
"Government partner, or project abandoned."
"It is unlikely that the project would have proceeded although we would have sought another equity partner."
"Development would not have proceeded."
"None."
"The government partner would not have built the plant."
"We would have had to seek venture partners."
"Nil."
"None. The process would have been sold overseas."
"None - development for overseas application would have been reduced."
"The project would not have proceeded without NPDP funding."
"None - project otherwise unviable."
"None."
"It is unlikely that the project would have proceeded without NPDP assistance."
"The project would not have gone ahead and the government partner would have purchased from a Canadian company."

Responses which have been taken to indicate that the project would have proceeded without NPDP assistance:

"Cash flow."
"Project may not have proceeded in its current form. Greater borrowings."
"Sales of other products and shareholders funds. Progress would have been slow."
"Current bank facilities and profit from trading."
"Project would have proceeded with another (international) partner under more difficult logistic conditions."
"Nil - project would have slowed down."
"Capital injection from shareholders."
"Sale of technology overseas."
"A loan from an investment partner."
"Trading funds."
"Capital injection from shareholders."
"Budget allocation for R&D, however, development would have been impeded through lack of sufficient funds to devote to the project within the given timeframe."
"Own funds/loan from financial institution."
"State government and government partner."

(Continued over...)

Table C.4 (continued): **Alternative sources of funding for NPDP projects**

"The full costs would have been funded from our own current assets but the time scale for expenditure and achievement would have been longer by 1-2 years."
"More debt."
"Borrowing and/or equity injection from parent company."
"Internal."
"Bank loan."

Source: Commission survey

Table C.5: **Project sales reported by firms that received an NPDP grant**

	Number of firms	*Grants*	*Project sales to government partner*	*Project exports*
		($ million)	($ million)	($ million)
Project would not have proceded without an NPDP grant	21 (52.5%)	8.2 (55%)	3.2 (94%)	3.1 (40%)
Project would have proceded without an NPDP grant	19 (47.5%)	6.6 (45%)	0.2 (6%)	4.7 (60%)
Total	40	14.8	3.4	7.8

Source: Commission survey

Table C.6: **NPDP project purchases reported by government partners**

	Number of projects	*Grants to these projects*
		($ million)
Government partner purchased final product	10	2.2
Government partner did not purchase final product	8	2.2
Project incomplete	15	6.1

Source: Commission survey

Table C.7: **NPDP project sales reported by commercial partners**

All surveyed commerical partners:

40 projects ($14.8 million in NPDP grants)
7 projects have achieved sales to the government partner ($3.4 million of sales)
6 projects have achieved exports ($7.7 million of exports)

Surveyed commerical partners of NPDP agreements that have been completed:

23 projects ($8.1 million of grants)
6 projects have achieved sales to the government partner ($1.7 million of sales)
6 projects have achieved exports ($7.7 million of exports)

Completed more than 1 year:

12 projects ($3.1 million of grants)
4 projects have achieved sales to the government partner ($1 million of sales)
3 projects have achieved exports ($0.8 million of exports)

Completed more than 18 months:

8 projects ($1.7 million of grants)
4 projects have achieved sales to the government partner ($1 million of sales)
3 projects have achieved exports ($0.8 million of exports)

Completed more than 2 years:

5 projects ($1 million of grants)
2 projects have achieved sales to the government partner ($0.9 million of sales)
3 projects have achieved exports ($0.8 million exports)

Figure C.1: **Previous sales to government agencies, reported by commercial partners**

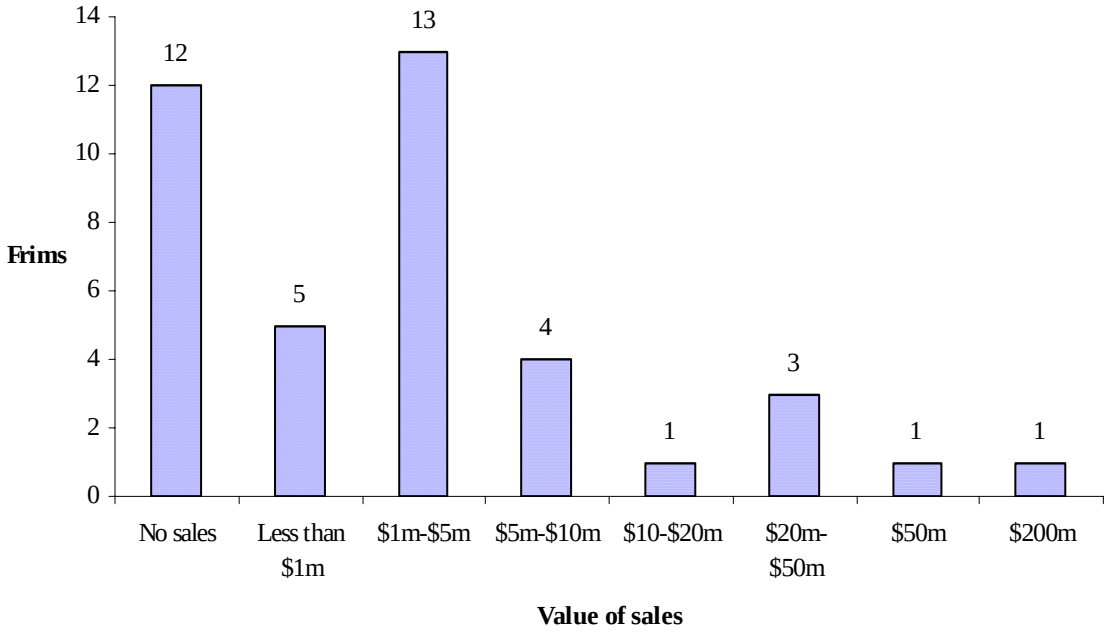


Figure C.2: **Previous exports, reported by commercial partners**

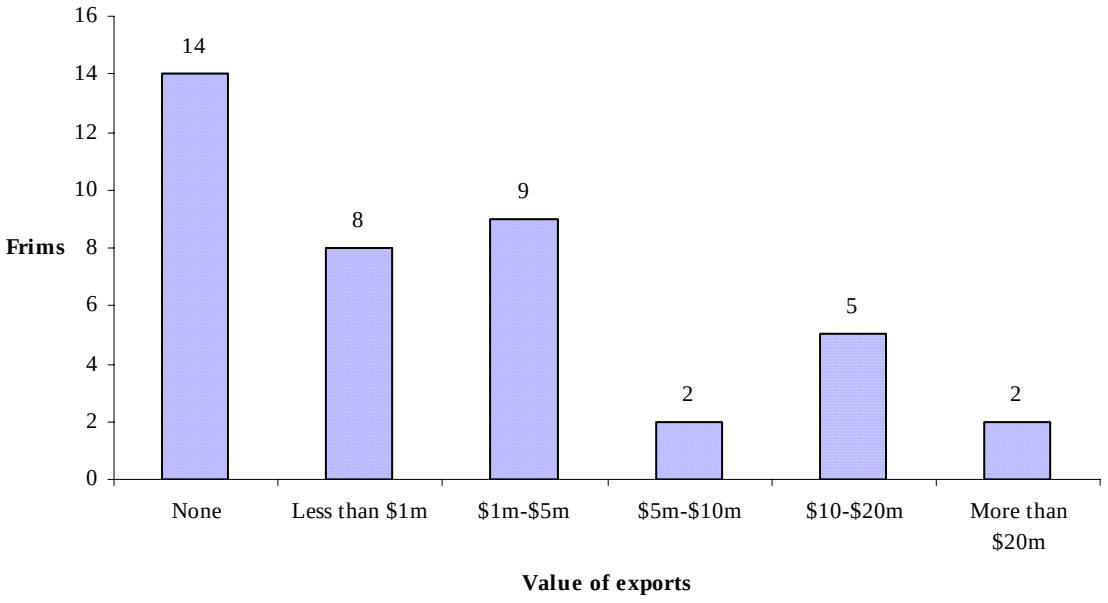
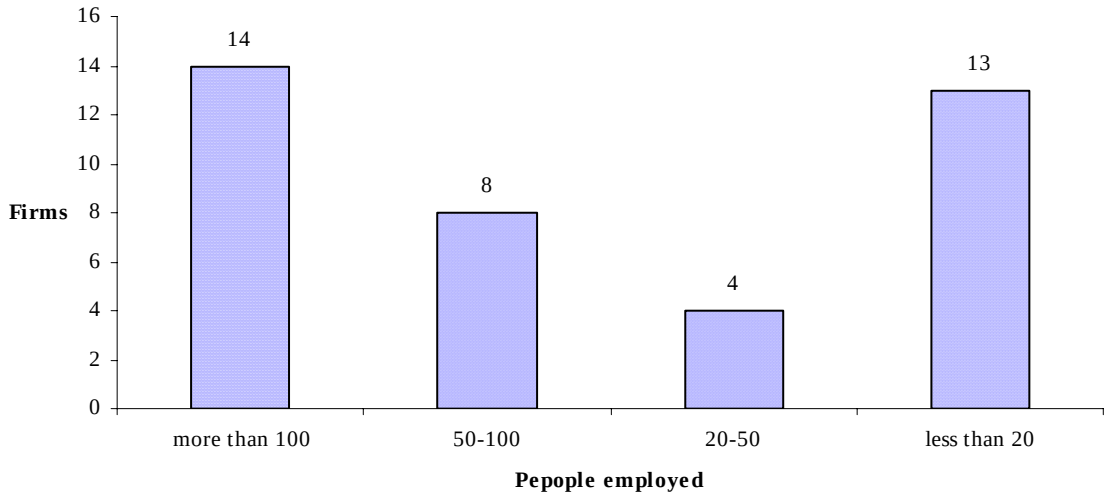


Figure C.3: **Employment profile of commercial partners**



INDUSTRY COMMISSION

INQUIRY SURVEY

NATIONAL PROCUREMENT DEVELOPMENT PROGRAM

FORM A: FOR FIRMS THAT HAVE RECEIVED AN NPDP GRANT

If you have received more than one grant, please furnish responses for each.

What is the name of your firm? .....

How many people do you employ?

[ ] 100 or more
[ ] more than 50 but less than 100
[ ] more than 20 but less than 50
[ ] less than 20

Your application:

In which financial year did you apply? .....

Who initiated the project?

[ ] your firm
[ ] the government partner

Who initiated the application?

[ ] your firm
[ ] the government partner

Did the NPD Committee Secretariat assist in finding a government partner?

[ ] Yes
[ ] No

Did the NPD Committee Secretariat assist in the preparation of your firm's application?

[ ] Yes
[ ] No

If yes, how did they assist?

.....

.....

Was a consultant engaged to assist in preparing your application?

[ ] Yes
[ ] No

At what stage was the project when the partnership with the government body was formed?

.....

.....

Was there any pre-existing partnership or link with the government partner before the particular NPDP project? [ ] Yes [ ] No

If yes, what was the nature of the link? .....

.....

At what stage of the project did your firm become aware of the NPDP?

.....

.....

The project:

What was the short title of the project? .....

Who was the government partner? .....

How much funding was applied for? $.....

How much funding was approved? $.....

Please give details of any applications for extensions of the grant. .....

.....

How did your firm finance its share of the project? .....

.....

If the NPDP application had been unsuccessful, what would have been the most likely alternative source of finance?

.....

.....

Do you have any comments on any of the criteria for approving NPDP grants?

.....

.....

Could the requirements of the NPDP, the NPD Committee or Secretariat be altered to improve their impact on the way in which the project was carried out?

.....

.....

Do you have any comments on the eligibility of items of expenditure or the methods for payment under the NPDP?

.....

Do you have any other comments on the administration or eligibility of the NPDP?

.....

If the project has been completed:

Has the project generated sales to the government partner?

If yes, how much $.....

If no, why not? .....

Has the project generated sales to any other Australian government bodies?

If yes, how much $.....

Do you have any comments? .....

Has the project generated domestic sales other than to government bodies?

If yes, how much $.....

Do you have any comments? .....

Has the project generated sales to foreign government bodies?

If yes, how much $.....

Do you have any comments? .....

Has the project generated non-government foreign sales?

If yes, how much $.....

Do you have any comments? .....

Has the partnership with the Australian government partner assisted your firm to achieve export sales? *Please explain.*

.....

If the government partner did not purchase the final product, did this impede export sales? *Why?*

.....

Experience with government procurement prior to the NPDP:

Apart from the NPDP project, has your firm endeavoured to secure contracts to supply products or services to government departments or agencies in the last five years? *Was it successful? Please comment.*

If your firm achieved sales of other products or services to governments in the last five years, what did they total? $

If your firm achieved export sales of other products or services in the last five years, what did they total? $

Did your firm have any involvement with any government schemes before your NPDP project? *If yes, what was the scheme?*

Do you believe that a history of some sort of involvement with government is important to the success of an NPDP application?

What other factors do you believe are important to the success of an NPDP application? Are these adequately set out in the criteria?

Do you have any other comments on the NPDP?

Thank you for your participation in the survey. You are urged to expand on the issues raised in the survey by making a submission to the inquiry. Information submitted to Industry Commission inquiries is made public. If you want the Commission to consider keeping information confidential it must be clearly indicated. Please return your completed survey in the enclosed envelope by 22 November 1991.

INDUSTRY COMMISSION

INQUIRY SURVEY

NATIONAL PROCUREMENT DEVELOPMENT PROGRAM

FORM B: FOR FIRMS THAT HAVE APPLIED UNSUCCESSFULLY FOR AN NPDP GRANT

If you have applied for more than one grant, please furnish responses for each application.

What is the name of your firm? .....

How many people do you employ?
[ ] 100 or more
[ ] more than 50 but less than 100
[ ] more than 20 but less than 50
[ ] less than 20

Your application:

In which financial year did you apply? .....

Who initiated the project?
[ ] your firm
[ ] the government partner

Who initiated the application?
[ ] your firm
[ ] the government partner

Did the NPD Committee Secretariat assist in finding a government partner?
[ ] Yes
[ ] No

Did the NPD Committee Secretariat assist in the preparation of your firm's application?
[ ] Yes
[ ] No

If yes, how did they assist?

.....

.....

Was a consultant engaged to assist in preparing your application?
[ ] Yes
[ ] No

At what stage was the project when the partnership with the government body was formed?

.....

Was there any pre-existing partnership or link with the government partner before the particular NPDP project? [ ] Yes [ ] No

If yes, what was the nature of the link?

At what stage of the project did your firm become aware of the NPDP?

Was the project abandoned when the NPDP application was rejected? [ ] Yes [ ] No

If the project was not abandoned, how was it funded?

Was the project commercialised? [ ] Yes [ ] No

If the project was commercialised, what sales were achieved?

Domestic sales	$
Exports	$
Sales to a government department or agency	$

How would an NPDP grant have enhanced your sales to government bodies or exports?

What do you believe was the reason behind the failure of the application?

Do you have any comments on the criteria for approving NPDP grants?

Do you have any comments on the eligibility of items of expenditure or the methods for payment under the NPDP?

Do you have any other comments on the administration or eligibility of the NPDP?

.....

.....

Experience with government procurement prior to the NPDP:

Apart from the NPDP project, has your firm endeavoured to secure contracts to supply products or services to government bodies in the last five years? *Was it successful? Please comment.*

.....

.....

If your firm achieved sales of other products or services to governments in the last five years, what did they total? $.....

If your firm achieved export sales of other products or services in the last five years, what did they total? $.....

Did your firm have any involvement with any government schemes before your NPDP project? *If yes, what was the scheme?*

.....

.....

Do you believe that a history of some sort of involvement with government is important to the success of an NPDP application?

.....

.....

What other factors do you believe are important to the success of an NPDP application? Are these adequately set out in the criteria?

.....

.....

Do you have any other comments on the NPDP?

.....

.....

Thank you for your participation in the survey. You are urged to expand on the issues raised in the survey by making a submission to the inquiry. Information submitted to Industry Commission inquiries is made public. If you want the Commission to consider keeping information confidential it must be clearly indicated. Please return your completed survey in the enclosed envelope by 22 November 1991.

INDUSTRY COMMISSION

INQUIRY SURVEY

NATIONAL PROCUREMENT DEVELOPMENT PROGRAM

FORM C: FOR GOVERNMENT PARTNERS IN NPDP PROJECTS

If you have applied for more than one grant, please furnish responses regarding each application.

What is the name of your government department or agency?

.....

In which financial year did you apply? .....

Was the application successful? [ ] Yes
[ ] No

What is the short title of the project? .....

Who is the commercial partner? .....

How much funding was applied for? $.....

How much funding was approved? $.....

Please give details of any applications for extensions of the grant.

.....

.....

Could the requirements of the NPDP, the NPD Committee or Secretariat be altered to improve their impact on the way in which the NPDP project was carried out?

.....

.....

Do you have any comments on the eligibility of items of expenditure or the methods for payment under the NPDP?

.....

.....

Do you have any other comments on the administration or eligibility of the NPDP?

.....

The project:

Comment on any connection your department/agency had with the private sector partner prior to the NPDP project.

.....

.....

Did your department/agency purchase the final product? [ ] Yes
[ ] No

Did the contract go to tender? [ ] Yes
[ ] No

If the contract went to tender, how many tenders were there, including the NPDP partner? .....

If your department/agency did not purchase the NPDP project product, what were the reasons?

.....

.....

If your department/agency did not purchase the final product of the NPDP project, how was the item sourced? Was the item imported or was it sourced from an alternative domestic supplier?

.....

.....

The purchasing/tendering process:

How was the NPDP partner initially selected?

.....

.....

If several private firms express an interest to develop an innovative item, what process is used to select the firm to carry the project through?

.....

.....

Is eligibility for an NPDP grant a factor in selecting a private sector firm to develop and trial an innovative product?

.....

.....

If a project for an innovative product was ineligible for an NPDP grant, what sort of agreement could be established with a firm to ensure satisfactory completion of such a project?

Could such an agreement have been used with the NPDP partner if the NPDP application had been unsuccessful?

What other mechanisms are used to reduce the risk of failure of development projects to government bodies? Does your department/agency use them?

How did/would the NPDP grant impact on the purchasing process when the contract went to tender?

What are the safeguards to ensure that the NPDP partner has no unfair advantage over other firms in a tender?

Why did your department/agency apply for an NPDP grant?

Do you have any other comments on the NPDP?

Thank you for your participation in the survey. You are urged to expand on the issues raised in the survey by making a submission to the inquiry. Information submitted to Industry Commission inquiries is made public. If you want the Commission to consider keeping information confidential it must be clearly indicated. Please return your completed survey in the enclosed envelope by 22 November 1991.

APPENDIX D: CASE STUDIES

Case study 1: **Electricity Distribution Network Fault Indicator**

Government Partners: South East Queensland Electricity Board (SEQEB)

Commercial Partner: CHK Engineering (CHK)

Grant: $160 145

Project timing: February 1989 to September 1990

The project:

An NPDP grant was awarded for the development and trialing of a device for detecting and locating faults in power distribution systems. These devices are mounted on power poles around electricity distribution networks, and can quickly signal the location of a fault in the network. The need for such a device was driven largely by dissatisfaction with the reliability of previous imported products. Accordingly, there was strong buyer interest from SEQEB.

The device differs from existing technology by measuring the ratio of current flows between conductors and reacting to any major (eg 100 per cent) discrepancy in flow on any line. The CHK approach, along with added safety features, has resulted in a device which is superior to alternatives in both sensitivity and reliability.

CHK retained full ownership to the rights of the technology and is seeking further NPDP assistance to enhance the product. SEQEB (the government partner) has a substantial record of involvement in product development.

Project outcomes:

Trials have proven the design a success. The product has been rapidly taken up by almost all Australian electricity authorities. Sales to date amount to 3000 units, or around $1.6 million. The unit is currently being evaluated by Southern California Edison for entry to the US market.

Assistance history of the firm:

In addition to the NPDP grant, CHK received assistance for this project from the IR&D Board under the Australian Industry Research and Development Incentives Scheme (AIRDIS). The company also received assistance under the National Industry Extension Service (NIES).

SEQEB is the government partner in two more recent NPDP projects with Nu-Lec Pty Ltd (Integrated Intelligent Recloser) and Redmond Gary Pty Ltd (Telescopic 12M Platform).

Case study 2: Terminal Management System (TMS)

Commercial Partner: The Preston Group (TPG)

Government Partner: Federal Airports Corporation (FAC)

Grant: Initially $394 000

Project timing: Signed in 1989-90

Originally due for completion 26 June 1991

Extended to June 1992

The project

TMS is a sequencing software package for airport management which simulates optimal gate usage, aircraft servicing, manpower and usage of other terminal equipment.

Project outcomes:

In the Commission's survey, TPG reported domestic sales of $250 000 and exports of $1 million. TPG's second submission reports $3 million of additional sales to Heathrow, Manchester and Amsterdam airports. These three contracts carry a great deal of prestige. There are immediate prospects of further contracts of similar value.

Assistance history of the firm:

The CSIRO holds equity in TPG (which was established to commercialise CSIRO research).
A Management Investment Company, Advent Group, also holds equity.

A discretionary (GIRD) grant of $432 000 was approved in 1988-89 for an air space modeller. Sales of this system were made to the Civil Aviation Authority and to the United States, United Kingdom and Germany.

The Preston group is registered for the 150 per cent tax concession for R&D and has qualified for Export Marketing Development Grants (see below).

Year	NPDP	GIRD	EMDG
1988-89		$432 000	$99 891
1989-90	$394 000		$200 000
1990-91			$157 533

Case study 3: SWD Powerline Communication Project

Government partners: State Electricity Commission of Victoria (SECV) and Electricity Trust of South Australia (ETSA)

Commercial partner: Oliver J Nilsen Limited (Nilsen)

Grant: $1 739 000

Timing of project: December 1988 to December 1991

The project:

The project involves Sequential Waveform Distortion (SWD) technology which enables electricity utilities to communicate with their customers using power lines as the communication medium. The technology can be developed to two stages. Stage one allows the electricity authority to undertake load or demand control (involving one-way communication), thereby reducing the maximum capacity required of the generation system. Stage two involves a two-way interaction between supplier and user. Advantages of the stage-two system include remote meter reading, credit control, remote connection/disconnection of service, fraud detection and pre-payment metering.

Nilsen formed a joint venture with the SECV and ETSA to develop the SWD technology. The three partners have all committed resources, and all will earn royalties if the project is successful.

Project outcomes:

Trialing of the two-way system has proven successful. The SECV intends to purchase a working system from Nilsen in December 1992. About 100 000 customers (out of 1.6 million) will receive the equipment over the next 5 years. SECV expenditure will be $200 000 in 1992-93, rising to about $5 million in 1996-97. ETSA has not indicated if it will purchase the system. Negotiations are underway for trialing to be carried out with electricity authorities in Ireland.

Assistance history of the firm:

1982-83	Project grant	$106 349
1986-87	Commencement grant	$10 468
1989-90	NPDP	$1 739 000
1991-92	NPDP[a]	$500 000

[a] SWD Ltd applied for a second grant after failing to spend the original grant in the maximum three year time period.

Case study 4: Orroral Laser Ranger

Government Partners: Australian Survey and Land Information Group (AUSLIG).

Commercial Partner: Electro Optic Systems Pty Ltd (EOS)

Grant: $186 000

Timing of project: Commenced September 1990

The project:

An NPDP grant was approved to assist the development of a Laser Ranger at AUSLIG's Orroral Valley station. The ranger uses laser pulses linked to an atomic clock to measure precise distances to satellites and reference points on the moon. The precision of the device is such that measured distances are accurate to within 6 millimetres. When used in conjunction with other laser stations, it is possible to gather precise data on variations in such things as the earth's rotation, axis and continental plate movements.

The project did not depend on the NPDP grant, but with grant assistance EOS decided to develop a more sophisticated version than originally planned. This has required additional investment from EOS, resulting in a longer time frame before the project returns to profit.

To accommodate the extra development, EOS have transferred resources from other high-yield export activities.

There is no Australian market for the product other than the prototype now owned by AUSLIG. EOS believes that a substantial share of the benefit of the grant has been captured by AUSLIG through acquiring the development unit at a subsidised price. The company has indicated that it would not have taken on the project in its current form if the assistance had been by way of a loan. EOS dominates the international market for this technology.

Project outcomes:

The development is proceeding to schedule. No sales have been achieved to date (with the exception of the project unit).

Assistance history of the firm:

In 1986, EOS received a grant under the former Australian Industry Research and Development Incentives Scheme for $335 000. This grant was used to develop technologies upon which the company's core business is now based, including the laser ranger.

In addition, EOS has received a $45 000 grant under the National Teaching Companies Scheme and $469 000 in export market development grants since 1986.

Case study 5: Microwave Landing System (MLS)

Commercial partner: Interscan International Ltd (Interscan)

Government partner: Civil Aviation Authority (CAA)

Grant: $2 040 800 (the largest to date)

Timing: Signed 1989-90

Intended date of completion 31 December 1991

The project:

MLS is a precision approach system for aircraft. It represents the next generation of technology to succeed current Instrument Landing Systems, and has been accepted by the International Civil Aviation Organisation. MLS must be in place at international airports by 1998. The benefits of the MLS include: almost unlimited number of aircraft approaches, fewer distortions to the signal, and safer aviation in poor weather.

Project outcomes:

No domestic sales yet as tenders are not likely to be called until 1993-94.

Interscan has already achieved exports valued at $3.9 million -- a demonstration unit sold to Spain. This sale surpasses the end-of-1991 sales target. Spanish officials were among those that have visited the trial site at Canberra airport. Others have visited the site from: the USA, the UK, China, Singapore, Italy, New Zealand and Papua New Guinea.

Assistance history of firm:

The original technology was developed by CSIRO. The Australian Industry Development Corporation, which is government owned, holds 100 per cent of the equity ($13 million).

Year	NPDP	EMDG
1983-84		$13 129
1984-85		$79 718
1985-86		$77 760
1986-87		$161 765
1987-88		$117 717
1988-89		$138 127
1989-90	$2 040 800	$150 000

Interscan has signed a $1.8 million Defence Offsets contract with an Italian company to supply air navigation antennae to the RAAF.
2/01/02

Case study 6: Memtec Limited

Government partner: Sydney Water Board (SWB)

Commercial partner: Memtec Limited (Memtec)

Grant: $627 000

Timing of project: Signed 1989-90, to be completed in early-1992

The project:

The continuous microfiltration membrane system (Memcor) uses special hollow fibres to filter large volumes of fluid to specific standards. Typically, several kilometres of these fibres are sealed into a membrane module. In turn, a filtration system may have several hundred modules. The input is pumped into the system and flows over and around the fibres. Clean water passes through the membranes of the fibres and out of the system for safe use or discharge into the environment, while pollutants are trapped on the outside of the fibres.

The technology has many of potential applications. At present, it is used to purify drinking water contaminated by algae, bacteria or viruses, and to purify sewage discharges to tertiary standards, without using chemicals.

Project outcomes:

In December 1991, Memtec signed an agreement with the SWB to install a unit at Cronulla. Memtec has trialed the system with water authorities in the United Kingdom, France and Japan. Memtec reports that it has orders 'in excess of $100 million under negotiation'.

Assistance history of the firm:

	NPDP	Project grant	Commencement grant	GIRD	EMDG
1984-85		$1 006 200	$40 000		
1985-86			$40 000		$140 774
1986-87		$196 250	$34 242		$199 483
1987-88				$780 312a	$200 000
1988-89					$100 589
1989-90	$627 200			$1 979 764	$200 000
1990-91				$500 000a	

a Partnership with CSIRO, AWA, Bioclone and Nucleus.

Case study 7: Ticket Reading Wagering Terminal

Commercial Partner: Stanilite Electronics Pty Ltd (Stanilite)

Government Partner: Totalizer Agency Board (NSW)

Grant: $496 850

(unsuccessful application for extension of $270 335 in April 1990)

Project timing: Signed 1988-89

The intended date of completion was 30 June 1990.

The project:

The project aimed to build a terminal which could read a punter's ticket, compare the ticket information with race results from TAB computers, and print results on the ticket.

Project outcomes:

The government partner did not complete agreed arrangements to trial the project, and did not buy the completed terminal. Stanilite is endeavouring to use the technology it developed to create similar terminals for other racing agencies.

Assistance history of the firm:

Stanilite received the following Australian Industry Research and Development Incentive Scheme grants from the IR&D Board:

1981-82	Commencement grant	$40 000
1982-83	Commencement grant	$40 000
1983-84	Commencement grant	$40 000
1985-86	Project grant	$200 000

Stanilite also received the following EMDG grants:

1986-87	$37 858
1988-89	$8 553

Stanilite also received assistance under the Computer Bounty Program.

The Australian Industry Development Corporation has a 28 per cent equity investment in Stanilite.

Case study 8: Artificial Intelligence Air Traffic Management System

Commercial Partner: Australian Artificial Intelligence Institute (AAII)

Government Partner: Civil Aviation Authority (CAA)

Grant: $250 000

Timing of project: Signed 1989-90

Intended date of completion 31 October 1991

The project:

AAII calls the project OASIS, or Optimal Aircraft Sequencing using Intelligent Systems. It is basically a software program which minimises aircraft delay, both on the tarmac and in holding patterns in the air. AAII claims that this leads to a 5 to 10 per cent increase in efficiency.

Project outcomes:

The project is yet to be completed. There has been some inspection of trials by overseas interests. Assistance history of the firm:

AAII was set up in 1987 to commercialise Australian R&D. The generic scheduling technology behind OASIS was developed under an IR&D Information Technology grant received in 1987. The grant was for $744 000 (which represented 65 per cent of the total expenditure). The commercial partner for this grant was Computer Power, one of AAII's founders, along with the Victorian Government.

The Victorian Government contributed $100 000 to the (OASIS) NPDP grant. The same year as it received the NPDP grant, 1989-90, AAII also received another Information Technology grant, this time of $480 000 to further develop OASIS to be able to cover more than one airport (the CAA was commercial partner in one instance, but government partner in the other).

Case study 9: JTEC

Commercial Partner: JTEC

Government Partners: Department of Social Security / Telecom

Grant: $548 129

(plus an extension of $150 781 approved on 16 April 1991)

Project timing: Signed 1989-90

Intended date of completion 31 November 1990

The project:

JTEC states that the full description of this project is "Trialling of ISDN Multiplexers and Multi-Service Workstations". A multiplexer is a device which enables different data types coming from one source to be directed to their proper receivers, for example within a video, it would direct sound to the speakers and pictures to the TV screen. A "Multi-Service Workstation" is the product which combines a personal computer, scanner, fax, phone and printer.

ISDN, or Integrated Switchable Data Network, is a form of transmission network that can carry voice and other data in digital form, which results in faster and more accurate transmission. Telecom is developing ISDN for Australia -- JTEC is not developing ISDN itself, but its product is ISDN compatible.

Project outcomes:

As at the date of JTEC's response to the Commission survey (25/11/91), no sales had been achieved. JTEC recently indicated to DAS that its workstations "would be ideal" for one of DAS' projects, but DAS declined to purchase, stating that the products were too expensive.

Assistance history of the firm:

In 1989-90, this project received a discretionary (GIRD) grant of $1 926 263 in addition to the NPDP grant.

APPENDIX E: NPDP GRANT LINKAGES

Not many organisations know much about the NPDP. A survey by Worthington Di Marzio (1991) of firms chosen at random, but of which 70 per cent were suppliers to government, revealed that only 11 per cent were aware of the existence of the NPDP.

Organisations with members on the IR&D Board or its Committees would be more likely to know about THE NPDP and other R&D assistance schemes than would most companies.

Since 1987, when the NPDP was founded, there have been 79 members (from companies, agencies or institutions) on the IR&D Board and its Committees (plus some DITAC ex officio members). A high proportion of IR&D Board grants approved during this period have gone to organisations with connections to these members, including 19 NPDP grants totalling $9 million (representing around a third of NPDP grants by value) -- see Table E.1.

The linkages shown in Table E.1 add to the Commission's concerns that the assistance available through the NPDP is not more widely known; that firms and/or products are assisted under several programs; and that it is difficult to gauge in any meaningful way the full extent and effect of the assistance.

No impropriety on the part of the Board or its Committee members is implied.

Table E 1: Organisations with IR&D Board linkages receiving NPDP grants, 1987-88 to 1991-92

grant recipient	grant $'000	year approv	member's name	year in which was a member	member's organisation and link to recipient
Agen Biomedical	104	91/92	Wenck G*	90-91	Techniche, MIC investor in Agen
AMRAD-Trace	309	89-90	Grant J*	89-91	Trace Scientific, parent of AMRAD-Trace
			Grace J	89-91	AMRAD, parent of AMRAD-Trace
Ausonics	200	91/21	Osman P	88-89	Nucleus, owner of Ausoncis
Australian Artificial Intelligence Institute	250	89/90	Henshaw A	88-91	Computer Power, Parnet of AAII
AWA Microsystems	262	89/90	Nicholson P*	88-90	AWA
Cameronics Technology Corporation Ltd	478	89/90	Grant J*	89-91	Trace Scientific, owned by Cameronics
Cochlear	919	91/92	Osman P	88-89	Nucleus, owner of Cochlear
Computer Power P/L	439	88/89	Henshaw A	88-91	Computer Power
Electrodata P/L	456	89/90	Grant J*	89-91	Hambro-Gratham, MIC investor in Electrodata
Forensic Science Technology International P/L	114	87/88	Gitsham A*	88-90	Visions Systems, parent of FSTI
Forensic Science Technology International P/L	205	90/91	Gitsham A*	88-90	Vision Systems, parent of FSTI
Interscan International Ltd	2105	89/90	Byran E	86-89	AIDC, which wholly owns Interscan
JTEC	548	89/90	Wenck G*	90-91	Techniche, MIC investor in JTEC
			Grant J*	89-91	Hambro-Gratham, which "was considering investing in JTEC" at the time of the JTEC's application
			Robinson E	89-91	DITAC (but also board member of JTEC)
			Tyrell, L	88-91	Telecom, partner to JTEC
Labtam (Aust(P/L	221	90/91	Parrot Dr J*	90-91	BHP, part owner of Labtam
			Box, D	89-91	BHP, part owner of Labtam
			Scaiffe, P	91-91	BHP, part owner of Labtam

Memtec Ltd	627	89/90	Hanley D	89-91	Memtec
			Grant J*	89-91	Hambro-Gratham, shareholder in O/S parent of Memtec
Network Automation Ltd	827	90/91	Sauer, R	88-91	solicitor, represents Network Automation
Quantum Technology P/L	186	89/90	Clark Dr G	88-91	IBM, which has equity in Quantum
Soecial Purpose Vehicles	91	87/88	Miller Dr P*	86-91	"director of a related company" to SPV
St Vincents/Garvan Inst. (see Cochlear)		91/92	Shine Prof J	86-91	St Vincents/Garvan Institute
Stanilite Electronics P/L	497	88/89	Grant J*	89-91	Stanilite
The Preston Group P/L	394	89/90	Kelly, P	90-91	NSW Super Board, has equity in TPG
Victorian Soap Corp	60	89/90	Kricker W	86-91	Alfred Group of Hospitals, govt partner of Vic Soap
Total	**9292**				

Notes:
*member of NPDC
grants approved does not include any later extensions, or exclude grants approved but not signed.

Source: Various IR&D Board annual reports, IR&D Board declarations of interest
Senate Estimates Committee, various companies' annual reports
"Who Owns Whom"

APPENDIX F: GOVERNMENT ASSISTANCE TO R&D

This appendix provides broad details on major government programs that directly and indirectly assist research and development (R&D) in Australia. Table F.1 summarises some of these programs and their funding for 1990-91 and 1991-92.

Table F.1: **Direct Commonwealth expenditure on R&D, 1990-91 and 1991-92**
($ million)

	1990-91	*1991-92*[a]
Higher Education	**987.4**	**1081.8**
Estimated research component of general university funding	660.0	680.0
Identifiable research support for universities	155.0	160.0
Australian Research Council and other funding[b]	171.4	239.9
Commonwealth research organisations	**859.9**	**891.7**
Commonwealth Scientific and Industrial Research Organisation	421.1	448.1
Defence Science and Technology	227.2	221.1
Bureau of Mineral Resources	52.9	54.2
Australian Nuclear Science and Technology Organisation	62.6	64.9
Special purpose and directed grants	**309.1**	**384.0**
National procurement development program	7.5	6.1
Discretionary grants for industry research and development and the Generic grants for industry research and development	29.6	32.2
Advanced manufacturing technology program	0	5.0
Primary industries and energy research and development net of industry contributions	98.2	116.6
National health and medical research council research grants	94.7	103.3
Motor vehicle research and development	4.7	2.8
Cooperative research centre grants	-	19.5
National teaching company scheme	2.7	na
Revenue foregone as a result of tax concessions	**266.0**	**250.0**
150 per cent tax concession for research and development expenditure	232.0	250.0
100 per cent tax concession for investment in Management Investment Companies	34.0	-
Total	**2422.0**	**2607.0**

a Budget estimates.
b Other funding includes postgraduate awards, fellowships, overseas postgraduate research scholarships, special centres and infrastructure.
Source: Free 1991

Higher education funding

Funding for research in the higher education sector is estimated to increase to $1082 million in 1991-92 from $987 million in 1990-91, representing a real rise of 6.1 per cent. The higher education sector receives support through general or non-directed research funds, funds provided specifically for research, and research funds under the control of the Australian Research Council.

Funding for research in higher education is generally allocated to basic or fundamental activities. For example, higher education institutions carried out 79 per cent of Australia's pure basic research activity in 1988-89, but only 18 per cent of applied research activity and 4.5 per cent of experimental development (ABS 1990, p. 5).

Commonwealth research organisations

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

CSIRO is an independent statutory authority operating under the provisions of the Science and *Industry Research Act 1949*. During 1989-90, the CSIRO employed a total staff of 7051 and undertook research activity valued at $501 million (see Table F.2).
CSIRO's primary functions are to:

- carry out scientific research;
    - to assist Australian industry and to further the interests of the Australian community, and
    - to contribute to national and international objectives and responsibilities of the Commonwealth Government, and
- encourage or facilitate the application and use of the results of scientific research.

Its secondary functions include international scientific liaison, training of research workers, publication of research results, and dissemination of information about science and technology. The allocation of funds sectors and industries is shown in Table F.2.

Defence Science and Technology Organisation (DSTO)

The stated role of the DSTO is to enhance Australian defence capabilities through scientific and technological assistance to the Australian Defence Force and the Department of Defence and, as necessary in the national interest, to assist the development of Australian industry. The organisation had a budget allocation of $212.5 million in 1991-92 ($215 million in 1990-91) (Free 1991, p. 29).

Table F.2: **CSIRO distribution of research effort, 1989-90**

	Proportion of expenditure	*Expenditure*
	(%)	($ m)
Manufacturing industries	19.6	95.2
Animal production and primary products	15.7	78.7
Plant production and primary products	11.4	57.1
Environment	10.2	51.1
Economic development: economic aspects	8.9	44.6
Rural manufacturing	7.1	35.6
Minerals industries	6.7	33.6
Information and communications industries	4.8	24.1
Transport, construction and commercial services	3.7	15.8
Energy resources	3.6	18.0
Advancement of knowledge	2.3	11.5
Health, social development and defence	2.2	11.0
Energy supply	2.0	10.0
Total	**100**	**501.3**

Source: CSIRO 1990

Bureau of Mineral Resources (BMR)

Funding for the BMR in 1991-92 is estimated at $54 million. The Bureau is responsible for monitoring and assessing factors that affect Australia's natural resources, including Australia's petroleum, mineral and groundwater reserves.

Australian Technology Group (ATG)

In the Prime Minister's 'One Nation' statement, it was announced that an ATG is to be established in 1992-93 to purchase intellectual property rights in R&D projects developed in Australia. More specifically the Group will:

- have a one-off capital base of $30 million;
- act as a small, commercially focused company;
- help to identify research with commercial potential, particularly from public sector research bodies, but not limited to the public sector;
- secure effective control and protection of intellectual property for itself and partners;
- market research output to Australian and overseas companies (including, where necessary, by providing seed capital to bring the idea to a stage where it would be attractive to private sector partners).

Special purpose and directed grants

Cooperative research centres program

The Commonwealth's cooperative research centres program invites applications for grants from research institutions, government departments and agencies, and private companies interested in setting up a research centre. The first 15 centres were selected in 1990-91, but due to technical difficulties the program funds were not distributed. The Commonwealth will add these funds of $4 million to the program budget for 1991-92, bringing it to $19.5 million.

The first 15 centres are to undertake research in the resource, manufacturing, information, environmental and biomedical sectors.

Up to 50 centres are to be established by 1994-95, with funding of an estimated $100 million in that year.

The main objectives of the program are to:

- support long-term high-quality scientific and technological research which contributes to national objectives, including economic and social development, the maintenance of strong capability in basic research and the development of internationally competitive industry sectors;

- capture the benefits of research, and to strengthen the link between research and its commercial and other applications, by the active involvement of the users of research in the work of the centres;

- build centres of research concentration by promoting cooperative research, and through it a more efficient use of resources in the national research effort; and

- 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.

National Health and Medical Research Council

During 1991, the Council funded over 1100 research projects, as well as contributing funds for several research centres and institutes. Spending for 1990-91 totalled $94.7 million.

Primary Industries and Energy

There are 18 research and development corporations and councils established within the Commonwealth Department of Primary Industries and Energy. The aim of these organisations is to:

> ... encourage greater end-user participation in research and to ensure industry research organisations are more active in the commercialisation of research and the realisation of industry opportunities, and more involved in the transfer of technology (Free 1991, p. 70).

Research expenditure undertaken through these bodies in 1991-92 is expected to be $188 million, of which about 40 per cent will be collected from industry levies. Of the 18 organisations, 15 are based on a single agricultural industry. Provision is made for Government funding of these corporations and councils on a dollar-for-dollar basis.[1]

Three research and development corporations are mainly funded by Government:

- the Land and Water Resources Corporation;
- the Rural Industries R&D Corporation; and
- the Energy R&D Corporation.

Table F.3: **Commonwealth support of industry R&D through the Primary Industries and Energy portfolio**
($ million)

	1990-91	*1991-92 (est)*
Wool	11.7	13.6
Meat	13.6	20.7
Fishing industry	8.5	10.4
Grains	14.4	17.5
Horticulture	3.1	5.0
Energy	15.9	11.8
Land and water	13.3	13.3
Special rural research fund	6.0	8.4
Other rural research	11.7	15.9
Total	**98.2**	**116.6**

Source: Free 1991

The Discretionary Grants Scheme

The stated aim of this scheme is to provide direct R&D funding to companies which have insufficient taxation liability to obtain adequate benefit from the tax concession for R&D.

The scheme commenced in July 1986 and is scheduled to cease on 30 June 1994. Under the scheme, R&D projects can be supported for up to three years at a maximum of 50 per cent of eligible project expenditure which must exceed $50 000.

[1] Funding is up to a maximum of 0.5 per cent of the gross value of production of the commodity.

Applications for grant funding are assessed by the Discretionary Grants Committee of the Industry Research Development (IR&D) Board.

The discretionary grants scheme was recently expanded to include services and R&D-related market research (see Table F.4).

Generic Technology Grants Scheme

The generic technology grants scheme is administered by the IR&D Board with the assistance of five committees.

- Biotechnology Committee
- Communications Committee
- Environmental Committee
- Information Technology Committee
- Manufacturing and Materials Technology Committee

During 1990-91, 24 projects received funding of $12.1 million under the scheme. In this period the IR&D Board (1991) reorganised the program.

The essence of the change is a greater emphasis in the activities of all of the granting committees towards industry/technology development in general and commercial potential of supported projects in particular (p. 10).

Table F.4: **Agreements signed by the IR&D Board in 1990-91**

	Number of grants	*Grant funds committed* [a]	*Average grant committed*
		($'000)	($'000)
Discretionary grants	69	15 113	219
Generic grants			
Biotechnology	8	3 439	430
New materials technology [b]	9	4 748	528
Information technology	5	2 911	582
Communications technology	1	498	498
Waste and environment management technology	1	453	453
National Procurement Development Program	**12**	**2 589**	**216**

a Payments for these grants extend into future financial years and are not met solely out of 1990-91 funds

b Includes advanced manufacturing technology

Source: IR&D Board 1991, p.133

The National Teaching Company Scheme

The National Teaching Company Scheme aims to foster links between companies and public sector research institutions by providing support of up to $50 000 over two years towards the cost of employing graduates on projects designed to improve company performance.

In 1990-91, approval was given to 53 of 143 applications at an estimated total cost of $2.65 million. Grant payments totalled $1.85 million. State governments also approved support for six additional projects at an estimated cost of $300 000.

Advanced Manufacturing Technology (AMT) Development Program

The Advanced Manufacturing Technology Development Program began in early 1992. The program was modelled on the NPDP. It will support research, development, trialing and demonstration of innovative Australian AMT products and services which meet the requirements of Australian manufacturing industries. It is intended that the scheme will assist:

- advanced materials and related process technology;
- advanced computer-controlled or microprocessor-based equipment used in the design, production, testing of handling of a product; and
- advanced manufacturing techniques or services.

The Government has committed $20 million to the program over the next seven years. Grants will be awarded over a four-year period for up to 50 per cent of eligible project costs. The program is administered by the IR&D Board, under the existing provisions of *the Industry Research and Development Act 1986.* The program is run in conjunction with the NPDP.

Revenue forgone as a result of tax concessions

The 150 per cent tax concession for industrial R&D

The tax concession for industrial R&D is set at a rate 150 per cent until 30 June 1993, after which a rate of 125 per cent will apply.

Firms that register under the program receive a tax concession on the value of their eligible R&D expenditure. The introduction of the tax concession in 1986-87 has resulted in an increase in reported private expenditure on R&D. IR&D Board (1991) estimates of tax revenue foregone are: 1986-87, $105 million; 1987-88, $145 million; 1988-89, $195 million; 1989-90, $215 million and 1990-91 at $230 million.

Table F.5: **Eligible expenditure, by industry sector based on 1988-89 tax concession registrations**
($ million)

Industry sector	*R&D expenditure*
Computer software	116.7
Miscellaneous manufacturing	92.6
Chemicals and petrol	88.7
Other non-manufacturing	87.2
Mining	76.1
Fabricated metal products	47.3
Basic metal products	46.3
Food, beverages and tobacco	42.7
Transport equipment	42.7
Appliances electrical equipment	32.1
Paper, printing and publishing	25.4
Non-metalic mineral products	23.5
Industrial machinery equipment	20.4
Photographic scientific equipment	18.2
Agriculture	17.6
Finance, property and business service	10.6
Construction	6.8
Transport storage	5.1
Wood and furniture	4.9

Source: IR&D Board 1991

The Management and Investment Companies (MIC) program

The MIC program ceased operation on 30 June 1991. Up until that time the program had provided a 100 per cent tax concession for investments in licensed MICs that invested in approved high-technology areas. An upper limit of $20 million applied to revenue foregone under the program.

Commonwealth schemes that provide indirect support to research and development

Australian Defence Offsets Program

Defence Offsets are activities of defence and technological significance which are directed to Australian industry by an overseas supplier as a result of winning a contract for goods and/or services for the Department of Defence. In 1989-90, the total value of contracts awarded which involved offsets obligations was $3.9 billion. The value of new offsets obligations was $347 million.

The general offsets requirement is 30 per cent of the imported content of single or accumulated contracts. The types of activities which are accepted as Defence Offsets are: R&D; collaborative

ventures; training; technology transfer; or the purchase of Australian made products, components and service for export.

Australian Civil Offsets Program

The Australian Civil Offsets program requires foreign firms who gain large government contracts to undertake certain activities in Australia. A major aim is to help local firms access global marketing facilities and advanced technologies. The program currently applies to Commonwealth civil procurement and State procurement of information technology products, commercial vehicles, plant and equipment, and power generation and distribution equipment.

Offsets are required in respect of purchases which individually or collectively exceed $2.5 million and the imported content exceeds 30 per cent. In areas not covered by the national agreement, such as medical and scientific equipment, the States use a $1 million imported content threshold. In 1989-90, $1.9 billion of government procurement incurred offset obligations of $372 million (see Table F.6).

Table F.6: **Obligations by commodity classification, 1989-90**
($ million)

Commodity	*Obligation*
Aerospace	256.6
Air traffic control	8.0
Information technology hardware	59.6
Information technology software	2.6
Vehicles and associated equipment	32.1
Miscellaneous mechanical	-
Miscellaneous electrical	2.2
Power generation equipment	7.7
Heavy engineering and construction	2.9
Scientific and medical	0.7
Total	**372.4**

Source: DITAC 1991, p.13

The major means of fulfilling offsets obligations are exports, research and development, and technology transfer. During 1989-90, offsets obligations were completed mainly through exports ($165 million) and R&D ($127 million).

Offsets are generally calculated on the basis of activity undertaken by Australian industry. Expenditure on research, development and training qualifies for a multiplier of three. The multiplier can only be applied if commercialisation of the R&D is intended to be carried out within Australia.

In March 1991, the Commonwealth announced that Partnerships for Development and Fixed Term Agreements would replace the civil offsets program in the information technology industry.

Partnerships for Development Program

The program began in 1987 as an alternative to the civil offsets program for transnational information technology companies. Companies in the Partnerships for Development program must agree that by the seventh year they will have:

- expenditure on R&D equivalent to 5 per cent of their annual local turnover;
- exports of goods or services equivalent to 50 per cent of their annual imports into Australia; and
- an average of 70 per cent local value added across all exports

Table F.7: **R&D expenditure and exports by partnerships for development firms, 1989-90** ($ million)

	Research and development	*Exports*
Hardware products and components	10.0	49.0
Hardware other	47.0	98.0
Hardware and components total	57.0	147.0
Marketing and management	0.0	4.0
Services, training and education	0.5	4.0
Technical and engineering support	4.5	3.0
Services total	5.0	11.0
Software applications	19.0	82.0
Software other	3.0	4.0
Software systems	21.0	14.0
Software total	43.0	100.0
Total	**105.0**	**258.0**

Source: DITAC 1991, p.42

Yearly targets are negotiated and a company's performance is gauged by whether the firm is increasing the level of activity at a reasonable pace to meet its commitments at the end of the agreement.

Participating transnational companies benefit from the program as their offset obligations cease at the end of the seven year agreement.

In March 1991, the Commonwealth Government announced that Partnership Agreements will be mandatory for all transnational companies with information technology sales of over $40 million to government, while firms with sales between $10 million and $40 million are expected to sign Fixed Term Agreements. Offset obligations will not apply to firms selling less than $10 million annually (PM&C 1991, p. 3.27).

Government purchases of information technology

The Prime Minister announced, in the 'One Nation' statement of 26 February 1992, a plan for the Commonwealth Government to assist Australian firms producing information technology by:

> ... applying the concept of "limited liability" in its systems integration and software development contracts. Following an assessment of the risks involved in individual contract, the Government will consider accepting more of the risk and setting limits to the suppliers' liability for damages. This will provide wider opportunities for companies to access the valuable public sector market and will enhance the prospects of the local industry (p.95).

The factor f pharmaceutical scheme

The Pharmaceutical Benefits Pricing Authority is responsible for negotiating the price at which manufacturers sell their product through the Pharmaceutical Benefits Scheme. The factor f pharmaceutical scheme enables the Authority to increase the price of a particular pharmaceutical, provided that the manufacturer agrees to meet quantitative targets on export levels and R&D activity.

There are nine companies currently operating in the scheme. The estimated value of the price increases granted in 1991-92 is $46 million (IC 1991, p. 135). The scheme is due to expire in 1992-93.

National Energy Research Development and Demonstration Council (NERDDC)

The Energy Research and Development Corporation was established on 2 July 1990 (see Primary Industries and Energy). The Corporation assumed responsibility for the non-coal component of the former National Energy Research, Development and Demonstration Program. During 1990-91 the NERDDC continued its advisory and monitoring role in respect of coal research, development and demonstration projects and assessment of grant applications. The coal R&D projects are funded by an industry levy.

Customer premises telecommunications equipment scheme

Access to the Australian market for customer premises equipment is governed by a set of industry development arrangements intended to encourage greater local production and exports, and to move the industry to a position where it can compete internationally. The arrangements were introduced in 1989 and will apply to 1993.

The scheme covers private automatic branch exchanges, small business systems, and cellular mobile telephones. The arrangements restrict access to the Australian telecommunications network (managed by Austel) to firms which achieve a threshold level of points for exports, local content, and R&D. The number of points needed to retain endorsement progressively increases over the life of the arrangements.

In the nine months to May 1991, endorsed suppliers reported a turnover of $267 million. Local content was reported at 34.6 per cent, exports totalled $32.6 million and R&D was $13 million or 5 per cent of turnover (IC 1991, p. 137).

APPENDIX G: RISK AVERSION AND OTHER POTENTIAL BIASES

Risk aversion

Risk aversion can be expressed in several ways, but generally refers to a propensity to:

- exaggerate the probability of unfavourable outcomes; and/or
- give too much consideration to the consequences of an unfavourable outcome relative to the consequences of a favourable outcome;

Many definitions refer to the unwillingness of a risk-averse individual to participate in a fair gamble:

> A risk averter is defined as one who, starting from a position of certainty, is unwilling to take a bet which is actually fair (*a fortiori*, he is unwilling to take a bet which is actuarially unfair to him). (Arrow 1974, p.90)

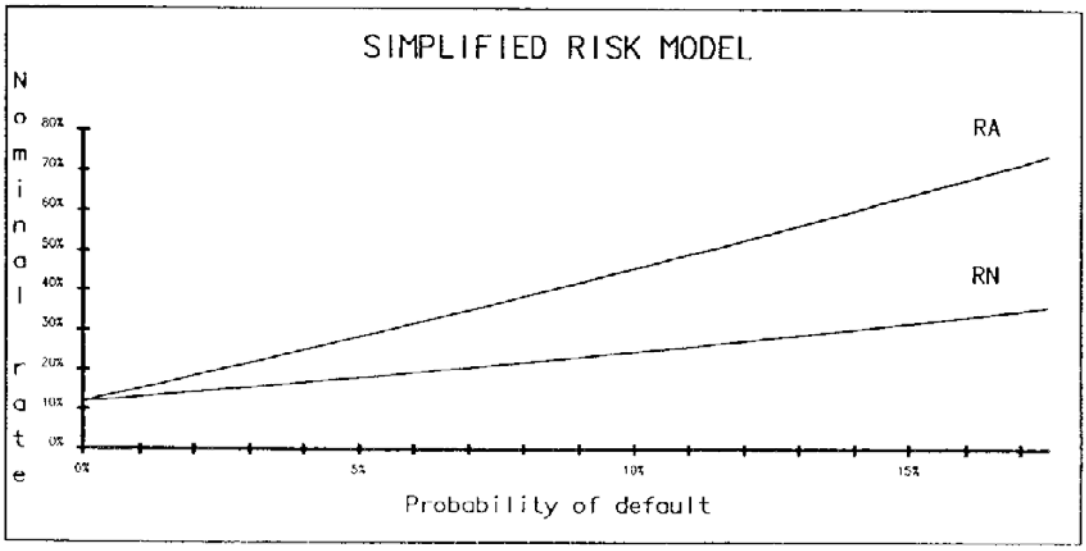
Risk aversion is therefore not simply attaching greater probability to loss than the probability of gain, as this may be warranted by the circumstances (eg the probability of winning lotto). Nor is it simply allowing a decision to be influenced by the probability of loss.

Consider the case of an investor facing a series of 1 year bond options of varying risk of default (for simplicity, the outcomes from each option are either total payment or full default). Compared with the alternative of a risk-free investment (eg a government security) for which the outcome, by definition, is certain.

The accompanying diagram plots against combinations of risk and nominal (promised) interest the boundary of options acceptable to a risk-neutral investor. The combinations for which the combined effect of (higher) risk and (higher) nominal interest rate is such that risk weighted expected return is the same as the risk-free option is represented by the line RN. All of these combinations would be acceptable to a risk-neutral investor although, quite obviously, a lower risk for a given return or higher return for a given risk would be preferred.

Note that a risk-neutral investor still requires compensation for any exposure to loss and would not accept an opportunity with some risk of loss without a compensating increase in the potential for gain (relative to the risk free option).

A risk-averse investor would only consider a *subset* of combinations above this line - that is, options where the (probability weighted) expected outcome is above that of the risk-free option. The lower boundary of a risk-averse investor might be like a line like *RA*.



Rarely do decision makers -- whether consumers, managers, investors or government agencies -- have the luxury of an observable probability distribution or a single risk variable.

Almost all decisions involve uncertainty -- rather than risk -- in the sense that the underlying mathematical probabilities are not known with certainty. Factors such as the weather, the behaviour of others, market variability, technology change and political risk all defy any precise assignments of probabilities to possible future outcomes.

Faced with uncertainty, access to relevant information (and the knowledge and skills of how to use it), become a valuable commodity. Thus knowledge/previous experience with similar situations can make realistic assessment of risks easier, but may not be a necessary requirement to be in a position to assign informed probabilities to uncertain events. In this sense, while it is still useful to use mathematical language in risk analysis, probability assignments are often based on subjective judgements, and may (as described in some literature) therefore reflect the 'strength of belief' attaching to a prospective event. For these reasons, the study of risk aversion has focused on behaviour under conditions of uncertainty (rather than 'risk') as the appropriate statistical concept.

As discussed in Chapter 2 of this report, government purchasers frequently face a range of risks in terms of possible causes of an unfavourable outcome. The significance of each depends on the circumstances of the purchasing authority -- including the reliance placed on the supplier.

It is therefore difficult to devise a 'typical example' to illustrate risk-neutral and risk-averse behaviour, and there would be little benefit in replicating the complexity of many actual procurement evaluations. The following is an attempt to illustrate the major principles using a contrived example.

Suppose an agency is facing replacement of a major component of a claims-processing system. It has reached the stage where it has narrowed possible suppliers to two candidates -- one which is known to be reliable and meet requirements with a price of $1 million, the other of unknown price and performance. However, the vendor of the latter product has contended that the 'unproven' product will meet the performance of the known product at a 20 per cent lower price.

The component proportionately affects the performance of the entire system, which is expected to have annual running costs of some $10 million in the new system. The life of the component is expected to be 5 years under either option.

The following outcomes from the unknown product are possible:

Outcome A: Product meets expectations in all respects.

Outcome B: Product increases system costs (eg extra staff, maintenance, capacity to achieve target) by 10 per cent relative to the known product.

Setting aside the need to discount cash flows to present values, outcome B would entail a $4.8 million penalty for the agency (10 per cent of operation costs over 5 years less the price saving).

The manager assesses the probability of outcome B occurring to be 5 per cent (ie a 1 in 20 chance).

Weighting possible outcomes by their expected probabilities of occurrence gives an expected gain from the unknown product of:

(0.95 X $200 000) - (0.05 X $4 800 000) = -$50 000.

That is, the manager could be expected to decide in favour of the known product, although given the sums involved, the decision could be considered marginal.

The hypothetical example illustrates how the direct cost of the product in question may only equate to a small portion of the total investment put at risk.

Whether the manager has been risk averse or not cannot be judged from the above. It might be that the true probability of the unknown project failing to perform as expected is only 2 per cent -- in

which case it should win the contract. Conversely the true probability may be much greater, or there may be contingencies not allowed for (eg additional staff training or risk of total failure).

An outside party could be expected to be more vulnerable to error and bias in making the same assessment. There are several reasons for this, including:

- reduced incentive to carefully evaluate options;
- conflicting agenda (eg industry assistance); and/or
- insufficient familiarity of the complexities of the operational environment and potentialities for failure.

Clearly, it is therefore not appropriate to entertain any assertions about risk aversion without considering the position of the authority making the assertion. That a procurement decision is necessarily based on subjective assessments of the probabilities attaching to the various possible outcomes does not necessarily imply that there is bias, let alone that outsiders could make a better decision despite the obvious additional risks of error.

Other potential sources of purchasing bias

The cost of finding the 'best' solution

In its discussion of risk aversion, the IR&D Board addressed the translation of uncertainties into risk-assessments. Acquiring information to facilitate this process, although desirable, is not costless:

> Unless there is an appropriate pay-off (reward) to riskier (more uncertain) outcomes, government purchasing decisions are likely to be biased against the riskier outcome in favour of the better known "experience" product.
>
> In such circumstances, there will be an inevitable bias against newer, yet-to-be proven technology from newer companies. The economic costs (including time costs) associated with gaining information and "experience" will tend to bias against the smaller, local technology supplier. It is this type of "bias" which appears to underlie the concerns of the Inglis Committee and which in part underpins an NPDP-type innovation policy (Sub. 15, pp.30-1).

It is not clear from the above, or elsewhere in the Board's submission, what determines an "appropriate pay-off" other than the potential benefit (including intangibles and spin-off benefits) of meeting the purchaser's objectives more cost effectively as assessed by the purchaser. It is the nature of uncertainty/risk that assessors may make errors in estimating the underlying probabilities. Such assessments may be loosely based on past experience and judgment but this does not seem to support an argument for a systematic bias against prospects affected by limited information.

Investing in information and decision-making skills is one way of reducing the risk that 'bad' purchasing decisions will be made. In extreme cases, gathering more information may confirm or dispel predispositions towards a given option. It may also uncover problems not previously considered. The purchaser is therefore faced with deciding on an appropriate level of search/training costs, having regard to the expectation that incurring some cost will change the purchasing decision for the better.

Accordingly, it may be more efficient (ie, cost effective) to make a decision with some avoidable uncertainty rather than gather further information. Notionally, this could discriminate against products which would have proved to be a 'better' buy on further investigation. Equally, failure to gather all relevant information could bias against products which would prove unsuitable on further investigation. Setting aside hunches about which of these is more likely to be the case, there seems to be little objective evidence one way or the other.

The purchaser also faces a decision about how much effort to invest in attracting expressions of interest from potential suppliers. If a particular product is known to be suitable, a straight purchase has obvious attractions (or only inviting tenders for products very similar to the type that is known to be appropriate). However, there are costs in moving from a known design to devising functional specifications and evaluating a wider range of candidates.

The fact that information gathering, tendering and decision making all consume resources (and therefore should be subject to the same sorts of controls that are applied to any other expense) is a reality of the market, and does not represent a case for government intervention.

Prospects which require additional search costs to evaluate effectively represent a higher price to the purchaser. Efficiency requires that these costs should be allowed for in the purchase decision (in much the same way as delivery and installation expenses). To subsidise search costs, (including demonstration and trialing) would be to encourage over-investment in such activity relative to what can be justified by prospective returns.

Adverse selection

Many claims about the purpose of the NPDP suggest that government procurement decisions are based on generalisations on the presumed (inferior) quality and reliability of Australian firms, compared with overseas counterparts. If authorities behave in this way it may be a response to limitations in buyers' ability to properly assess representations made on the quality and prospective performance of a individual products, the capabilities and viability of suppliers and/or their future performance (eg after-sales support, on-going development and supply of a system). Certain suppliers therefore have the advantage of possible ignorance on the part of potential purchasers and therefore an incentive to overstate their capabilities and intentions. This situation can give rise to

the problem of *adverse selection*, that is, a possibility that a sub-optimal option will be chosen because of buyer's disadvantage in information.[1]

Adverse selection may still occur if buyers' perceptions on average performance are accurate. By facing average judgments, the incentive for any individual seller to invest in superior performance and reliability is weakened by the incentive for other firms to free ride on that investment.

In the Commonwealth environment at least, there may be scope for this problem to occur. DAS have advised that while directories exist on supplier contracts, information transfer between agencies on supplier performance is largely by word of mouth. Further, Commonwealth purchasing authorities are reluctant to formally pass on information of bad experiences due to potential exposure to legal action.

The Commission seeks further comments on information flows between purchasing authorities, particularly as it reflects on poor performers as well as recognition of reliable firms.

Industry protection

Purchasing bias may also arise as a result of other government programs to assist selected firms/activities. As noted elsewhere in this report, there is presently a host of programs directed at encouraging investment in high-technology research and manufacturing in Australia. The desire to make these programs appear successful may also be a source of pressure within government to bias decisions in favour of purchasing the products of participants in these programs, regardless of risk. One submission noted:

> Australian manufacturers have always been discriminated against in favour of international companies, and this has cost the Australian public and the Australian economy enormous monies in the past.
>
> One of the main problems that brings this about is all governments' desire to "attract investment to this country". ... What then tends to occur in this industry is that having established a factory, the factory and branch management then need to become involved in the "market share game". This means that having made an investment in this country they then demand a certain market share (Sub. 3, p.1).

Another participant appears to have been disadvantaged by purchasing agencies' preference for in-house development:

> In addition both the NSW RTA [Road Transport Authority] and Vicroads set about a program to build their own Deflectometers, at many millions of dollars, although we had shown that a unit worth $200 000 could be successfully integrated into the AREV [Australian Road Evaluation Vehicle].

[1] Akerlof (1970) has examined the impact of adverse selection under several scenarios. His work demonstrates that adverse selection can have a depressing effect on the level of activity and quality of a market (or class) and can lead to a self reinforcing cycle of discrimination against that market (class).

> Recently Vicroads bid for a contract to collect data for the ACT Administration at half our price, in spite of the fact that we would use two people not three, and our equipment was one third the value (Sub. 9, p.2).

It is not clear whether risk management has any role to play in the latter case as the basic problem appears to be that of (implicit) protection of own-account activities by the Road Transport Authority and Vicroads.

In some circumstances the NPDP may help to offset the effects of other intervention programs. However, a preferred strategy would be to clearly address the source of the problems directly, namely the bias induced by the other programs and practices within the control of the governments sponsoring the NPDP.

Fair dealing

Various organisations expressed concern to the Inglis Committee that probity requirements hindered co-operative developments, as many departments felt that all their transactions had to be seen to be at 'arms length'. The IR&D Board commented:

> In terms of the procurement process, government partners adopt standard purchasing procedures which require public tendering and probity in all stages of the process. The survey of government partners reflected in places a frustration by the "users" within the department concerned and the purchasing officials when, at the end of a NPDP project the users wanted to buy the relevant product or system, but the purchasing regulations place limitations on a direct purchase without proceeding through normal purchasing procedures (Sub. 15, p.4).

However if this is still the case, it would not appear to stem from the official regulations. Guideline 3: 'Ethics and Fair Dealing' allows for sole supplier relationships. The only requirement is that the reasons for choosing such a supplier should be a matter of record, to avoid allegations of unethical practice.

Clearly, there is reasonable scope for co-operative developments, at least at the federal level of government.

Use of specialist procurement officers

DITAC argues in its submission that co-operative development is hindered by the 'distance' between the user (or potential user) of a new product and the purchaser. Because of this gap, while the user may have built up a good working knowledge of the company and the product, "the purchasing section may well continue to exhibit risk-averse behaviour to a tenderer".

However, at the federal level and in Queensland, the respective Departments of Administrative Services no longer do most of the purchasing on behalf of other agencies. Further, purchasing has been devolved within most agencies as well, so that most Federal and Queensland government

departments do not have sections responsible for all purchasing, and DAS claims that in many cases, the gap between user and purchaser is in fact nonexistent, as they are the same person.

'Red tape'

The high cost of dealing with government and becoming familiar with government procedures may be a barrier to entry for new suppliers. The IR&D Board noted:

> It's much harder to sell to the Federal Government than to the private sector;
>
> It's always hard to find the right people to deal with when trying to sell to the Federal Government;
>
> There is a huge gulf between the person who makes the purchase decision and the end user (Sub. 15, p.31).

This problem can reduce public (and private) sector efficiency by limiting competition between existing and potential suppliers. The NPDP, which in practice mainly supports firms with some record of sales to government, can have only a limited impact on overcoming such barriers. The apparent persistence of unnecessary procedures in dealing with government underscores the importance of streamlining general procurement practices.

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