MDL

McKinlay Douglas Ltd

CROWN RESEARCH INSTITUTES

GOVERNANCE & CAPABILITY

A report prepared for the Ministry of Research, Science & Technology

by

McKinlay Douglas Limited

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36-42 GreySt
P O Box 13 125, Tauranga
Tel: (07) 579 4217 Fax: (07) 579 4218
www.mdl.co.nz
email: mckinlay@mdl.co.nz

Contents

Page

Page

1. INTRODUCTION

This report is one of two being completed for the Ministry of Research, Science and Technology (MoRST) by McKinlay Douglas Limited (MDL). The purpose of the report is to act as a think piece on Crown Research Institute (CRI) governance and capability. The context is MoRST's ongoing work on the recommendations in its recent report *"An Appraisal of Crown Research Institutes 1992-2002"*. Those recommendations were:

- Government must be explicit about its expectations that CRIs focus on the present and future research capability needs of the nation.
- The success of CRIs should be seen by the impacts of their operations on the wider public (social, economic, environmental) good.
- Government should appoint boards with the skill mix appropriate to roles for CRIs that are focused on the wider benefits that their activities deliver to the national innovation system.

The brief for this report, as agreed between MoRST and MDL, is to explore issues including:

- Different ways of thinking about the nature of corporate governance including the appropriateness of public choice theory, agent/principal theory, and transaction costs theory as the intellectual basis for governance structures. There is an emerging body of credible analysis challenging the central role that has been given to this theoretical approach whilst still recognising the need to develop structures that are capable of delivering desired outcomes including the efficient and effective use of resources.
- Preconditions for the development/enhancement of capability, both internally and externally. This will include building on current thinking about the management of knowledge intensive organisations. It will also include the potential of different contracting approaches including relational contracting and evergreen rollovers. (These are contracts that typically guarantee the provider funding for a defined period plus a rollover for a further period with a review at the end of the defined period. Subject to satisfactory performance, the rollover period becomes the new defined period with a further rollover attached.)
- The role and design of instruments of governance.
- Implications for performance assessment and monitoring associated with the different options the paper will canvass.

The intention is that MDL's work should seek to raise questions that might not necessarily emerge through the conventional departmental policy process. Essentially, the requirement on MDL is to provide a counterfactual for conventional thinking regarding CRI governance and capability.

In the rest of this report we:

- Look at the background to the establishment of CRIs. If CRIs were the answer, what was the question and is it still the right one?

- Approach: what we did.
- Governance: of structure and mission.
- Governance and capability.
- The role and design of instruments of governance.
- Implications for performance assessment and monitoring.
- Conclusions.

2. BACKGROUND TO THE ESTABLISHMENT OF CRIS

The establishment of CRIs can be seen both in the context of government owned science in isolation – a response to perceived needs for improvement – and in the broader context of the fundamental reforms taking place in New Zealand government administration generally.

REFORMS GENERALLY

Graham Scott, the former Secretary to the Treasury who played a key role in public sector reforms of the late 1980s and early 1990s, provides an overview of change (Scott, 1996). Selected quotes from that paper provide both an understanding of the motivation for change and of the theoretical framework that underpins change:

> *"In the last 10 years, New Zealand has undertaken perhaps the most rapid and radical reform of economic policy and government management anywhere beyond the former communist countries, Chile and possibly Mexico. This reform arose mostly out of necessity driven by the need to overcome years of delayed economic adjustment. During this period, every aspect of New Zealand's economic management and government administration has been subject to fundamental review and reform."* (p.5)
>
> *"In order to understand the context of New Zealand's reform programme, it is important to note that it began in 1984 from a situation in which government interventions and controls in the economy were more pervasive and rigid than in any other developed economy."* (p.5)
>
> *"From the late 1970s the government's advisers had drawn on the emerging developments in institutional economics as one source of theoretical insights for developing the concepts behind advice on a new approach to government management in New Zealand."* (p.11)
>
> *"The essential feature of institutional economics as it was being developed at the time was that the firm in the theory of economic organisations ceased to be viewed as a production function, as in classical economics, but was instead regarded as a governance structure. In other words, the firm ceases to be viewed as a single maximising entity and becomes an organisational framework within which individuals transact as participants in an internal market. The theory emphasises asymmetric information, self-interested behaviour within the firm, and bounded rationality, meaning that individuals seek to optimise their position but within a framework of imperfect information."*
>
> *"It follows that the government's problem is one of contracting*

> *efficiently between principals and agents in a way that minimises the so-called 'agency costs' of setting up and monitoring that contractual relationship. Theories based on these concepts are known as agency theories."* (p. 11, 12)
>
> [As well as leading to the emergence of New Zealand's state owned enterprises model] *"Institutional economics also played an important role in the design of the framework of management for central government departments."* (p.12)
>
> *"As in the private sector, institutional economic analysis of the public sector is concerned with selecting governance structures that minimise transaction costs between the parties involved in the production and distribution of a service."* (p.12)
>
> *"While the business literature is generally not grounded in theory, it was influential in the thinking of New Zealand's advisers because of the weight of evidence and the widespread conviction among business writers that hierarchical systems of management control have become a major cause for organisational failure in the private sector. It seemed obvious that the same corrosion was likely to be at work in the hierarchical institutions of government. At a practical level, many private sector management techniques were introduced into government agencies beginning at this time. The experience tended to confirm this view of the causes of poor performance and thereby increase the pressure for reforms. It was generally found that there was nothing fundamentally different between the private and public sectors when it came to the practical details of more effective management." .* (p.12)
>
> [Public choice theory] *"… was influential in thinking about redesigning public administration. It seemed plain that there were problems of 'provider capture' in major areas of public service provision and various frameworks were proposed to correct these through increased transparency, changing organisational structures, and contestability in the provision of services." ."* (p. 12, 13)

As Scott observed, the generic principles identified by officials for public sector reform were applied through virtually every part of the public sector. Science was no exception.

SCIENCE REFORMS

The following quotation from Devine (1997), then Executive Director of the Association of Crown Research Institutes and previously a DSIR scientist, provides a not entirely unsympathetic perspective:

> *"The critical factor of the old science system was that governments had little confidence that the science system was giving value for money. Scientists had captured the system; they were like a new religious priesthood, somewhat independent of society and accountable primarily*

to themselves. The science culture assumed that what was good for science was good for the nation. Many scientists felt little obligation to help the nation to capture the benefits of research; stating that this was the responsibility of industry or others."

"The structures were overloaded with bureaucracies. This was not necessarily the fault of the departments so much as the fault of government itself. Nevertheless, MAF Head Office had about 500 staff and more economists than Treasury. The scientist at the bench did not see this bureaucracy. Contrast this with today's scientists who, because of the transparencies of the science reforms, are now in a position to complain about and influence the level of bureaucracy. Government financial and purchasing procedures were a disaster. Many of us can tell stories about ludicrous end-of-year 'spend ups' and the crisis that struck if equipment could not be bought within the financial year."

"While scientists led a comfortable existence, they had their problems as well. It was extremely difficult to buy equipment which was essential for leading edge research. Researchers were isolated from the rest of the world because of the difficulty in overseas travel. That which did occur was often at the management level. Because of this, researchers tended to reinvent the wheel, building equipment they should have been able to purchase; in effect becoming followers of international developments rather than participants in the developments."

"The basic problems of the past government-funded science system can be summarised as:

- *There was no system for establishing the value of different types of research;*
- *There was no adequate system for allocating resources to different areas.*
- *Researchers were isolated from the community they were expected to serve; and*
- *Government funding structures inhibited rather than facilitated good research."*

Other observers, in personal comment to MDL in the course of projects undertaken for MoRST, have been much more blunt. They describe a science system – of which they were part – in which something like 20-25% of scientists were producing little or nothing of value; the system contained no flexibility to allow that problem to be addressed; the resource allocation process – and the policy advice process – had substantially been captured by the DSIR and other agencies; and the system was virtually in crisis.

In this respect it is interesting to observe that the crucial report, in triggering the process of reform in science, was prepared by the Science and Technology Advisory Committee, a ministerial committee established by the Minister of Science under a provision in the then Scientific and Industrial Research Act 1974 which enabled him to do so. At the time it was widely considered that the Minister had established this committee to provide him with an alternative source of advice because of his concern that the only advice he could

get from the DSIR was based on the assumption that all was well with the existing system and nothing needed to change.

WHY CRIS: THE NEW SCIENCE SYSTEM

What then was the question or questions to which CRIs were the answer? An overview of the reports at the time (the STAC report already referred to and the report of the Ministerial Science Task Group that scoped the establishment of CRIs) can be seen as answers to questions about:

- How to improve resource allocation – especially how to achieve a better linkage between research, development and commercialisation.
- How to ensure greater efficiency in the use of resources.
- How to improve accountability.

Generally the answer was seen to lie in:

- Making the funding of research contestable
- Placing government owned research within commercial structures in order to provide a framework and culture appropriate both to efficient resource utilisation and to a better alignment between research and development on the one hand and commercialisation on the other (including giving research organisations the legal powers they needed to enter the market – whether capital markets for funding investment in research or markets in which to commercialise the outcomes of research). The STAC report had recorded as a significant issue the fact that government departments (the predecessors of CRIs) lacked the necessary commercial powers.

On the face of it, the new science system directly and effectively addressed the main problems that had been identified with the former departmental system. Thus:

- Departments, particularly the DSIR, which had combined policy advice, purchase (allocating available funds to science areas) and provision (doing the science) were replaced by separate essentially single-purpose structures - the Ministry of Research, Science and Technology as policy adviser, the Foundation for Research, Science and Technology as purchaser, and Crown Research Institutes as providers.
- The company structure adopted for CRIs, with both the general legal framework regulating the roles and responsibilities of directors, and the specific statutory requirement that a CRI *'operate in a financially responsible manner so that it maintains its financial viability'* set the framework for efficient resource allocation.
- The adoption of a contestable purchasing regime as the main means for channelling taxpayer funds to CRIs (and other eligible providers) provided the means for focusing research activity primarily on the government's objectives, thus minimising the risk of provider capture, and introduced a 'value for money' emphasis.

10 YEARS ON

10 years on from the restructuring a number of successes have been identified. The MoRST appraisal report, speaking of CRI's achievements, states:

> *"Over the 10 years they have existed, CRIs have achieved outstanding financial success as well as acting in accordance with the principles for CRIs outlined in the CRI Act. Whether the research has been conducted for government or private sector clients, there have been notable outcomes for the environment, within economic sectors, for our knowledge base and for our society."*

At the same time, a number of concerns are expressed about the operation of the present structure. The same appraisal report includes comments such as:

> *"There is a widely held view that the R, S & T system lacks a clear strategic direction or priority setting process."*
>
> *"There is a perceived disconnection between policy settings from government and the funding decisions from the purchase agents."*
>
> *"CRIs have, without exception, challenged the Crown to settle issues they have around ownership, purchase and audit."*
>
> *"Some CRIs noted that the boards need to have a broader understanding of the scientific merit of an investment, rather than simply focusing on the potential rate of return for the capital investment."*
>
> *"The present fully contestable model is being linked to some undesirable long term impacts. For example, some researchers are leaving New Zealand because they don't see a place for themselves in the system."*
>
> *"Feedback from CRIs suggests that changes in funding can lead to instability of employment, creating a vicious cycle. Funding cuts can lead to staff redundancies, thereby reducing capability and lowering the CRI's ability to gain future funding in a specific area."*
>
> *" … funding decisions by the purchaser may compromise the retention of capability a CRI sees as critical for long term national benefit or for future business development."*
>
> *"Stakeholders highlighted the tension between the CRIs' public good role and their commercial focus:*
>
> *'The public good functions that are uniquely provided by CRIs have been neglected at the expense of pursuit of commercial gain.'"*

> *" … CRIs and stakeholders saw that a commercial focus could lead to public mistrust in the organisations as independent providers of scientific advice."*

Difficulties or dissatisfaction with a new system, 10 years after its introduction, can point to one (or more) of three things:

- The adoption of the new system was itself a mistake.
- Basically, not only was the adoption of the new system correct, but it is the right one for the long haul. The issue is to undertake the fine-tuning needed to deal with identified problems as they arise.
- The change was the right one at the time but it is now time to move on. The new system resolved a set of problems that existed at the time, but the need now is to address a new set of problems requiring a different approach.

The first of these possibilities can effectively be ruled out. None of the material that MDL has considered or feedback from stakeholders in the system suggests that the change was wrong. There are clearly still individuals who would prefer the former system and/or do not understand the drivers of the present system, but generally there seems to be an acceptance that what was done was not only done for the best but also allowed some otherwise quite intractable difficulties to be addressed.

Instead, the question that needs to be addressed is whether the present system and its underpinning philosophy is basically correct, or whether it is time to move on. It is this that will be considered in the balance of this paper.

3. APPROACH • WHAT WE DID

Our principal focus, in preparing this report, was to seek out both individual views and research that might assist us in the objective of finding new ways of thinking about the governance of CRIs and their role in building/maintaining capability in the New Zealand science system.

In order to do this we:

- Interviewed a range of individuals with knowledge of CRIs and the New Zealand science system (persons to be interviewed were agreed in consultation with MoRST).
- Undertook extensive searching of databases dealing with corporate governance, governance of science, innovation, and related topics.
- Reviewed and, as appropriate, drew on a range of reports dealing with the restructuring of the New Zealand science system and, more generally, with the New Zealand public sector reform process.
- Drew on our own previous and extensive work on governance including other reports that we have prepared for MoRST.

4. GOVERNANCE • STRUCTURE AND MISSION

GOVERNANCE

Essential to this report is an understanding of the term "governance", a term that has a number of different shades of meaning depending both on context and on the user. Governance is often used interchangeably with "corporate governance" to encompass the processes and practices that a board of directors uses in discharging its role in a limited liability (usually listed) company. It has a particular focus on how the interests of shareholders are protected.

Governance in a Crown owned company, such as a CRI, takes place in a somewhat different context. Specifically government, as owner, and ministers as shareholders on the government's behalf, play a much more active and direct role in governance than do shareholders in a publicly listed corporation.

Against that background, we propose using a definition developed by the Canadian Institute on Governance which is that governance is *"The structures, functions (responsibilities), processes (practices), and organisational traditions that the board of an organisation uses to ensure accomplishment of the organisational mission."*

Recognising the role of government as shareholder, one further element is necessary. This is to include within governance the instruments of governance that government and ministers will use to achieve alignment of a CRI's activities with the outcomes sought by government and ministers. These instruments will include the statement of intent, ministerial letters of expectation or other guiding documents, and funding instruments, as well as the role of the Crown Company Monitoring Advisory Unit (CCMAU) in acting on behalf of government to monitor CRI performance.

The key relationship identified in this definition of governance is between the board's structure, functions, processes and organisational traditions on the one hand and the organisational mission on the other. In an entity such as a CRI, which is strongly influenced by the instruments of governance used by the shareholder, the relationship becomes a three-way one between those instruments, the board's structures and functions etc, and the organisational mission.

The way the definition is written emphasises, quite properly, that the purpose of governance is to support the accomplishment of the mission. Necessarily, this puts considerable emphasis on knowing the mission.

Once the mission is known, a subsidiary issue then arises: is the governance appropriate to accomplishing the mission? If it is, all is well. If it appears not to be, is it simply a matter of fine-tuning or are there more fundamental matters that need to be addressed[1].

[1] Scott (2001) at p.310 observes *"Crown entities do not stay locked in their original configurations. As time moves on, their accountabilities are redesigned and they pick up and drop functions. The practical experience they accumulate feeds into the policy making and evaluation process and may be influential in changing policies. The designers of new entities need to consider what the possible paths of development of a new entity may be and account for that in the way it is established and in the incentives that are set around it."*

THE CRI MISSION

A persistent difficulty for CRIs and their boards has been that of determining organisational mission. This is highlighted in the quotations above referring to CRIs wanting government to be clear about what it expects of them.

The Crown Research Institutes Act states that the purpose of every Crown Research Institute is to undertake research and then outlines a set of principles of operation including that research *"should be undertaken for the benefit of New Zealand",* that a CRI *"should pursue excellence, comply with applicable ethical standards, promote and facilitate the application of the results of research and technological developments, be a good employer and be an organisation that exhibits a sense of social responsibility by having regard to the interests of the community in which it operates and by endeavouring to accommodate or encourage those interests when able to do so".*

All of that is then subject to a further requirement that, in fulfilling its purpose, every Crown Research Institute shall operate in a financially responsible manner so that it maintains its financial viability. The Act then states that a CRI is financially viable if, on the basis of generally accepted accounting principles, it generates an adequate rate of return on shareholders' funds and is operating as a successful going concern.

Most of the operating principles are expressed in generic and high level terms that provide very little practical guidance without significant further interpretation. The best known example of this has been the question of what is meant by undertaking research *"for the benefit of New Zealand"*. The Foundation, as purchaser, has recently set out its views[2], but that is simply a view from one participant in the system.

At the moment, the strongest signal that CRIs get is that they should be expected to meet their weighted average cost of capital. That achieving WACC should be the sole or principal objective is strongly criticised, from within and without CRIs, on several grounds including:

- At best, from a governance perspective, meeting a financial target or targets is simply a measure that a CRI is being well managed – not an end in itself. If there is a logical reason for government ownership of CRIs, it is much more likely to be a government view that CRIs perform a function in the national innovation system that requires continuing government ownership.
- According to the chief executive of one "economic" CRI, earning your weighted average cost of capital can be very easy to achieve – but at a cost of transforming the organisation from a research oriented entity with a medium to longer term emphasis, into a commercial consultancy with a short term, profit oriented emphasis, in the process significantly undermining any capability objectives.
- As an objective, it is in any event applied somewhat randomly. Different CRIs – Landcare, ESR and IRL provide examples – have, with the Minister's agreement, fallen significantly short.

[2] See *"National Benefit and its Application to Publicly Funded Research, Science and Technology Investments".*

- If WACC is to be a primary objective, then at the very least the CRI business plan designed to deliver WACC ought to be closely aligned with the government's research strategy (which it does not yet have) and with the purchasing policies followed by the Foundation. Unless these three elements are mutually supportive, the likely outcome is significant failure on one or more of the three dimensions.

THE PURPOSE OF GOVERNMENT OWNERSHIP

Despite the emphasis in CRI monitoring on financial return, one point that should be clear is that government ownership is not simply in order to earn a return on investment – it is not a proper role for governments to act as some kind of compulsory mutual fund on behalf of taxpayers. Rather, government ownership is and always must be as a means for securing another objective or objectives that, in government's view, requires ownership as one means.

The recent MoRST appraisal report provides some guidance. It notes that

> *"Broadly speaking, the purpose and principles, taken together, provide a rationale for ownership. This is to:*
>
> - *Maintain particular research capabilities; and*
> - *Use those capabilities to drive the development of New Zealand's innovation capacity.*
>
> *Against this ownership rationale, the government has taken quite a passive ownership interest, doing relatively little to ensure 'research capabilities are maintained' or 'used to drive development of New Zealand's innovation capacity'.*

The implication of this quotation is that government itself has not seriously addressed the ownership issue. As the MoRST report suggests, the most logical reason, from a public policy perspective, for continuing to own CRIs is to maintain and develop a critical mass of capabilities that the government considers are necessary for the achievement of overarching objectives such as New Zealand's economic, social and environmental well-being.

That begs the question of what the government's objectives might be and where they should be found. For the purposes of this report it seems clear that obvious sources are government policy statements such as the growth and innovation strategy, and the various strategies within that.

The issue of "Why government ownership?" is non-trivial. A repeated theme that came through to MDL in interviews for this project (and for previous projects in relation to CRIs that MDL has undertaken for MoRST) is that scientists themselves lack a sense of direction. As one very experienced CEO expressed it *"What staff want to know is why they are here".* He went on to speak of the issue of recruiting/retaining people in terms of the personal objectives that different groups of scientists had. As a number of other informants have done, he drew a distinction between scientists who had been in the system long enough to remember the essentially "public good" focus of the former DSIR

and other government science departments and younger scientists who had joined the system more recently.

This chief executive (as do at least some of his fellow chief executives) sees older scientists as still having a significant reservoir of goodwill towards the public science system – a sense of working in the public interest and a preparedness to trade potentially higher incomes elsewhere off against that personal satisfaction.

On the other hand, younger scientists whose only experience has been with the more commercialised, contestable system tend to take a much more utilitarian approach. For them it is much more likely that their attitude is "this is just a job" and they will stay as long as the financial/career development incentives justify it.

Those comments were made in the course of a discussion about the influence of governance structures on the performance of the science system. From this CEO's perspective, the critical issue was not so much the structure as the ethos, culture and philosophy that accompanied it.

THEORETICAL UNDERPINNINGS

That comment actually goes to the heart of the relationship between governance and organisational mission. This same recognition of the importance of ethos, culture and philosophy can be seen expressed in more formal terms in another quotation from Scott (1996):

> *"This theory [institutional economics] emphasises the importance of 'private ordering' or 'social capital'.*
>
> *These are the established values, norms and conventions that provide implicit agreements, incentives and restraints on individuals within complex organisations as they go about their business. It had long been commonplace in private sector business management to emphasise the importance of culture, and later leadership, in successful organisations. The institutional theorists were increasingly giving attention to these issues."* (p.12)

The principal/agent and transaction costs theoretic approach to organisational design incorporated a very clear understanding of the nature of the human problem that structure needed to address. Oliver Williamson, the leading writer on transaction costs theory, identified two key conditions: a behavioural condition that he terms "opportunism" and a cognitive condition that he terms "bounded rationality". Opportunism he defines as *"self interest seeking with guile"*. It *"refers to the incomplete or distorted disclosure of information, especially to calculated efforts to mislead, distort, disguise, obfuscate or otherwise confuse."* (Williamson, 1985)

Bounded rationality recognises that economic actors must make decisions on the basis of limited information – with perfect knowledge, opportunism would not be a problem as decision-makers would be fully aware of the opportunistic leanings and opportunities of those whose behaviour might expose them to risk.

On the basis of these two conditions, the role of the designer of an organisational structure is to put in place systems and incentives designed to minimise the risk resulting from opportunism.

Transaction costs theory provides a perspective on organisational behaviour within the firm (or other organisation). Its complement is what is often known as "shareholder value" theory. In its simplest terms, this is a view that shareholders, and shareholders alone, are entitled to receive the full residual earnings of the firm. All other parties – employees, suppliers, lenders – receive fixed rewards defined in terms of the contracts they have with the firm.

With these two views put together, the task in designing an organisational structure is to minimise transaction costs (the potential loss from opportunism) as part of maximising the residual earnings available to the shareholder, and thus shareholder value.

The choice of a company structure for government's research entities was one made deliberately in the context of then current theoretical understandings about the nature of organisation and the incentive issues that needed to be resolved in organisational design. Selection of a company structure also reflected a view that research activity had about it an inherently commercial focus – at least in a New Zealand environment – and that the rewards for success in that environment belonged to the shareholder. This was reflected not just in the provisions of the Crown Research Institutes Act (quoted above) but also in the approach that successive governments have taken to monitoring their ownership interest in CRIs – essentially against financial performance.

There has been strong theoretical backing for this approach. For example, Michael Jensen (2001) argues *"that since it is logically impossible to maximise in more than one dimension, purposeful behaviour requires a single valued objective function. 200 years of work in economics and finance implies that in the absence of externalities and monopoly (and when all goods are priced), social welfare is maximised when each firm in an economy maximises its total market value."* The article is significant in that Jensen nonetheless reconciles value maximisation with stakeholder theory, arguing that *"Enlightened stakeholder theory specifies long term value maximisation or value seeking as the firm's objective and therefore solves the problems that arise from the multiple objectives that accompany traditional stakeholder theory"*. In other words, intelligent value maximisers manage stakeholder interests as well as shareholder value but against the single objective of maximising value.

An important element in the Jensen approach is that it preserves the argument that shareholders, and shareholders alone, are entitled to share in the residual. Stakeholder theory, under various guises, has argued that this is not the case – that, for example, workers should also be entitled to share in surplus, recognising the investment that they themselves make in firm-specific human capital (see Blair (1995)).

Despite the strength of arguments such as Jensen's, the transaction costs/shareholder value approach to the firm is coming under increasing challenge. The first problem with the use of the single metric of financial return as the means of judging management performance is the implicit assumption of substitutability – that the firm typically operates in markets for inputs which approach the ideal of perfect competition. Absent that assumption, the fact that a firm does not earn its weighted average cost of capital

may say little or nothing about the ability of management or the extent to which opportunism has worked against shareholder interests. The explanation may lie instead in imperfect competition, for example the fact that the firm may simply not have available to it the assets or resources required to compete effectively and may not be able to obtain them through the market. The problem for the shareholder then becomes that of determining the nature and cause of the shortfall rather than simply attributing it to managerial non-performance – with its comparatively simple conclusion that all that is necessary to rectify the problem is to replace the management.

NEW THEORETICAL PERSPECTIVES

More fundamentally, and of specific reference to CRIs, the conventional approach has been challenged on grounds that:

- Taken by itself, it is insufficient as a theoretical basis on which to build the management of a knowledge intensive firm.
- It lacks an effective theory of innovation.

Foss and Langlois (1997), speaking of transaction costs theory, state that:

> *"In today's economics of organisation, transacting is fraught with hazards, and the problem of organisation is one of creating governance structures to constrain the unproductive rent seeking behaviour that imperfect information permits. Indeed, it is probably not unfair to say that the heuristic driving this literature is to reduce virtually all problems of economic organisation to problems of misaligned incentives attendant on imperfect information."*
>
> *"The result of this partition of responsibilities has been an imbalance in the economics of organisation. Seldom if ever have economists of organisation considered that knowledge may be imperfect in the realm of production, and that institutional forms may play the role not (only) of constraining unproductive rent seeking behaviour but (also) of creating the possibilities for* productive *rent seeking behaviour in the first place. To put it another way, economists have neglected the benefit side of alternative organisational structures. For reasons of history and technique, they have allocated most of their resources to the cost side."*

In a later article, Foss (2001) argues that:

> *"As numerous writers have emphasised, an important aspect of the knowledge economy is precisely that physical assets are of strongly waning importance. Of course, the implication is that ownership of such assets is an increasingly ineffective source of bargaining power and that, therefore, authority must wane as bargaining power increasingly becomes more symmetrically distributed over the owners of knowledge assets. Since the boundaries of the firm are (also) defined in terms of legally recognised ownership to the firm's alienable,*

> *primarily physical, assets and since such assets are of declining economic and commercial importance, it is obvious that the very notion of the firm's boundaries is becoming increasingly fuzzy or perhaps even irrelevant. Finally, because authority declines in importance as knowledge becomes distributed and knowledge inputs increase in importance, resort to other coordination mechanisms is necessary."*

Andreas Pyka (Pyka, 1999), writing on the nature of innovation networks, observes that:

> *"The crucial problem of traditional transaction costs[3] analysis is the interpretation of organisational dynamics in terms of marginal costs. By focusing on transaction costs only, as a consequence of the marginalist perspective adopted, an (implicit) perfect substitutability between internal and external knowledge sources is assumed. In this light, the characteristic features of innovation processes like true uncertainty, variety and irreversibility are totally ignored."*
>
> *"Thus, the incentive based approaches, with their focus on cost based and rational decisions, are excluding crucial aspects of firms' strategies which are influenced by a couple of factors lying by their very nature beyond the scope of these approaches."*

He identifies these as including learning, individual and collective motivation, mutual trust etc.

Critique of the traditional approach has come also from disciplines other than economics. Simon Learmount (2002) reviews new research taking an organisational approach to corporate governance. He observes that:

> *"Social sciences carry a special responsibility because of the process of the double hermeneutic: its theories affect the agents who are its subject matter. By assuming the worst, this theory can bring out the worst in economic behavior. By assuming opportunism and establishing it as his base case, Williamson is blind to forces that work to confirm or discredit the validity of his assumptions ... In the process, his theory is likely to encourage the very behavior that it takes for granted and seeks so hard to control."*

He reviews a number of different approaches including stakeholder, trusteeship and stewardship theories. Trusteeship, certainly in the context of organisations such as CRIs, appears a promising formulation. It is put forward by way of analogy with the role of a trustee – someone who controls and manages assets which they do not beneficially own themselves. He quotes Kay and Silberston (1995) as observing that

> *" ... the duty of the trustee is to preserve and enhance the value of the assets under his control, and to balance fairly the various claims to the returns which these assets generate. The trusteeship model therefore differs from the agency model in two fundamental ways. The*

[3] Here Pyka is speaking of transaction costs as including costs of contracting and monitoring as an essential element in determining whether particular activities are market based or firm based.

responsibility of the trustees is to sustain the corporation's assets. This differs from the value of the corporation's shares. The difference comes not only because the stock market may value these assets incorrectly. It also arises because these assets of the corporation, for these purposes include the skills of the employees, the expectations of customers and suppliers, and the company's reputation in the community."

Learmount himself then goes on to observe that:

" … to some extent or another, almost all current approaches to corporate governance ('economic' and 'organizational') ultimately focus on hierarchical controls such as fiat, incentives or monitoring mechanisms (Williamson 1996) which are aimed at attenuating the potentially opportunistic or utility-maximizing behaviour of company managers. Recently though, some organizational researchers have put forward ideas that as social organizations, the governance of firms might also usefully be explored in terms of non-hierarchical or social controls, which includes, for example, trust (Tyler and Kramer 1996; Lane and Bachman 2001) and the responsibilities and obligations that are engendered in everyday socio-economic interactions."

"New institutional economists have recognized organizational trust for some time as an issue with implications for the way that companies are governed, and have attempted to extend and amend their theories to account for the phenomenon (Williamson 1993; Bromiley and Cummings 1995). The underlying assumptions of their approach to trust is that humans are self-interested and opportunistic; therefore the concern of transaction costs economics is to understand the constraints and sanctioning mechanisms that exist to enforce trustworthiness. In this view, it is generally assumed that trust is possible only in very small groups where there is repeated interaction, and is explained principally through calculation and hierarchical controls that proscribe individual self-interested behaviour (Varian 1990; Stiglitz 1993). Emerging notions of trust in the organizational literature, by contrast, propose that the economist's conceptualization is limited, and building on insights from other disciplines including psychology, sociology, political science and socio-biology aim to challenge the dominance of the 'rational choice' economic model of individual motivation (Rousseau, Sitkin et al 1998; Tyler and Kramer 1996)"

Learmount concludes by expressing the hope

" … that by drawing attention to the various limitations of economic theories of the firm and discussing some of the organizational alternatives that have been proposed, this paper has called into question the hegemony of economic theories in theorizing the governance of the corporation. As descriptive theories, 'organizational approaches' to corporate governance have many advantages over their economic counterparts, especially in that they tend to acknowledge the

> *complexities of organizational life. Yet they also have their own drawbacks: stakeholder theories for example seem to share many of the limiting assumptions of the economic theories that they criticize, whilst notions of 'trust-based' or 'socially endogenous' corporate governance require a lot more theoretical development and empirical support. What these organizational alternatives do urge, however, is reflection on the currently pervasive, narrow definition of the 'corporate governance problem'. In particular they commend a more extensive consideration of how companies are and might be governed, beyond current narrow concerns with the protection of investors' capital and the accountability of managers to shareholders."*

Other writers have critiqued the shareholder value approach to corporate governance on the grounds that it does not incorporate, or allow for, a theory of innovative enterprise (Lazonick & O'Sullivan, 2000; Lazonick, 2001). For Lazonick and O'Sullivan, innovation is about producing higher quality, lower cost products.

> *"By its very nature, given competitive conditions, innovative enterprise requires the transformation of prevailing technological and/or market – that is 'industrial' conditions, for it is only by the transformation of these industrial conditions that higher quality, lower cost products can be generated. Moreover, when competitive conditions change – when new competitors emerge with the capability of developing even higher quality and/or lower cost products, then an enterprise that had been innovative in the past will have to transform the technological and/or market conditions it faces to remain an innovator."* (2000, p.50)

At the heart of the innovative endeavour is organisational learning. As Lazonick describes this:

> *"… organizational integration provides an essential social condition for an enterprise to engage in and make sense of organizational learning – that is, learning that is* collective *and* cumulative *(O'Sullivan, 200a). Organizational learning is collective because it depends on the development of the skills and application of the efforts of an array of people in a specialized division of labor. Organizational learning is cumulative because the extent of the collective learning required for innovation makes it necessary to cumulate learning within an integrated organization. Moreover, as O'Sullivan (2000a and 2000b) argues, because the innovation process is not only cumulative and collective but also* uncertain*, the innovative enterprise must also be* strategic*, and hence for a theory of innovative enterprise the abilities and incentives of those who exercise* strategic control *are critical determinants of the types of specialized capabilities in which the enterprise invests to generate organizational learning and the incentives that are used to integrate the people bearing these specialized capabilities into the organizational learning process.*
>
> *From the perspective of the innovative enterprise, the essence of organizational integration is that, by making possible organizational learning, it transforms "bounded rationality" and "opportunism" so that*

> *the cognitive and behavioral characteristics of participants in the enterprise contribute to the innovation process. Organizational integration can transform "individual rationality" into "collective rationality", and thus unbounds the cognitive abilities available to the enterprise. Organizational integration can transform opportunism, and indeed transform "human nature as [Oliver Williamson] know[s] it", by both generating and sharing the gains of the innovation process in ways that create "high-powered" incentives – employment security, career opportunities, collective purpose – for the people on whom the enterprise relies to develop and utilize productive resources."*

For Lazonick, the innovative enterprise requires strategic control – the ability to allocate the organisation's financial flows between corporate resources and corporate returns. As he expresses it, the condition for strategic control

> *"… is that institutions vest control over the allocation of corporate resources and returns with decision-makers who are integrated with the learning process that generates innovation. The integration of strategy and learning ensures that those who exercise control over the allocation of resources and returns have the abilities and incentives to make innovative investments."*

The rationale for this is that

> *"Innovative resource allocation is strategic and, therefore, interpretative and experiential, so decision-makers must have control of resources if they are to commit them to a developmental process in accordance with their evaluation of the problems and possibilities of alternative learning strategies. They also require control to keep resources committed to the innovative strategy until the learning process has generated the higher quality, lower cost products that enable the investment strategy to reap returns. Thus, inherent in the process of innovation, in the need to commit resources to undertake it and the uncertainty of returns from innovative investments, is a need for control of resources by the decision-makers who shape the innovative process."*

To put it, perhaps, in simpler terms, Lazonick's argument is that innovation requires the ability to allocate corporate returns as between shareholders and the people who work in the organisation. This is not just a matter of paying people in terms of fixed price contracts for their services. It is creating the incentive climate in which they will put their best effort into innovation itself. The argument is that a theory of innovation requires a clear recognition that corporate returns are shared amongst different interests and that for shareholders to exercise the sole rights to claim residual returns is to defeat the organisation's need to have in place incentive arrangements (arrangements for investment in human capital) that will encourage innovation. It also includes the power to defer shareholder returns by undertaking investments in innovation whose returns may be both inherently uncertain and medium or longer term rather than immediate.

Strategic allocation is not necessarily a matter of increasing financial reward. Instead, or as well, the strategically appropriate investment may be in enhanced job security, equipment, professional development, or enhancing networking opportunities.

IMPLICATIONS: THE QUESTION FOR GOVERNMENT

The literature just reviewed presents a very real dilemma for transaction costs theory. At the heart of the theory is the assumption that people cannot be trusted – or rather, they can be trusted to act opportunistically in their own selfish interests. Whether it is Learmount's emphasis on the firm as a social organisation or Lazonick's argument that managers must have the discretion and authority to act strategically in allocating corporate returns as between shareholders and others, these different ways of considering corporate governance appear to reject the basic premise on which transaction costs theory is built.

That comment needs to be qualified by noting that the analysis does not reject the use of the limited liability company as a means for undertaking entrepreneurial activity. Rather, its focus is on how the relationship between shareholders and the company as a social organisation is established and managed, and how returns are shared. Interestingly, it has exactly the same concern as underlies principal/agent theory and transaction costs theory. What is the appropriate incentive framework within which to optimise the owners' objectives? What the new analysis is doing is rejecting the view that the appropriate way to optimise the owners' objectives is to focus directly and solely on shareholder return. Rather, the analysis can be seen as arguing strongly that such a direct focus, to the exclusion of other objectives, is actually counterproductive.

Consider what underlies the principal/agent and even more, the transaction costs theory approach. It is a picture of the owners as portfolio investors, focusing their attention on the management of financial risk and seeking to balance their portfolios over time to optimise returns within their particular risk preference. These theories have assumed that, of their very nature, owners neither can nor should intervene in management. At most, they should be considering the quality of corporate governance – that the right directors and structures are in place to secure alignment between the interests of owners and the actions of management[4]. The concern that these new lines of debate are raising focuses on what has emerged as the essentially negative impact of theories of organisational design that have taken, almost literally as their starting point, that people in organisations cannot be trusted and will routinely act in their own self-interest against the interest of owners, if there are not sufficient checks and balances in place to prevent this.

The challenge for the private sector, in dealing with the issues raised in these new approaches, is a formidable one. The question it poses is how do owners find an alternative (or complementary) means of incentivising management when owners are typically portfolio investors. As an example, it is difficult to conceptualise the kind of arrangements, to optimise the interests of owners, that could be put in place based on the principal of mutual trust where mutual trust is something that arises out of an

[4] The post-Enron review of corporate governance in the US is raising questions around even this approach as analysts recognise that the Enron corporate governance structure, and skills and experience of its directors, were significantly better than most US corporates.

ongoing process of relationship building between people in different roles and with different interests based on quite close experience of working together.

Fortunately, this is not the dilemma that faces government. Although public sector governance structures have been, as far as possible, based on private sector models, the government is not simply a portfolio investor building a diversified portfolio and trading its investments as required to match its rate of return objectives and its risk preference. Instead, government does have a direct relationship with the entities that it owns and, even within the current model, engages very extensively with management (at least as compared with corporate governance in the private sector).

Instead, as will be elaborated on further in this report, government has the opportunity within the existing instruments of governance it already has in place, if it thinks it appropriate to do so, to respond to the newly emerging understandings about the nature of firms as social organisations and the preconditions for the effective management of innovative knowledge-based entities.

The immediate question for government is whether there is empirical evidence to support the implication from new theory that the current approach to governance of CRIs is inconsistent with the government's objectives for them. The next section of this report considers that issue, on the assumption that the government's objectives are indeed developing and maintaining capability as a means of contributing to the objectives of its growth and innovation strategy.

5. GOVERNANCE AND CAPABILITY

The relationship between governance and capability is a theme that has come through very strongly in the work done for this report. It is fundamental to answering the very basic question of why is it that the government owns CRIs. As Section 4 suggests, the logical answer appears to be to maintain and develop a critical mass of capabilities that the government considers necessary for achieving its objectives, especially as identified in policy statements such as the growth and innovation strategy.

If capability is indeed the main rationale for ownership, then that requires:

- An understanding of what is meant by capability.
- That there are means in place to facilitate achievement of the capability objective(s).

MEANING OF CAPABILITY

There are two dimensions to what is meant by capability in the context of the government owning CRIs in order to maintain/develop a critical mass. The first dimension is a human capital one – concerned with the numbers, abilities, experience, networks etc of scientists within disciplines of importance to New Zealand (and requires, as a complement, organisational capability in the sense of structure, financial and physical resources, and managerial and related skills).

The second dimension is whether the focus is on capability in the CRI itself in the disciplines in which it is engaged, or is it capability within New Zealand in disciplines of importance to New Zealand?

Logically, the latter interpretation is the correct one. Indeed, the concern that government is currently showing through a number of different policy initiatives to lift the R & D capability of the private sector makes it very clear that it is distribution of capability throughout the New Zealand economy that is of primary importance, not simply preserving capability sets within individual government owned entities.

In turn, this suggests that government's policies should be focused on ensuring at least that:

- CRIs themselves are able to develop/maintain some minimal level of capability internally. (It is beyond the scope of this report to pass judgement on what that minimum level might be within any particular discipline. We simply note that from input we have had for this report this is a matter that is far from resolved in any discipline but which does need attention.)
- CRI capabilities are effectively directed towards realising the government's growth and innovation objectives.

- Capability is transferred to/developed within the rest of the New Zealand economy, which might include requiring CRIs themselves to have in place means for transferring capability.

Support for this interpretation is found in the government's growth and innovation strategy statement *"Growing an Innovative New Zealand"*. In a section entitled *"Significant Issues to be Addressed"*, the first two that the strategy identifies are:

- New Zealand's relatively small expenditure on research and development by international standards and, within that, the dominance of government rather than private institutions (a 72/28% government/private sector split compared with an OECD average of a 29/71% split).
- *"Not withstanding the generally high quality of New Zealand science and technology and our general capacity for innovation as a people, the New Zealand innovation system has struggled to commercialise the considerable flow of ideas that emerge from our institutions or from individuals".*

It is probably not an exaggeration to say that the government's growth and innovation strategy puts research and development at centre stage. New Zealand's future is seen as dependent on the development of high growth, export oriented firms active in high value added products and services themselves R and D based. What this suggests is that the issue of capability within the New Zealand science system is crucial for New Zealand's future development.

In turn, this means that the role of CRIs, both in maintaining/developing capability in disciplines important for New Zealand's future growth and in supporting the extension of those capabilities in the private sector, must form an integral part of the government's growth and innovation strategy. Amongst other things this requires that:

- The government must place a heavy emphasis on capability as a principal reason for owning CRIs; and
- It must place a very strong emphasis on the relationship between governance and capability.
- There is a high level of integration between CRI's strategic and business plans and FRST's purchase policy and activities. Specifically, purchase outcomes that are inconsistent with CRI strategic and business plans should be seen as a serious indicator of system failure.

The previous section of this report surveyed a range of recent research raising questions about the conventional underpinnings of current governance arrangements. The implications they raise justify considering whether there is any evidence that existing governance arrangements may be less than satisfactory. If there were no evidence to raise any concern about the impact of current governance arrangements on capability, then the mere fact that recent research suggests that the theoretical underpinnings of the CRI governance structure are not appropriate for the governance of knowledge-based organisations could, perhaps, be disregarded on the principle of "if it ain't broke, don't fix it".

The purpose of this section is to consider whether there is evidence of difficulties sufficient to warrant reconsidering the basis for CRI governance arrangements.

Of necessity, the evidence gathered for this report is largely anecdotal. There is, however, a consistency in the anecdotes, regardless of the source, which does suggest a very real concern and one that government should address if it wishes to give effect to its innovation strategy.

CURRENT GOVERNANCE ARRANGEMENTS

As a first step it is necessary to consider just exactly what the governance arrangements with CRIs are. They are part of a grouping known collectively as Crown entities – which covers a very broad range of arm's length entities owned or controlled by the Crown. They take a range of organisational forms and are so diverse that it is difficult to make generalisations that are broadly and usefully applicable to all Crown entities. Instead, governance arrangements tend to be specific to different types of Crown entity.

The existing governance arrangements for CRIs fall broadly into three separate categories:

- The statutory framework (the Companies Act and the Crown Research Institutes Act).
- Shareholder instruments.
- Purchase instruments.

The Statutory Framework

CRIs are limited liability companies. This constitutes the first element of their governance structure. By virtue of the Companies Act 1993, the business and affairs of a CRI " *… must be managed by, or under the direction or supervision of, the board of the company"* which *"… has all the powers necessary for managing, and for directing and supervising the management of, the business and affairs of the company"* (Section 128).

The Companies Act is designed to apply to a wide range of different business forms – from investor owned companies with a wide spread of shareholdings to wholly owned subsidiaries of large corporates (which themselves may be significant businesses, such as the New Zealand subsidiaries of many multi-nationals), to the predominant form, by number – the small or medium business controlled by an owner or owners who work in the business.

The important thing to note about the Companies Act structure is that it is designed to facilitate a situation in which:

- There is a sharp separation between the role of shareholder and the role of director, at least when the two are separate persons.
- Shares are tradable and are traded on the basis of financial information designed to report to shareholders on the success of the board and management in enhancing shareholder value.

Crown Research Institutes depart significantly from this model. As well as being incorporated under the Companies Act they are also subject to the provisions of the Crown Research Institutes Act 1992. Amongst the governance obligations CRIs face, which do not apply to companies in general, are:

- A requirement to prepare a statement of corporate intent which, for all practical purposes, is a contract between the board and shareholding ministers designed to constrain how and for what purposes the board will manage the business.
- Section 5 of the CRI Act requires every CRI in fulfilling its principal purpose (undertaking research) to operate in accordance with a stated set of principles. As already discussed, one of these is financial viability but others concern matters such as undertaking research for the benefit of New Zealand and promoting and facilitating the application of the results of research and technological developments.

There is scope for statements of intent to be very wide in their coverage and, in particular, provide a means for imposing a range of obligations (setting performance objectives) regarding capability.

Shareholder Instruments

In common with other Crown owned companies, especially SOEs, CRIs are subject to shareholder monitoring, a process that includes:

- Ministerial letters of expectation – letters from the Minister for CRIs that may be either generic to CRIs as a group or specific to individual CRIs. These can provide a very useful means of informing CRIs of the Minister's (and the government's?) objectives.
- CRI directors are appointed by shareholding ministers (the Minister for CRIs and the Minister of Finance). The formal process for appointment involves the Crown Company Monitoring Advisory Unit (CCMAU) which is responsible for managing a database and a search process through which prospective appointees are recommended for appointment. Although the Act vests the power of appointment solely in shareholding ministers, in practice appointments will be considered by the Cabinet Honours and Appointments Committee and will also be referred to the Labour Party caucus and potentially to the caucuses of Labour Party allies. Although the CCMAU selection process focuses on whether the prospective appointee has relevant skills and experience, that consideration may be put to one side once the CCMAU recommendation enters the political arena. It is apparently not uncommon for a CCMAU recommendation to be displaced to make room for appointment of someone whom the government of the day considers more appropriate (not necessarily for reasons that have a great deal to do with what is required to be an effective CRI director).
- CCMAU is also responsible for monitoring CRI performance. This includes reviewing a CRI's strategic and business plans for ministerial approval and agreeing the financial targets that should be set for the CRI, such as return on equity, return on assets and the CRI's debt/equity ratio. The process of reviewing and approving strategic and

business plans provides the opportunity to ensure that these plans are appropriately aligned with the government's growth and innovation objectives.

Purchase Instruments[5]

The purchase framework is the third and, in some respects, the most directly influential of the instruments of governance that government currently employs. It derives its importance from two factors:

- Virtually all CRI revenue is contestable, either by bidding for government funds or by contracting with individual clients. The only element of CRI funding that is non-contestable is NSOF (Non Specific Output Funding). This is fixed at 10% of a CRI's FRST funding over the previous year. With FRST revenue running at an average of slightly beneath 50% for CRIs as a group, effectively NSOF is at a level of 5%.
- The bulk of government funding potentially available to CRIs is channelled through a single agency, the Foundation for Research, Science and Technology (FRST). FRST effectively functions as a monopsonist, something FRST itself acknowledges.

A recent FRST paper[6] sets out the approach that the Foundation takes. Amongst the key principles it sets out are:

- The Foundation for Research, Science and Technology's mission is to invest in innovation for New Zealand's future. Research produces new knowledge. Innovation is the *application* of new knowledge.
- Research goals may be economic, environmental or social. New knowledge underpins each. The Minister determines the broad relative priorities among these goals, through the output classes. The Foundation's task is to design and manage a decision process that balances prospective risks and returns across many science areas in the various output classes so as to generate the maximum benefit to New Zealand from taxpayers' dollars.

THE CAPABILITY IMPACT

There appear to be quite significant implications for developing and maintaining capability through each of these three sets of governance instruments and for ensuring that CRI capability is applied in support of the government's growth and innovation objectives. We consider the impact of each of these in turn.

The Statutory Framework : Impacts

There are both general and specific concerns with the statutory framework.

First, the statement of principles in Section 5 of the Crown Research Institutes Act is very general in its terms. The question of what constitutes "benefit for New Zealand" remains

[5] Our discussion of purchase instruments essentially ignores the roles of the Marsden Fund and the Health Research Council as they are relatively insignificant funders of CRI research.

[6] *National Benefit and its Application to Publicly Funded Research, Science and Technology Investments*, August 2002.

controversial. FRST has set out its own views in the paper quoted above. There is a strong focus on a demonstrated link between expenditure and return. As the paper puts it, *"The Foundation does not fund R, S & T for its own sake. It is a means to an end. Wealth producing R, S & T produces returns when it is incorporated into a process, product or service, or leads onto other R, S & T that can be."*

Related to this is the issue of how wealth-producing returns are actually generated and by whom. The Foundation's view is by commercialisation through a competent New Zealand owned firm rather than through licence fee or royalty income for the use of CRI generated intellectual property by foreign owned firms (although the Foundation does recognise that there will be occasions, potentially many, when IP will need to be commercialised by foreign owned firms). Lack of precision in the Act contributes to a concern expressed by several informants that scientists do not know what it is that government wants them to do. Arguably the growth and innovation strategy should provide the framework both for determining what is "benefit for New Zealand" and for enabling CRIs to better understand what government requires of them.

A second area of concern is the focus arising from a combination of the Companies Act and the Crown Research Institutes Act on returns to shareholders. Here the Crown Research Institutes Act is much more specific than the Companies Act. The latter simply requires that *"A director of a company, when exercising powers or performing duties, must act in good faith and in what the director believes to be the best interests of the company."* (Section 131). This requirement is normally construed as meaning that the director should act in a manner that maximises shareholder value but with a qualification, particularly important in the case of a company that has a single shareholder, that the director is required to have regard also to the interests of other claimants. Thus, if a shareholder that owns 100% of a company seeks to require the board to act in ways to the detriment of the position of other claimants on the company (for example secured creditors), the director can decline to do so on the grounds that the duty is owed to the company as a whole and not just the shareholders.

In practice, the Companies Act requirements do give directors significant discretion to make judgements as to how best to maximise shareholder value. There are examples of companies that, year after year, report losses because they are following a medium to long term strategy of investing in (say) research and development in the expectation (hope) that ultimately shareholders will be handsomely rewarded. A relevant example for this report is Genesis Research and Development Limited.

The Crown Research Institutes Act is much more specific in its requirements. Section 5, setting out principles of operation, requires that *"Every Crown Research Institute shall, in fulfilling its purpose, operate in a financially responsible manner so that it maintains its financial viability."*

The section goes on to provide that a Crown Research Institute is financially viable if:

- Regardless of whether or not it is required to pay dividends to the Crown, the activities that the Crown Research Institute generates, on the basis of generally accepted accounting principles, are an adequate rate of return on shareholders' funds; and
- The Crown Research Institute is operating as a successful going concern.

CCMAU, in its role monitoring CRIs on behalf of shareholding ministers, adopts the view that these provisions impose an obligation on CRIs to earn their cost of capital. In other words, in each year to have as their target a tax paid profit derived from their weighted average cost of capital.

The Act, as worded, does not appear to give directors a great deal of discretion – for example to allow them to earn an adequate return, on average, over a period of (say) 5-10 years, but perhaps incurring losses in some or most of those years so long as they achieved the target on an averaged basis.

CRIs themselves certainly see this as a significant problem. One chief executive commented to the effect that earning WACC was very simple – the problem was that it turned you from a research institute into a consultancy. Another echoed this sentiment but in a somewhat different way, expressing a concern that the focus on short term earnings inherent in the CRI model was forcing his organisation more and more towards becoming a clone of a large multi-disciplinary engineering consultancy.

Another concern expressed was that the requirement itself appeared to be applied in a somewhat ad hoc way. Thus:

- One CRI had argued to the Minister that it made better sense to retain staff in order to preserve capability rather than make them redundant to achieve WACC. The Minister agreed and the CRI acted accordingly.
- Another CRI has had a practice of consistently targeting less than WACC in order to generate funds for reinvestment (in staff capability etc and thus as a form of investment that is expensed). Again the Minister accepted this.
- A third CRI commented on the recent decision that had allowed another CRI to operate at a loss through an agreed arrangement with the Minister to invest in capability (additional staff and related resources).

Each of these examples was seen as sending a confusing signal. Does the statutory obligation apply as worded, or is it subject to ministerial discretion[7]? On what basis is that discretion exercised and what are the implications for CRI business planning – and how easy is it for a CRI CEO, still required to target WACC, to explain to his staff that he is required to impose redundancies for financial reasons when another CRI has not faced the same discipline because of a ministerial waiver.

No one seriously questioned the use of the company structure – the need to have a vehicle capable of acting commercially and with a culture of financial accountability was seen as entirely appropriate. The difficulty, rather, was with the short-term focus imposed through the particular terms of the financial viability requirement in the Crown Research Institutes Act.

The acceptance of the company model may reflect:

[7] And is ministerial acceptance of a lower rate of return ***as a target*** lawful given the wording of the section?

- The fact that the only substantive requirement of CRIs that has come through the ownership side has been financial viability. It is possible that a stronger emphasis on non-financial outcomes – capability, etc – would see a stronger questioning of whether a structure based solely on maximising shareholder return was appropriate.
- It is likely that a number of informants, at least from the CRI sector, would have little in the way of alternative organisational structures against which to compare.

In this latter respect, it is interesting that a senior official from one central agency, in discussing structural questions, expressed the informal view that perhaps New Zealand law needs to make provision for the equivalent of a US not-for-profit corporation – something that can combine the commercial powers and disciplines of a company structure with the public purpose focus of an incorporated charitable trust.

Shareholder Instruments: Impact

Currently this does seem to be rather problematic. Areas of concern include:

- What does the shareholder want?
- Board appointments.
- Monitoring.

There is a very real sense, amongst the informants consulted in the preparation of this report, that the shareholder is very unclear about what it requires of CRIs. This was reflected in the comment already quoted above (page 12) *"What staff want to know is why they are here".*

A real difficulty for CRIs is that the main formal objective set for them is financial viability. This is reinforced by the recently adopted dividend policy that has clearly reinforced in the minds of many scientists a belief that the government is really only interested in CRIs for the money it can make out of them (see the discussion of dividend policy at pages 15 and 16 of *"Crown Research Institutes : Issues for Consideration"*, a May 2002 report for MoRST by MDL).

Confusing signals come from statements of government policy on the one hand and government actions on the other. We have already discussed the central role for CRIs that appears implicit in the government's statement of its growth and innovation policy. That would suggest a strongly supportive approach towards CRIs and capability building. The signals that CRIs are getting in directions such as dividend policy are almost exactly the opposite – the government is a very reluctant investor.

Perhaps more importantly, the government appears unconcerned with the non-financial outcomes from its investment in CRIs. As one CRI CEO expressed it, from his perspective it was great that the Foundation put dollars $*x* million[8] a year into the business, but no one has ever come to [the CRI] asking *"What have you done and what value have you added?"*.

[8] We have left the amount out to help preserve the anonymity of the informant.

This may reflect another factor as well. Ministers are clearly risk averse in the sense of not wishing to place themselves in a position of appearing accountable for outcomes over which they may have personally little influence or little means for response if the outcomes are not achieved. In this respect, holding CRIs accountable in financial terms is relatively straightforward and so are the responses in the event of apparent failure. Holding CRIs accountable for science outcomes, building/maintaining capability, or other at least partly non-quantifiable outcomes is an entirely different matter. In this respect it is worth reflecting on the history of ministerial unwillingness to accept the outcome responsibility expected of them within the Public Finance Act framework.

The difficulty that this leaves for CRIs, and the effectiveness of New Zealand's investment in research through them, includes:

- CRI boards and management do not have clear signals from government of what is expected of them within their areas of capability.
- There is very little integration of their activity with other government programmes also intended to contribute to government's growth and innovation objectives (although there is a merging collaboration between FRST, Industry New Zealand/Trade New Zealand and the Tertiary Education Commission).

There are concerns within the CRI sector that the current director appointment process is failing to produce the calibre of boards required if CRIs are to play a central role in the growth and innovation strategy. Concerns include:

- Recommendations for appointments to board vacancies focus rather too much on the skills and background of the individual appointee and rather too little on building a board which, collectively, has the skills, experience and other characteristics required for the role.
- There is too much political interference in the appointment process. It is recognised that government, as owner, has the right to appoint directors but critics argue that it should exercise this right to ensure that the people appointed are the best people for the job and not people who are appointed because of past services to or support for the incumbent government.
- The role of CRI directors appears not to be properly recognised. The claimed willingness of governments to substitute their own choices for CCMAU recommendations is put forward as one piece of evidence in support of this. If government genuinely believes that CRIs could make a critical difference in achieving its growth and innovation outcomes, then it would want to appoint directors capable of supporting that. Another concern is that CRI boards have been seen as training grounds for new directors – something that seems inconsistent with the potentially critical role for CRIs in the national innovation system.

Generally, there seems to be an impression that the current appointment process has produced some very good directors but too many who lack the skills and experience required to make a truly useful contribution at board level. This is coupled with a concern that there are insufficient directors who have the ability to understand the science base of the business.

Monitoring is also the subject of some concern. CCMAU is seen as very capable in monitoring financial performance but not equipped to make informed judgements about the science base of the business. The emphasis on short-term financial return is seen as inappropriate for a research business – providing strong incentives to shift towards the commercial/consulting end of the spectrum to the detriment of maintaining a strong research and development capability.

If CRIs and their capabilities are to be significant contributors to achieving growth and innovation objectives, then the monitoring process should:

- Play a role in ensuring that CRI strategic and business plans are well conceived for that purpose.
- Oversee performance in terms of growth and innovation objectives, picking up on the concern reported above by one CRI that no one had ever come to ask "What have you done and what value have you added?"

One CRI noted a further drawback of the current shareholder arrangements - the difficulty of getting timely and appropriate decisions:

- Decisions requiring a ministerial or government sign-off could take months – a potentially serious conflict with the operating in a commercial environment.
- Further equity investment is virtually impossible to obtain regardless of the quality of the business case because the government is a reluctant investor.

Purchase Instruments: Impact

There is a general acceptance that contestability in the allocation of government funding to research and development is entirely appropriate. The shift away from the pre-1992 reliance on departmental appropriations has imposed a needed discipline. There is, though, very real concern with both the structure and the implementation of the present model – a sense that, although there have been significant gains from the use of a purchase model, it is now time to revisit both the objectives for the model itself and the extent to which its operation, in practice, contributes to achieving those objectives.

The starting point for considering the purchase framework is the recognition, both by CRIs and by FRST, that FRST is effectively a monopsonist. New Zealand is unique in the extent to which research institutions are dependent on a single funder for research activity. This is compounded by three additional factors:

- The relatively low level of investment by the private sector in research and development, with the consequence that private sector funding is seldom an alternative.
- The very high proportion of CRI revenue that is contestable.
- The extent to which non-CRI funding may in fact be dependent upon a CRI continuing to attract significant FRST funding. As an example, NIWA's substantial revenue stream from the Ministry of Fisheries and from commercial interests in the fishing industry is in practice unlikely to be independent of continuing FRST funding for research.

The practical consequence of FRST's dominance as a purchaser is that it plays a significant role not just as a purchaser of services, but as an influence on governance of CRIs. We consider this under five separate dimensions:

- Responsibility for business direction.
- Management of purchase risk.
- Career/capability management.
- Cost.
- Duplication.

Responsibility for Business Direction

A principal role for the board of any company is setting its strategic direction and overseeing the preparation of its strategic and business plans. A well run board will have a clear vision of where it wants to take the company and of the mix of resources and capabilities required to get it there. CRI boards do approve strategic plans and business plans. These are considered by CCMAU as part of its monitoring responsibility on behalf of shareholding ministers.

The ability of boards (and CRI management) to deliver on the business and strategic plans is crucially dependent on FRST's funding decisions. These are not, however, taken in the context of those plans. Instead, FRST's purchase decisions are taken on the basis of its own strategic priorities (which admittedly are communicated to CRIs and should be taken very much into account as they prepare their business and strategic plans).

The purchase decision-making process itself operates not at the level of the CRI business but through a series of 11 reference groups, each dealing with a separate science area. Reference groups will have in front of them a proposal which may be quite substantial in amount (the average FRST contract is valued at $1.2 million) and may cover two or more disciplines. What the reference group does not have available to it is information on the "big picture" of where the proposal or proposals it is considering fit within the CRI's strategic direction.

The most recent funding round resulted in some quite major shifts in funding as FRST sought to shift the emphasis of its purchasing towards the government's priority areas of information technology, biotechnology and creative industries. The impact of those decisions on some CRIs was clearly major, involving a significant disruption to the strategic plans they had in place. Accounts vary as to the appropriateness of the FRST decisions, and whether or not the CRIs concerned paid significant attention to the investment signals that FRST had communicated earlier in the purchase round.

FRST believes that the shifts were clearly signalled and that CRIs ought to have taken these into account. At least one CRI that was a significant loser saw this as amounting to a reversal of investment signals it had been given two years previously and on the basis of which it had developed a multi-year programme building capability which it saw as very much fitting in with the government's current strategic direction.

Regardless of which account is correct, the following points do seem to emerge

- The FRST decisions were of such a scale of significance that they were inevitably going to be a major driver of the CRI's strategic direction.
- The decision was taken without reference to the CRI's strategic plan or awareness of how the decision would impact on the CRI as a whole.
- The outcome, had the decision been taken in the context of the CRI's strategic plan, could have been significantly different. In particular, it could have provided a much better basis for negotiating the impact of the decision.

What also seems reasonably clear is that FRST's purchase strategy has the potential to be such a driver of strategic direction for an individual CRI that it can come close to displacing the role of the board of directors in setting and implementing a CRI's strategic direction.

The situation would be different if FRST were not a monopsonist. If CRIs faced a market in which there were realistically alternative purchasers for their research services, then a component board should be able to retain control of a CRI's strategic direction by working closely with various purchasers and understanding the market or markets in which they operate.

Faced with a monopsonist, for a board to be able effectively to discharge its role there is only one option. The board and the purchaser need to work closely together to ensure that each party understands the strategic direction that the board is setting for the CRI and the implications for that of different outcomes from the purchase activity.

This is more than just a business issue for CRIs. It reflects a major disconnect between the process through which the Minister agrees with CRIs the strategic direction they should be setting to contribute to the government's growth and innovation objectives, and the purchase strategy being pursued by FRST. The Foundation has a measure of statutory independence, amongst other things, to minimise the potential for political intervention in individual funding decisions. Currently that independence appears to allow the Foundation to develop a purchasing strategy that may be at odds with the strategic direction the government wishes to set through its major science providers. It would seem sensible to ensure rather more integration between the strategic and business plans of CRIs and the funding decisions necessary to enable those plans to be implemented.

Management of Purchase Risk

CRIs are clearly all very aware of the risks to their businesses of the fact that their principal funder is a monopsonist. They accordingly adopt various strategies intended to minimise the risk that could arise through loss of FRST funding.

Perceptions differ on how serious the risk actually is and the extent to which CRIs should take steps to minimise the impact. FRST commented to MDL that the biggest single shift in funding as a consequence of a FRST purchase decision, itself amounted to only about 15% of the CRI's FRST revenue and less than 10% of its total revenue. Expressed in this

way, the impact could be seen as significant but nothing more than the kind of fluctuation that is very typical for private sector firms in competitive markets.

From the CRI's perspective, the issue looked quite different. It responded on the basis that it had no viable alternative use for much of the scientific skill base involved and made a considerable number of research staff redundant. Essentially the CRI was saying that although the funding loss might be relatively marginal in terms of its overall business, the proper way to consider the impact was on the science group concerned and for them the loss was virtually 100% with no alternative source.

This poses a very real risk for CRIs in terms of recruitment and retention of science staff, something that will be discussed below under "Career/Capability Management".

As already noted, the very high percentage of CRI revenue that is contestable (on average, 95%) means that CRIs do place a very strong emphasis on retaining existing revenues and generating further revenue sources. The primary focus in retaining existing revenues is, for all but ESR[9], on the CRI's FRST revenues.

FRST itself is very aware of the potential impact of the loss of revenue and has endeavoured to manage both risk and contracting costs through measures such as:

- Enlarging the size of individual contracts.
- Moving increasingly to multi-year contracts.

That undoubtedly has benefits in terms of short term contracting costs but paradoxically may also increase the level of risk. Loss of a single major multi-year contract will have an impact qualitatively and quantitatively different than loss of one or even a series of low value, short-term contracts.

CRIs themselves have adopted a number of coping mechanisms. They include:

- Spreading their activities more widely.
- Building alternative sources of revenue.
- Seeking to respond competitively to FRST bidding signals.

There is an increasing emphasis, in debates within New Zealand about the role of research and development, on the importance of building centres of excellence. There is a recognition that New Zealand has, and relatively in international terms always will have, very limited capability. Based on this there is an emerging view that our investment in research and development, and in innovation, should be in areas in which:

- The country has a comparative advantage.
- We have or can develop a world class research and development capability.

Within CRIs, the logic of this approach should be one of concentrating activity in a few areas. Arguably, this conflicts directly with management of purchase risk. A centres of

[9] ESR's FRST revenue is less than 10% of total revenue.

excellence approach would see CRIs concentrating on a set of core research areas where the CRI believes it can make the maximum contribution to New Zealand's growth and innovation objectives. Effective management of purchase risks suggests diversifying your portfolio in order to lessen the impact of the loss of a FRST contract. As FRST itself recognises, a CRI might undertake 20 programmes in order to spread purchase risk rather than (say) six if it was going to concentrate on those things that it could do best.

There is a clear implication from this approach to the management of purchase risk that CRIs may be acting in an appropriate commercial manner (and one which is consistent with the responsibility of directors to act in the best interests of the company) but that they are also acting in a way that means that government is getting a distinctly sub-optimal outcome from its investment in research and development.

The alternative put to us by one CRI is that government, as both owner and purchaser and as the leader of the growth and innovation strategy, should be ensuring effective integration between its growth and innovation strategy, the strategic plans of CRIs, and the purchase activity of FRST. Furthermore, this should be done in a way that minimises the incentives for CRIs to spread their activities to manage risk rather than focus on those things that they can do best and which best fit with the growth and innovation strategy.

One CRI identified what it saw as a related process: a reluctance under the present purchase system to encourage the emergence of monopolies. As this CRI saw it, the consequence was that the purchase system was too willing to fund poor quality work from alternative but smaller providers simply to avoid the emergence of a single provider in a particular area. As a consequence, the CRI argued, we were driving quality down.

A second major strategy is one of seeking to diversify the CRI client base. Some CRIs occupy niches that allow this to be done in a way consistent with building their research capability. As an example, Landcare Research's close association with regional councils with their environmental management obligations or GNS's association with the Earthquake Commission, both support research based activity. In other cases, however, the risk is that pursuit of private sector revenue, as a risk management strategy, may drive CRIs more and more towards the consulting end of the spectrum.

The risk with pursing consultancy revenue as a means of diversifying a CRI's revenue base is the risk of shifting from being a research business to a consultancy. What is significant with a consultancy-based strategy is the reason why it is adopted. As examples, a CRI might decide to grow its consulting business in order to:

- Strengthen its activity in technology transfer. Here the objective is to build the capability of private sector firms and, desirably, result in a positive feedback loop into the CRI's business itself by growing a market for its research and development outputs.
- Grow its revenue base, thus tailoring its consulting services to meet the needs, perceptions and capabilities of individual private sector firms.

The former approach has the potential to build the strength of a CRI as a research business and to enable it to build capability in the private sector. The latter carries with it a strong risk of dumbing down, one that several CRIs have identified to us.

Again, this reflects the importance in considering the appropriateness of the current purchase framework in looking not just at crude data such as growth and revenues (something identified by the recent MoRST appraisal report as one of the achievements of CRIs), but at the quality of the revenue and the impact that it has on the nature on and capability of the CRI itself.

Career/Capability Management

Views differ on how effective the present system is in enabling career development and capability management within CRIs.

CRIs argue that the purchase system should, amongst other things, focus specifically on building/maintaining capability. FRST concedes that there may be a case for doing this in two specific areas:

- R, S & T databases and collections designated as nationally important.
- Risk reduction research capabilities.

Generally, FRST argues that its obligation is to purchase science outputs and that every purchase contract supports capability development. In support of this, one of the criteria that FRST applies in considering proposals is future human capital/provider capability -– the research should be a "stretch" for providers into new areas rather than business as usual; develop new knowledge or platforms with many applications; and develop young and emerging teams.

Generally, it also argues that specifically purchasing "capability" would be contrary to its statutory role – which is to purchase outputs rather than inputs, and it sees capability as an input.

CRIs take a different view. For them, capability building is not simply something that emerges from an individual contract. Rather, it is the sum of skills, knowledge and experience built up over a period of time that, for example:

- Enhances the CRI's capability as an organisation to deliver outputs to meet government's outcome requirements.
- Creates a critical mass of organisational capability, tacit knowledge etc, essential for building teams of capable researchers.

There is support for the CRI view in emerging work on the concept of "dynamic capabilities" defined as *"The firm's ability to integrate, build and reconfigure internal and external competencies to address rapidly changing environments."* (Teece et al, 1997).

The emphasis is on organisational learning and the development of organisational capability, something that subsumes but is significantly greater than the development of individual capability. Expanding on this point, Zollo and Winter (1999) offer a revised definition and accompanying description:

> ***"Definition.*** *A dynamic capability is a learned pattern of collective activity through which the organization systematically generates and modifies its operational routines in pursuit of improved effectiveness.*
>
> *In addition to avoiding the near-tautology of defining capability defined as an ability, this definition has the advantage of specifically identifying operational routines, as opposed to the more generic "competencies", as the object on which dynamic capabilities operate. Also, it begins to flesh out some of the characteristics of this construct. The words "learned pattern" and "systematically", highlight the point that dynamic capabilities are structured and persistent; an organization that adapts in a creative but disjointed way to a succession of crises is not exercising a dynamic capability. Dynamic capability is exemplified by an organization that brings out generation after generation of innovative products through a relatively stable and replicable product development process. Another example is given by an organization that develops from its initial experiences with acquisitions or joint ventures a process to manage such projects in a systematic and relatively predictable fashion."*

The FRST view is that building capability in the sense of dynamic capability is the responsibility of the board and management of a CRI. FRST's role, through its purchase activity, is one of providing part of the opportunity to which a CRI's dynamic capability can respond.

CRIs will agree that the development of dynamic capability is a board/management responsibility, but in an environment characterised by a monopsonistic purchaser, the purchase framework itself must recognise the long term and evolutionary nature of the organisational learning process that creates dynamic capability.

Specifically, the purchase process needs to provide a suitable basis for career and capability development for individual staff. Without a measure of continuity, the efforts of board and management may be frustrated.

Here there are tensions, especially between "doing science" and the emphasis on deriving a return, whether financial in the sense of return on capital or more broadly in the sense of commercialisation and/or enhanced environmental and social outcomes.

What does appear to be the case – both as argued by CRIs and as accepted by FRST – is that there is a strong perception amongst CRI scientists that they face a high level of vulnerability. That is, that essentially they have project funding rather than a career. This perception has been encouraged by the impact of high profile funding decisions that have seen individual scientists made redundant. CRIs will argue that it is also encouraged by a sense of "fashion" – that the purchaser will tend to focus on currently fashionable science at the expense of more basic unglamorous science that may nonetheless be needed. As one CRI chief executive expressed it, commenting on how this had worked *"I can see the 'gene jockeys', but where are the plant physiologists whose skills will be needed to create the commercial application?"*

Amongst issues noted by CRIs are factors such as:

- A lot of good New Zealand scientists staying here are doing so because they want to live in New Zealand, not because they like the science system.
- People are moving away from science to commercial work, increasing both their income and job security, but undermining New Zealand's science base.
- There is a real risk of scientists in a number of CRIs abandoning dependence on government-funded research and development in favour of working for overseas and for local commercial clients.

The problem CRIs face is that this is a difficult matter to manage in the current environment. Scientists seeking to make a career in a particular discipline may see themselves as having a very limited range of employment options and within that range, dependence on a single funding source. The perception that a number apparently have is of a mid-career risk – perhaps 10-15 years away – of finding that their work, for whatever reason, is no longer funded. In an environment of multiple funders, or of significant private sector investment in R & D, this would probably be an acceptable risk. In New Zealand, loss of FRST funding may mean that there is no alternative employer. Faced with that prospect, a career in New Zealand science may not look compelling.

Cost

Again, there are differing views regarding the cost effectiveness of the purchase system. FRST itself estimates the average application cost (taking into account the cost of unsuccessful bids) is around 1% of total funding secured.

Other informants with a close knowledge of the system argue that the costs of contestability, as currently managed, are excessive. One informant who has had significant experience both with FRST and with CRIs noted that he was particularly concerned at the overheads, both in dollar costs and in the use of scarce human resources. Here he was concerned with the opportunity cost – of taking good scientists away from doing research to concentrate on writing proposals. Other informants echoed the same sentiment – but the point needs to be made that none of these had done the type of quantitative analysis that FRST has undertaken.

On the other hand, critics were clearly putting a lot of weight on opportunity cost and on the behaviours that the current process generates.

Duplication

In discussing the management of purchase risk, we commented on the tendency for CRIs to spread their activity rather than focus on the few that they could do best.

Associated with this is another feature of the present purchase system – a growing risk of duplication. Several informants observed that one of the incentives in the present system was for CRIs to seek to enter what might have been the territory of one or perhaps two. As one CRI chief executive commented, *"Where the buck goes, we go – and that does not fit well with being in charge of a long term skill base."*

The clear risk here is of a series of CRIs, each establishing new science groups or platforms that may be sub-critical both in terms of mass and capability, simply in order to secure FRST funding. Ideally the reference group/approval process should screen out proposals that do not meet standards of science merit, benefit to New Zealand, etc. However, it is important to remember that all of these tests are relative. If the incentives in the system are for a CRI to spread its efforts, and all CRIs take this approach, then the standard against which individual proposals will be measured will itself be lower than in a system that actively encouraged a centres of excellent approach.

6. THE ROLE AND DESIGN OF INSTRUMENTS OF GOVERNANCE

We start this section by going back to the definition of governance adopted in Section 4: *"The structures, functions (responsibilities), processes (practices), and organisational traditions that the board of an organisation uses to ensure accomplishment of the organisational mission."* What that emphasises is the enabling role of governance arrangements – their purpose is to ensure achievement of the organisational mission.

For CRIs governance structures, as noted, are not just those adopted by the board but crucially those adopted by government as owner and purchaser. The essence is one of alignment. Are the governance structures that government has in place appropriate to enable achievement of the organisational mission and managed in a way that supports that?

This report has already noted concern at the misalignment of different instruments of governance – both those used by government itself whether as owner or purchaser, and internal instruments of governance such as the strategic and business plans of CRIs. There appears to be insufficient awareness that these different instruments themselves need to be closely aligned if government wishes to optimise the potential of CRIs to contribute to its objectives. Doing this, admittedly, requires that government has a clear understanding of what its objectives are and of the need for alignment. What we are saying here is that government needs to do more than simply articulate a set of high level objectives (indeed, government may argue that it has already done this through mechanisms such as the growth and innovation strategy, letters of expectation, ministerial statements, and various Statements of Science Priorities). The crucial point for governance is that government needs to take the further step of deciding whether and to what extent different instruments of governance should be aligned and then act accordingly.

At a meta-level, the government's concern should be with the governance of the national innovation system. This includes not just CRIs and not just government's investment in research and development (including universities as well as CRIs), but much more besides – the education system, New Zealand's capital markets, employment law, and so on.

This report is concerned with the sub-system that embraces CRIs and the governance instruments peculiar to those. As already noted, these include the statutory framework (the Companies Act and the Crown Research Institutes Act), the shareholder framework and the purchaser framework.

Clearly, integration makes sense. Better decisions are likely to result if people have full (or nearer to full) rather than partial information. For government, the immediate issue is what set of objectives should its different instruments of governance be integrated around? It could pursue the implicit current objective of maximising shareholder value, effectively confining its objectives for CRIs to specific financial outcomes. The advantage of that approach is that it would allow government to continue with a governance approach focused on a set of objective and relatively easily determined quantitative

measures. Integration of the different sets of instruments would then focus on enabling that outcome. As an example, seeking integration around CRI financial performance would still support the purchaser adopting internal processes that ensured its purchasing decisions were taken in the knowledge of the business and strategic plans of each CRI.

The downside of integrating around financial outcomes is that this would address very few of the concerns identified in this report. Specifically, it would do little or nothing to contribute to what appear to be the more logical objectives that government should have for CRI governance including capability and contribution to government's growth and innovation strategy. It would also fail to address the incentive issues identified in recent writings on the economics of organisation and on organisation theory.

Discussion in this section on the role and design of instruments of governance proceeds on the assumption that government will want to consider designing and using its instruments of governance to support the capability and growth and innovation objectives.

There is one caveat. Focusing on capability and growth and innovation objectives would require a quite different approach within instruments of governance. It would almost certainly require different skills and capabilities within both the monitoring and purchase functions. It would also require a different approach on the part of shareholding ministers.

Deciding whether to take this different approach will turn, amongst other things, on ministerial judgements about how important it is that New Zealand's CRIs do evolve as centres of excellence rather than, as appears possible if the present approach continues, gradually degrading as research institutions and becoming more and more akin to commercial consultancies[10].

We now look at the role and design of instruments of governance within the three areas previously identified:

- Statutory framework.
- Shareholder instruments.
- Purchase instruments.

The statutory framework is largely capable of accommodating a shift to governance as supporting a CRI mission based around capability and contributing to the government's growth and innovation outcomes. The main difficulty is with the way that the financial viability requirement is specified. Clearly, whatever objective CRIs pursue, financial viability is crucial. The issue is what that means and how it is supported. Given the interest that New Zealand has that research and development should produce economic benefits, it also seems reasonable that CRIs should seek to earn an acceptable rate of return on shareholders' funds. The main difficulty of the requirement as currently specified is compliance with generally accepted accounting principles – the implication

[10] Clearly this statement is a generalisation. The impact on different CRIs of continuing the current approach to governance will differ quite considerably. It will be more marked on those CRIs whose activities are closer to the commercial end of the spectrum – the so-called economic CRIs – and less marked for those at the public good end – the so-called environmental CRIs.

that the return should be earned each year rather than realised over a timeframe consistent with investment in research.

Other provisions of the statutory framework, including the statement of corporate intent provisions, do not appear to present any difficulty. As an example, the provisions simply require CRIs to state the financial targets that they set, leaving it entirely open as to how those targets are arrived at.

SHAREHOLDER INSTRUMENTS

In this area the change could need to be quite significant. First is the question of monitoring CRIs. Currently this is done by CCMAU.

Monitoring

Comments made to us in the course of preparing this report suggest that CCMAU is held in high regard in terms of its capability to monitor financial performance. However, this is accompanied by strong doubts regarding its capability to monitor non-financial performance including the approval of CRI strategic and business plans to the extent that this requires an understanding of the science that underpins the plans.

Even in the current monitoring environment, this is seen as a significant weakness. The numbers might look fine, but if CCMAU cannot properly debate the assumptions underpinning the science judgements on which the plans are based, how can it then form a considered view on the robustness and feasibility of the plans?

If monitoring were taking place in the context of a set of government objectives around capability, growth and innovation, then the focus of that monitoring should be on CRI strategies to build/maintain capability (including to transfer capability to end users) and on the contribution that the CRI expected to make to growth and innovation objectives. Doing this would require a range of skills including significant science and industry knowledge.

We note that, in other instances where government has wanted monitoring of Crown entities to focus on the contribution the entities will make to government objectives, it has transferred monitoring responsibility from CCMAU to sector-specific entities – the Tertiary Advisory Monitoring Unit in education and the Hospital Monitoring Directorate in the Ministry of Health.

It is likely that the key document, for monitoring purposes, would become the CRI's strategic plan. It is in this document, and in supporting assumptions etc, that a CRI should be able to state the expected outputs from its activity over time, the outcomes it expects to result from those outputs, their relationship to government's desired outcomes, the milestones by which to measure progress, and specific strategies such as:

- Its strategy for managing/developing capability internally.
- Its strategy for transferring capability to end users.
- Its strategy for commercialisation of its research outputs.

- Etc.

The document should allow an intelligent dialogue between the CRI, the Minister of CRIs, and his or her advisers. Using the strategic plan would allow focus on scenario testing and on government decision-making in the context of its ownership interest, looking out over a timeframe appropriate to investing in and receiving a return from research and development rather than the current short-term annual financial performance focus.

Appointment of Directors

Appointment of directors is seen as a crucial instrument of governance. It is the means through which government should be seeking to ensure that CRIs have the management capability to deliver the outcomes that government requires. Accordingly, it is considered that government should have in place appointment processes, and criteria for selection, that reflect the significance of the role of CRIs.

There is a view that this may require government – and its advisers – to revisit the priorities they have set for allocating available directorial talent to different government companies. Currently, there is an impression that directors are allocated on the basis of the size of government's investment – so that the large generation SOEs, for example, may get the pick of the crop.

An alternative approach would be to prioritise the allocation of directorial talent in proportion to the impact that the companies concerned can be expected to make. If research and development is as central to New Zealand's future economic growth as government appears to believe, then this would suggest that appointments to CRI boards are amongst the most important that the government will make.

Lifting performance in this area would require, amongst other things, that the search process:

- Was supported by clear, comprehensive and relevant descriptions of the expectations of a director and the skills, experience and personal attributes appointees should bring to the position.
- The search process should be informed not just by a formal understanding of the role of directors, but also by a good grounding in what is required to be an effective director of a research business. A measure of industry knowledge will be required by at least a proportion of the board and those responsible for recommending appointments must have the ability to determine what that requirement would be and satisfy themselves that prospective appointees meet that requirement.
- The director appointments process should be focused not just on selecting competent directors with relevant skills and experience but on building a board which, as a totality, has the right mix of skills and experience needed.

PURCHASE INSTRUMENTS

FRST's role as a monopsonist necessarily means that the purchase instruments are the single most important set of governance instruments. They comprise not just actual

purchase contracts but FRST's various purchasing strategies and policy documents which, together, set the framework within which purchase decisions are made.

FRST itself operates within a framework set by government. It:

- Purchases science outputs relating to public good science and technology.
- Does so within the output classes determined for it.
- Seeks to comply with government policy as it understands that policy.

CRI Concerns

CRIs (and others) express a range of concerns, a number of which have already been discussed in this report including:

- A lack of integration between CRI strategic and business plans and FRST purchase decisions.
- Contestability driven by a monopsonist encourages perverse behaviour including gaming, duplication (as CRIs 'home in' on new purchase opportunities), dumbing down of research activity through diversification rather than concentrating on what CRIs do best, a shift towards commercial revenue for its own sake with a risk that CRIs will move from being research businesses to consultancies, adverse impacts on career management, and a generally risk averse approach to management.
- Disincentives to collaboration. One informant referred to a technology developed by a CRI that should logically have included collaboration with a medical school. That had not taken place for fear that, under the current competitive system, the CRI would then lose all of the related funding to the medical school. Another informant lamented the lack of the 'teaming' approach common among research institutes in the United States (where he has considerable work experience).

CRIs are particularly concerned that their core of non-contestable funding is now, on average, around 5% of total revenues. They argue that this provides them with insufficient scope to make the kinds of adjustments essential if they are to manage effectively in response to the impact of FRST funding decisions. FRST, in its turn, sees these sorts of issues as primarily a matter of effective management. From FRST's perspective, CRIs are sent investment signals well in advance of actual funding decisions and should be able to factor the potential impact of a loss in FRST funding into their forward planning well in advance of the time at which any change would take effect.

There is probably truth in both sets of assertions. Certainly, by international standards, New Zealand's funding system has significantly less committed funding than any other. This, coupled with FRST's position as a monopsonist, does limit CRI flexibility – in part because of an absence of potential alternative funders.

FRST is correct to emphasise that its signalling has become clearer and with longer lead times. However, this is in a context in which:

- Typically, CRIs may underestimate the risk of losing funding; and

- It does support a widespread perception within the science community that scientists have projects rather than careers.

Responding to Concerns: A Different Approach?

A number of the concerns could be addressed with quite minor changes to the basis of the present purchase system. For example, it should be possible for FRST to:

- Ensure that CRI strategic and business plans form part of the process of making purchase decisions – if only as a means of enabling dialogue between FRST and individual CRIs regarding the focus of the plan.
- Provide some form of assurance that collaboration would not result in one institution losing funding to another as a consequence of joining with it.

It is unlikely, however, that fine-tuning of the present approach to purchasing science outputs could deal with issues such as:

- The incentive CRIs face to work across a broad range of programmes rather than concentrate on those areas where they can achieve excellence.
- Resolve the inherent conflict between strategic business management within a CRI and programme based purchasing on the part of FRST.
- Enable FRST and CRIs to work together, effectively, on how best to align CRI activity with what is required to achieve the government's growth and innovation objectives.
- Provide confidence, within the science community, that scientists have careers rather than projects.

CRI informants offered different approaches to resolving what for them is a very real dilemma:

- NSOF funding should be increased from its present level of, effectively, 5% of CRI revenue (10% of FRST CRI funding) to a level closer to 20-25% (40-50% of the FRST funding for CRIs).
- New Zealand should adopt a practice quite common offshore of providing CRIs with funding for staff salaries on a non-contestable basis and making other funding (consumables; capital) contestable.
- FRST should shift from purchasing specific outputs to funding a CRI's business plan.

The FRST response to the suggestion of a higher level of core funding for CRIs is to reject the idea of bulk funding. As far as we can gather, FRST sees this as effectively a return to the 1980s situation of provider capture of funding. It is likely that CRIs would also reject the idea of bulk funding in its pure form. Rather, as MDL perceives the situation, CRIs are seeking a manageable balance between accountability and a measure of security in their core revenue stream. As one spokesperson for CRIs put it, CRIs do not have an issue with contestability as such but rather with the way it is applied.

From government's perspective, this comes back to the objectives it seeks to achieve through the various governance instruments at its disposal. On the information

considered in preparing this report, it does seem that the present purchase instruments are leading to behaviour that is sub-optimal in terms of government's objectives. A re-examination of this set of governance instruments should be based on encouraging:

- CRIs to focus on excellence rather than diversity.
- Reducing the incentive to "follow the buck".
- Facilitating career/capability management.
- Encouraging collaboration/teaming amongst different research institutions.

One possible approach is to shift from output purchasing at a relatively micro level to relational contracting as a means of funding CRI business plans. Under this type of approach, the focus would be on multi-year funding against strategic and business plans designed specifically to contribute to government's desired outcomes from CRI ownership (incidentally requiring government to be clearer on what those are).

This would require a quite different approach to contracting and one that would, in practice, start to merge with the monitoring function. In some respects there would be a parallel with the charters and profiles approach being adopted in the tertiary education sector. CRIs would be required to specify how their activities would contribute to government's outcomes and identify measurable milestones. In essence, CRIs would be saying this is what we are trying to achieve, this is why we think these achievements make sense in terms of government's desired outcomes, and this is how we will know if we are heading in the right direction.

It is a contracting process that would require a close working relationship between each CRI, FRST as the funder, and government's monitoring agency. Milestones would be opportunities to reassess both the CRI's performance and the level of funding. Adjustments could come on either side. The possibility of adjustments would be signalled reasonably well in advance through the dialogue relationship.

Introducing such an approach would require some careful adjustment, not just in the relationship between government and CRIs but between government and other research bodies including private sector firms. It would not be desirable to use a change in contracting with CRIs as a means of excluding currently eligible parties from access to FRST funding.

Such an approach, properly managed, ought to bring with it advantages such as:

- A sense in CRIs that they could afford to concentrate on what they do best.
- A reinforcement of the role of the board and management of the CRI in setting the direction of the business. The strategic plan would be both the basis for the management of the business and the basis of the contractual relationship with the funder.
- Providing a measure of certainty for CRIs in a given level of funding (subject to performance) should make collaboration much easier. It would remove much of the fear that collaboration could result in a loss of funding.

- It should also provide a better basis for partnering with the private sector as CRIs would be able to offer a measure of assurance regarding the level of their own participation.
- It would underpin career/capability planning.

Desirably, if such an approach were seen as worth exploring, it should also be harmonised with the introduction of the performance-based research fund within universities. Allowing for the fact that, typically, universities are somewhat more at the basic end of the research spectrum and CRIs at the applied[11], there would seem to be merit in ensuring that both funding systems focus on encouraging excellence, removal of unnecessary duplication, the ability for multi-year planning, and the minimisation of incentives for unproductive activity.

[11] FRST categorisation of its research spending, based on the Frascati definition, suggests that the gap is not quite as wide as normally assumed.

7. IMPLICATIONS FOR PERFORMANCE MONITORING AND ASSESSMENT

A number of the matters that this report addresses such as the lack of alignment between CRI strategic and business plans on the one hand and FRST's purchase decisions on the other, the perverse incentives arising out of the competitive process, the lack of emphasis on capability and the need for a better defined understanding of government's expectations of CRIs are all concerns that have been raised elsewhere. The question they have raised is the one that was signalled earlier in this report – is the science system basically the right one for the long haul or is it now time to move on?

The first, or fine-tuning, approach would see relatively little change. The existing competitive approach to the allocation of funding would remain. Change would involve some shifts such as:

- A better integration between CRI strategic and business plans and FRST's purchase decisions.
- Some stronger signals from government of its requirements of CRIs – perhaps through revised letters of expectations and/or additional provisions in statements of corporate intent.
- (Perhaps) a continuation of the current trend on the ownership side of recognising the need for investment in capability.

Monitoring and performance requirements would remain basically as they are. Government might want CCMAU to increase its capability to review the science judgements underlying strategic and business plans. Performance targets in statements of corporate intent might contain more of a multi-year emphasis. Basically, however, the main requirements including crucially the application of purchase instruments would remain essentially unchanged.

This report has consciously taken a different line, encouraged by the brief to act as a think piece and raise options that might not necessarily be canvassed through the departmental policy process. It has argued that, if government is to get the best out of CRIs, then this requires that they are able:

- To concentrate on developing in those areas where they can do best, without feeling a need to diversify in order to manage purchase risk.
- To invest effectively in developing capability.
- To deploy that capability in a manner which best contributes to achieving government's growth and innovation objectives.

If this is the case, then a different approach is required. Essentially, CRIs would receive funding against their strategic plans. The level of funding would reflect judgements on matters such as:

- The proportion of their revenue that should be derived from third party sources.
- The proportion of their government funding that should still be derived through a competitive process.
- The quality of the plan and its fit with government's objectives.

Even if the approach outlined in this report were fully adopted, a measure of competition, possibly quite substantial, would still be desirable for that part of CRI activity at the applied rather than the basic end of the research spectrum in order to ensure that:

- CRIs themselves faced commercial disciplines including the need to demonstrate the market reality of their proposals.
- The opportunity to bid for research funding for applied research and development remained open to any bidder qualified on the basis of capability for undertaking that work.

As already noted, the CRI's strategic plan would become the crucial document. This would be the case for ***both*** ownership and purchase purposes. On the ownership side, government would be concerned to see that the strategic plan:

- Focused on developing/maintaining capability in areas where the CRI could achieve excellence (in something of a parallel with what the performance-based research fund is intended to achieve in the tertiary sector).
- Ensured that those capabilities were to be deployed in ways that would best contribute to meeting the government's growth and innovation objectives.

Funding would shift from purchasing discrete science outputs from the CRI to funding the strategic plan. This would require the funding decision to be aligned with and made in parallel with decisions on the strategic plan itself (but with the CRI still expected to compete for funding at the applied end).

Performance assessment would focus on milestones set within the strategic plan and would have a strong multi-year focus.

The monitoring emphasis would need to shift away from the current short term return on assets/return on equity approach towards success in delivering on capability and growth and innovation objectives (financial viability would still remain important but cease to be – or be seen as – the primary objective).

Technically, this different approach to funding should still be possible within the terms of Section 5 of the Foundation's Act, which states its funding functions as to allocate funds:

- For the production of outputs relating to public good science and technology.
- Pursuant to ministerial schemes.

The more substantive issue is whether existing administrative arrangements would be appropriate to the different approach. The likely answer is no. Negotiating a CRI's strategic and business plans would require a high degree of scientific understanding and, desirably market understanding of the areas in which the CRI intended to be active. The

skills required might sit better within (say) the Ministry for Research, Science and Technology than within CCMAU (in a parallel with arrangements for education and health).

A perhaps more difficult question is whether the ownership role in approving a CRI's strategic and business plans and monitoring its performance could be effectively separated from funding its strategic plan. The implication of having a separate purchase function in place to manage funding is that somehow it would be serving a different set of objectives from the capability, and growth and innovation alignment, focus of the ownership interest. It seems likely that, if the government decided it wanted to take this type of approach, the ownership and purchase interests in funding the strategic plan should be placed with the same entity. Rather than MoRST, as suggested above, government might decide to place this combined function in FRST where it would then sit alongside FRST's other funding responsibilities, including that part of CRI funding that would continue to be available only through a competitive bidding process.

Of necessity, these comments are more in the nature of "in principle" observations rather than recommendations for organisational change. More detailed work would need to be carried out to test the feasibility of these suggestions before they could be seen as sufficiently robust to become recommendations.

Finally, a comment on one aspect of the early discussion in settling this brief. MoRST had expressed a particular interest in measures that might avoid gaming – a significant problem within the present system.

MDL's view, after considering the nature of the behaviours encouraged by the present competitive system, is that the alternative approach suggested in this paper would largely remove both the opportunity and the incentives for gaming. In MDL's view, gaming is very much a function of the highly competitive nature of the present system including the opportunity to bid on the basis of "where the buck goes, we go". A shift to substantial funding of strategic business plans, with those plans being developed around areas where individual CRIs could expect to achieve excellence, should remove most if not all of the incentive for gaming and also, largely, the possibility which is dependent on being able to bid opportunistically.

8. CONCLUSIONS

This report has been prepared as a "think piece" to stimulate consideration of different approaches to the governance of CRIs, including funding and monitoring.

In doing so, the report has highlighted new thinking about the economics of organisation and organisation theory that suggest a need to rethink our understanding of the management of knowledge-based organisations and the incentives knowledge workers face.

A number of the identified concerns regarding the CRI sector are consistent with the ideas coming out of that new work, suggesting that it does have value in thinking about the future governance and management of CRIs.

The report has also identified a number of practical concerns regarding the relationship between government's ownership interest, its purchase interest, and the growth and innovation strategy. Clearly, whatever approach is taken to the future governance and management of CRIs, these matters do need to be addressed. A number of informants argued that this should be done sooner rather than later if we are not to face the risk of a significant degradation in our research and development capability.

Finally, the report should be seen as very much "work in progress", even as a think piece. It is a contribution to a debate rather than a set of recommendations to be considered for adoption.

REFERENCES

Blair, Margaret (1995) *Ownership and Control: Rethinking Corporate Governance for the 21st Century*, Bookings Institution, Washington, USA.

Bromiley, P and Cummings, L L (1995) Transactions Costs in Organizations with Trust, in *Research on Negotiation in Organizations* by R Bies, B Sheppard and R J Lewicki, Greenwich, CT, JAI Press.

Foss, Nicolai J (2001) *Economic Organisation in the Knowledge Economy: Some Austrian Insights*, Danish Research Unit for Industrial Dynamics, Copenhagen.

Foss, Nicolai J and Langlois, Richard N (1997) *Capabilities in Governance: the Rebirth of Production in the Theory of Economic Organisation,* Department of Industrial Economics and Strategy, Copenhagen Business School, Copenhagen.

Jensen, Michael C (2001) *Value Maximisation, Stakeholder Theory, and the Corporate Objective Function*, Negotiation, Organisation and Markets Unit, Harvard Business School Working Paper No. 01-01 available at http://papers.ssrn.com/ abstract=220671.

Kay, J and Silberston, A (1995) *Corporate Governance*, National Institute Economic Review 153: 84-98.

Lane, C and Bachman, R (eds) (1998) *Trust within and Between Organizations,* Oxford: Oxford University Press.

Lazonick, William (2001) INSEAD Working Paper 2001/15/SM.

Lazonick, William and O'Sullivan, Mary (2000) *Perspectives on Corporate Governance, Innovation and Economic Performance*, the European Institute of Business Administration, Fontainebleau.

Learmount, Simon (2002) *Theorising Corporate Governance: New Organisational Alternatives,* ESRC Centre for Business Research, University of Cambridge Working Paper No. 237.

O'Sullivan, M (2000a) *The Innovative Enterprise and Corporate Governance*, Cambridge Journal of Economics, 24: 393-416.

O'Sullivan, M (2000b) *Contests for Corporate Control: Corporate Governance and Economic Performance in the United States and Germany*, Oxford University Press.

Pyka, Andreas (1999) *Innovation Networks and Economics: From the Incentive Based to the Knowledge Based Approaches*, INRA-SERD Universitē Pieres Mendēs, France.

Rousseau, D M, Sitkin, S B et al (1998) *Not So Different After All: A Cross-Discipline View Of Trust,* Academy of Management Review 23(3): 393-404.

Scott, Graham (2001) *Public Management in New Zealand: Lessons and Challenges*, New Zealand Business Roundtable, Wellington.

Stiglitz, J E (1993) Peer Monitoring and Credit Markets, in K Hoff, A Braverman and J E Stiglitz (eds) *The Economics of Rural Organization: Theory Practice and Policy,* New York: Oxford University Press.

Teece D J, Pisano, G & Schuen, A (1997) *Dynamic Capabilities of and Strategic Management,* Strategic Management Journal, 18(7): 509-533.

Tyler, T R and Kramer, R M (1996) Whither Trust? in R. M. Kramer and T. R. Tyler (eds) *Trust in Organizations: Frontiers of Theory and Research,* Thousand Oaks, CA: Sage.

Varian, H R (1990) *Monitoring Agents with Other Agents*, Journal of Institutional and Theoretical Economics **46**(1): 153-174.

Williamson, O (1985) *The Economic Institutions of Capitalism,* New York: Free Press

Williamson, O (1993) *Calculativeness, Trust and Economic Organization*, Journal of Law and Economics 34: 453-500.

Williamson, O (1996) *The Mechanisms of Governance,* Oxford: Oxford University Press.

Zollo, M and Winter, S (1999) *From Organisational Routines to Dynamic Capabilities*, Working Paper 99-07, Reginald H Jones Centre, the Wharton School, University of Pennsylvania.