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**EFFICIENCY PROGRESS IN THE  
NEW SOUTH WALES GOVERNMENT**

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# Efficiency Progress in the New South Wales Government

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## Contents

### **1.** [Introduction and Overview](#)

- [2. Efficiency in the Government Sector](#)
- [3. Performance measurement in government agencies](#)
- [4. General reforms in the government sector](#)
- [5. Performance Measurement and Monitoring](#)
  - [5.1. Performance Monitoring of NSW Government Businesses](#)
  - [5.2. Budget Sector Agencies](#)
- [6. Conclusions](#)

[References](#)

[Glossary - Key performance measurement concepts](#)

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## 1. Introduction and Overview

Assessing efficiency in the government sector is a challenge, and for too long rigorous analysis has been put in the 'too hard' basket.

This paper addresses how NSW Treasury is developing measures of efficiency and productivity for Budget Sector agencies and government businesses (which I will refer to collectively as government agencies<sup>1</sup>). To this end we have been developing Data Envelopment Analysis (DEA) and Total Factor Productivity (TFP) indexes.

This paper also describes initiatives to increase efficiency of government agencies. I will briefly discuss structural reform of agencies and then consider initiatives to increase efficiency by changing management practices both by internal managers and by central agencies such as Treasury.

Section 2 discusses attaining efficiency in the public sector. Sections 3 and 4 discuss performance measurement and general reforms in government agencies respectively. Section 5 describes the role of performance measurement and monitoring in government businesses and Budget Sector agencies in New South Wales. Section 6 provides some conclusions. ([back to contents page](#))

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<sup>1</sup> A Budget Sector agency receives the majority of its funding from general government funds, whereas a government business receives the majority of its funds from user charges.

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## 2. Efficiency in the Government Sector

Government agencies provide vital infrastructure services such as rail and electricity, and core human services such as health and education. Expenditure on these services nationwide is approximately 20 per cent of GDP.

The outputs of government businesses, such as electricity and transport make up a significant share of inputs for production. Low productivity imposes a 'tax' on users. Low productivity in the general government sector necessitates higher taxation in current and future periods. Given the narrow and inefficient tax base available to State Governments, increases in taxation reduce allocative efficiency in the economy.

Accordingly, improvements in the performance of government agencies will have a significant impact on economic growth and community welfare. Governments are interested in improving the efficiency of their agencies because of:

- the importance of these services;
- the burden on the community of funding these services (through taxes and charges); and
- general public concern over the financial management of the public sector.

The NSW Treasury monitors and advises the Government on the funding of these agencies in New South Wales. The Government must decide what services will be provided to the public. In doing this the opportunity cost of providing services and raising funds must be considered. Once the level and mix of services is determined, the Government decides how to deliver these services and seeks to ensure efficient delivery.

Government service provision is characterised by a failure of or 'remoteness' from the market mechanism. Ensuring efficiency is difficult. In a well functioning market, price changes provide signals about the quality of, and demand for, goods and services. However, the outputs of government agencies are typically traded in markets where prices are not free to adjust or may not exist. An alternative to market prices is needed to indicate performance improvements and guide decisions.

The Government has imperfect information on the efficient cost of providing a specified level of services. If governments could ensure that all services are produced in the most cost effective manner, then the current overspending could be used to provide more services or returned to the community in the form of lower taxes.

The NSW Treasury is adopting a variety of techniques to monitor the performance of agencies and implementing a number of initiatives to identify and improve best practice. ([back to contents page](#))

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### **3 Performance measurement in government agencies**

Measures of performance provide government policy makers and agency managers with:

- Information to facilitate accountability;
- Information on potential productivity improvements for an agency;
- A powerful internal management tool for agencies - in the form of information to managers on how efficient they are, why they perform poorly and can identify who are the 'leading performers';
- A means of identifying areas for review;
- A catalyst for policy ideas;
- A means of monitoring policy implementation and success;
- A guide for structural change;

- Information to promote yardstick competition in government agencies which face little direct competition in input or output markets;
- A means for analysing the interrelationship between agencies and between programs, to allow governments to coordinate policy across agencies; and
- Assistance for the resource allocation/budgeting process by providing a means of allocating funding between competing needs based on performance and need, rather than historic precedent<sup>2</sup>.

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<sup>2</sup> Ideas on formally linking performance measurement to funding are at an early stage. However, performance information during funding negotiations to indicate potential savings and provide insights on how to increase efficiency.

Improvements in the productivity performance of government agencies are necessary for substantial increases in community welfare. Improved productivity comes about through structural change:

*'Increasing wealth will only come if an economic system is able to carry out a complex process of structural change, in which the proportions of sectoral output, of consumption and, most important of all, of employment, in different sectors, are continually changing. The process of moving labour, ie people, from job to job, of moving labour and capital from sector to sector and even from region to region, far from being exceptional events, appear as the very normal pattern of growth of wealth through technical progress.'*

(Pasinetti 1993)

Given the distance from the workings of the market mechanism, structural change in the public sector is often introduced in situations of limited information and often occurs in an erratic manner. Productivity measurement provides information to guide structural changes.

For example, consider the restructure of the electricity supply industry in New South Wales. In the mid 1980s, State monopoly generating companies were imposing an unnecessary cost burden on Australian industry. Total factor productivity studies and international benchmarking of reserve plant margins provided firm evidence supporting this view. That evidence intensified the pressure to consider removing the State monopolies and splitting the large incumbent generating companies into smaller, competing firms. A study of scale effects in electricity generation showed that Pacific Power, in New South Wales, could be split into two or three firms without introducing scale inefficiencies. This information was used to guide the reforms that followed.

Several government exercises are developing consistent indicators for the performance of government agencies (Steering Committee on National Performance Monitoring of Government Trading Enterprises 1997; Steering Committee for the Review of Commonwealth/State Service Provision 1997, the Bureau of Industry Economics' international benchmarking of infrastructure program and NSW Treasury's annual *The Performance of NSW Government Businesses*). These exercises provide useful information to compare the performance of agencies with similar agencies in New South Wales, Australia and overseas.

The publications provide some technical and economic efficiency measures. However, the

main indicators of efficiency are usually cost per unit of service or partial productivity measures, such as service per employee.

The weaknesses of judging performance using partial measures are well understood. Partial indicators can vary for reasons other than inefficiency; for example, agencies may deliver services in different environments, have a different mix of clients or use different input mixes. Focussing on partial measures such as output per employee can be misleading because it only tells part of the story - how production is moving with labour. It says nothing about capital.

As a consequence of the shortcomings of partial indicators, governments are turning to more comprehensive techniques such as Data Envelopment Analysis (DEA), Total Factor Productivity (TFP) and Shareholder Value Added (SVA). The techniques combine information on the major services (outputs) and inputs of government agencies to provide better measures of performance (see glossary for basic definitions).

The NSW Treasury is increasingly using these techniques to monitor the performance of major agencies. It is encouraging agencies to use the techniques to identify reasons for poor performance.

Many of the models are still at a developmental stage. We are still learning how to use the techniques, how to model the agencies and how to interpret the results. We aim for these techniques to be adopted by agencies to help achieve their objectives.

We also have some preliminary ideas on how these techniques can be used to assist in the allocation of funds between agencies. These ideas are considered in Yaisawarng and Puthuchearry 1997.<sup>3</sup> Given Treasury has imperfect information to assess the efficient cost and difficulty gauging effort, these ideas will need to be further developed before existing funding regimes are modified. We hope to use performance information during funding negotiations to indicate potential savings and provide insights on how to increase efficiency.

Treasury will use SVA analysis to help set financial targets for the major government businesses in 1997-98, and is investigating the link between productivity and profit using TFP methodology. Consideration is being given to using DEA help specify service targets for some major government service providers in 1998-99.<sup>4</sup> These techniques will allow Treasury to monitor the progress of the financial and structural reforms to government agencies. ([back to contents page](#))

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<sup>3</sup> Yaisawarng S and N Puthuchearry (1997) *Performance measurement and resource allocation* presented to the International Conference on Public Sector Efficiency 27-28 November 1997.

<sup>4</sup> DEA can also be used for units operating in markets. DEA has been used to measure the technical efficiency of government businesses, in particular electricity distributors in New South Wales.

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## 4. General reforms in the government sector

Public sector reforms are directed towards improving the principal/agent relationships between voters (principals) and their elected representatives (agents) and, in turn, the Government (principals) and public sector managers (agents).

The key to understanding principal/agent problems is the difference in the quality and quantity of information available to each group. Agents have more information about inputs, outputs and performance than principals. To ensure that agents perform efficiently and in the interest of the principals, the principal needs to structure incentives which encourage good performance. The co-existence of two levels of principal/agent relationships in the public sector makes the establishment of effective incentive structures even more difficult than in the private sector.

One way to improve this situation is through efficient contracting, or making agreements more explicit. The operation of firms involves a number of implicit and explicit contracts both internally and externally. The public sector has been dominated by implicit contracts, and the resulting lack of accountability is an important factor in explaining the relatively low levels of efficiency observed in the past. Management reforms have centred on making implicit contracts more explicit. This process is easier in the government business sector than in the core agencies.

Major reform of the NSW public sector commenced in the late 1980s and is built on five core principles:

- Setting clear and consistent objectives and standards;
- Giving managers increased operational responsibility and autonomy;
- Holding agencies to account by objective performance evaluation;
- Giving managers and their agencies the incentive to perform better; and
- Removing privileges or handicaps to put government agencies on a comparable footing to their private sector counterparts.

It took time to truly come to grips with the fifth principle - competitive neutrality. In the interim, application of the first four principles produced some fairly substantial gains. But this was not enough to maintain ongoing and sustained change. Evidence of this is provided by the waterfront container handling sector which is beginning to lose ground in the move to best practice after making some promising early gains (BIE 1995).

The principle of competitive neutrality was given impetus with the adoption of National Competition Policy by the Council of Australian Governments in 1995. This policy provides both a framework for the reform of government business and consistent directions for the microeconomic reform efforts of individual States and Territories. It provides for the separation of regulatory and operating functions; the separation of natural monopoly and potentially competitive activities; and the break up of potentially competitive activities into independent business units to promote competition and efficiency.

Many of the reforms which were being undertaken under the microeconomic reform agenda are now taking place under the guise of National Competition Policy. The Industry Commission estimates that reforms associated with National Competition Policy will provide major economic benefits for Australia in the long run, permanently increasing real GDP by 5.5 per cent and creating 30, 000 jobs (Industry Commission 1995).

The NSW Government has introduced a financial framework for its government businesses, which is consistent with the principles of competition policy. The framework is designed to

remove any net competitive advantages conferred by government ownership and make government businesses operate in a commercial manner analogous to private enterprises with similar risk.

The financial framework requires government businesses to focus on commercial activities. Industry regulation is overseen by either Commonwealth or State regulatory bodies. To encourage competitive behaviour, the potentially contestable activities of government businesses are being separated from non-competitive activities and divided where possible into several businesses. The reform program has yielded substantial benefits in terms of efficient service delivery (technical efficiency) and financial performance, and the associated reforms designed to increase competition have improved allocative efficiency.

For example, the NSW Government separated the natural monopolies undertaking high-voltage electricity transmission and distribution from the potentially competitive electricity generation and retail supply parts of the electricity supply industry. Generators and retailers have been restructured and are being progressively exposed to competition within New South Wales and interstate.

New South Wales has been operating in a competitive market for trade in wholesale electricity since May 1996. The NSW market is now open to participation by any licensed electricity retailer, and the ability of customers to purchase electricity from any supplier is gradually being extended. It is expected that any customer in NSW will be able to purchase electricity from any supplier by 1 July 1999, or soon after.

State Governments are now beginning to apply these principles to Budget Sector service providers. The NSW Government is introducing performance budgeting for the Budget Sector. Under performance budgeting an agreement to purchase services is entered into between the Government and the agency. Additionally, private companies are already free to bid to provide some government services, and are doing so in areas including information technology, cleaning, building maintenance, transport, staff and property management.

The two main ways of increasing efficiency and productivity are by introducing structural reforms and improving management information and practices. The rest of the paper concentrates on the latter. ([back to contents page](#))

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## **5. Performance Measurement and Monitoring**

### ***5.1. Performance Monitoring of NSW Government Businesses***

The NSW Government expects its business enterprises to operate in a commercial manner, to match the performance of private sector businesses of similar risk and to improve their economic efficiency.

#### **Shareholder Value Added Performance Monitoring**

Unlike firms in the private sector, government businesses are not subject to scrutiny by shareholders and capital market disciplines. As a surrogate for these commercial incentives, the policy framework for government businesses involves the establishment of clear financial performance benchmarks and targets, which are used as a basis for monitoring performance. Previously, financial performance targets were negotiated between government businesses and Treasury on the basis of short to medium term accounting rates

of return, such as return on net operating assets and return on equity.

These measures have significant limitations, particularly because they do not consider the opportunity cost of capital (and particularly equity capital) or reveal whether a government business is increasing or eroding its economic value. The cost of capital is the minimum rate of return on capital invested that is required to compensate debt and equity investors for bearing risk. There has been a tendency amongst managers of government businesses in the past to look on equity capital as having no cost, which can lead to inefficiencies in the allocation of resources.

For these reasons, NSW Treasury is now using economic or value-based measures of performance, in place of accounting measures. In simple terms, this means measuring whether value is being generated or eroded in a government business through a formula which compares the percentage net return on assets with the weighted average cost of capital. Where the percentage return exceeds the weighted average cost of capital, the government business is creating Shareholder Value.

A comprehensive Shareholder Value Based Framework which has recently been developed, will substantially improve the quality of advice which Treasury provides to Shareholding Ministers and Governing Boards on business performance.

As well as requiring improvements to the quality and content of information sought from government businesses, the Shareholder Value Based Framework requires the identification of the cost of capital for individual firms, the establishment of appropriate capital structures and the accurate valuation of businesses. An appropriate management accounting framework to support reporting to Treasury of the new performance measures is also needed.

## **Profits and Productivity**

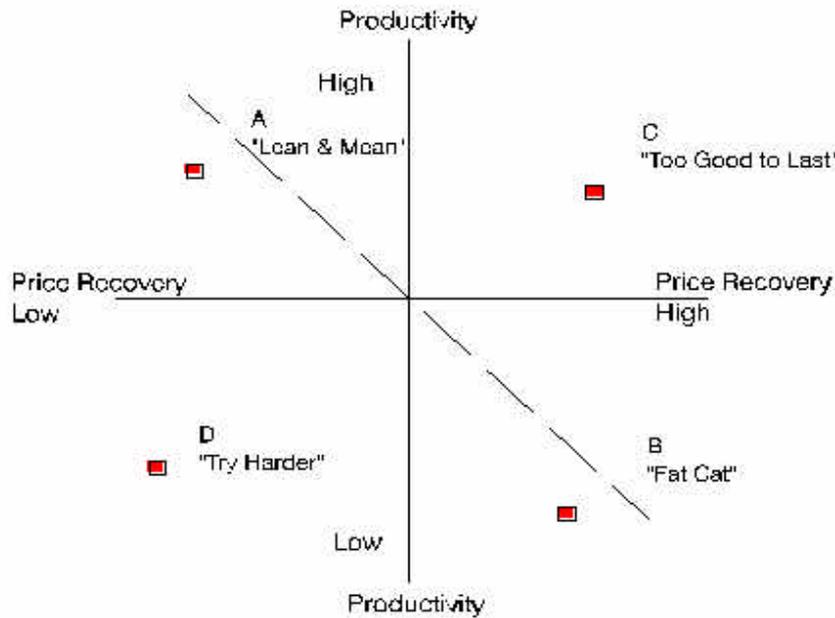
Treasury's adoption of SVA reflects a growing management trend towards the use of economic measures of financial performance. However there is not a well developed, widely used economic measure which relates productivity to business profit. Nor is there an established framework which measures the distribution of productivity gains amongst a firm's major stakeholders - its customers, workers and owners.

In a public sector context, as many government businesses operate in monopoly markets, their profit results require careful inspection. High profitability may reflect high price recovery from abuse of market power rather than strong productivity performance. Alternatively, a government business which is subject to economic regulation may experience low profitability from low price recovery (due to adverse pricing determinations) rather than inferior productivity performance.

Under National Competition Policy, government businesses will face increased competition, and profitability from monopoly pricing may no longer be sustainable. Profitability will need to increasingly come from productivity improvements, and information on productivity and efficiency will be of strategic importance.

Information on both productivity and price recovery is vital for determining reforms within a government business. Exhibit 1 shows four very different positions for a government business, with corresponding differences in the appropriate reform path.

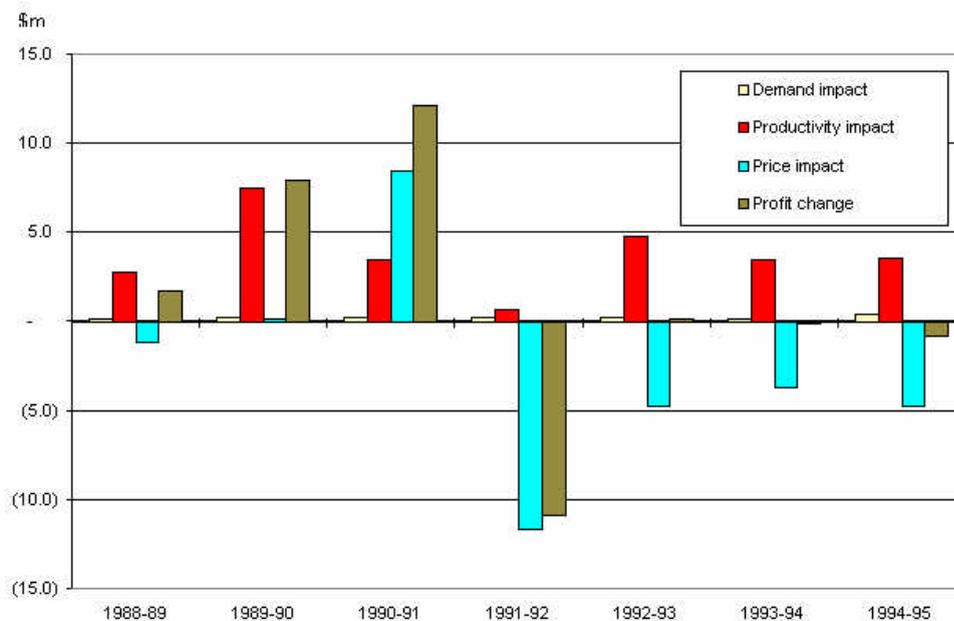
## **Exhibit 1: Profitability and Productivity**



Treasury has developed a new approach to profit decomposition by extending an established measure of total factor productivity measurement, the Törnqvist index <sup>5</sup>. In simple terms this approach decomposes a change in profit level into three main impacts: demand (or volume), productivity and price. The main result of a profit decomposition case study for the former Orion Energy is shown in Exhibit 2:

<sup>5</sup> Refer to Han and Hughes (1997).

**Exhibit 2: Decomposition of Profit Change, Orion Energy**



\$m

1988-89 1989-90 1990-91 1991-92 1992-93 1993-94 1994-95

Demand impact	0.133	0.217	0.225	0.218	0.178	0.094	0.393
Productivity impact	2.768	7.505	3.451	0.639	4.760	3.493	3.527
Price impact	<u>(1.157)</u>	<u>0.172</u>	<u>8.477</u>	<u>(11.713)</u>	<u>(4.807)</u>	<u>(3.742)</u>	<u>(4.737)</u>
Profit change	1.744	7.895	12.153	(10.856)	0.131	(0.155)	(0.817)

The **demand impact** is equivalent to the change in output quantity valued at base year output price. The demand impact indicates the variation in output level without any productivity change. The **productivity impact** is equal to the change in input costs between two periods to produce the current output. The **price impact** measures the effect of pure input and output price variations, holding productivity and demand constant at the base period.

In 1992-93, Orion's profit increased by \$0.131m. The value of the demand impact was \$0.178m. Productivity improvements contributed \$4.760m to Orion's profit change. The combined effect of these changes was sufficient to just offset the negative price impact of \$4.807m.

Decomposing the price impact into output price and input price impacts provides information on the distribution of productivity gains between owners and customers. Exhibit 3 shows the distribution of profit changes for Orion Energy.

### Exhibit 3: Distribution of Profit Changes, Orion Energy

\$m	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95
(a) Productivity impact	2.768	7.505	3.451	0.639	4.760	3.493	3.527
(b) Input price impact	<u>(13.531)</u>	<u>(8.561)</u>	<u>(5.155)</u>	<u>(14.437)</u>	<u>(3.538)</u>	<u>8.623</u>	<u>24.479</u>
(c) Input cost impact: (a) + (b)	(10.763)	(1.056)	(1.704)	(13.798)	1.222	12.116	28.006
(d) Transfer from (to) consumers [= total output price impact]	<u>12.373</u>	<u>8.734</u>	<u>13.632</u>	<u>2.724</u>	<u>(1.269)</u>	<u>(12.365)</u>	<u>(29.216)</u>
(e) Profit change before demand	1.610	7.678	11.929	(11.074)	(0.047)	(0.249)	(1.210)

	impact: (c) + (d)							
(f)	Demand impact	0.133	0.217	0.225	0.218	0.178	0.094	0.393
(g)	Profit change: (e) + (f)	1.744	7.895	12.153	(10.856)	0.131	(0.155)	(0.817)

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The distribution of a government business' productivity gains between its customers and the Government (as owner) is a key regulatory issue. A good economic principle is that a government business should not earn more than an economic rate of return on its capital.

In 1992-93, Orion's dollar value contribution from productivity of \$4.760m offset input price inflation valued at \$3.538m. This positive input cost impact was transferred to consumers via lower sales prices, resulting in a small negative profit change before demand impact. The contribution of the demand impact was sufficient to make the profit change positive for this year. A similar pattern occurred in the following two years.

In summary, this approach provides:

- Managers with a framework for analysing past and projected sources of profit change; and
- Regulators and managers with a tool for evaluating pricing strategies and cost containment programs.

(In addition, the decomposition of the productivity impact can provide guidance for a firm's dividend policy and performance-based pay for labour and management.)

In partnership with major government businesses, Treasury intends to continue productivity measurement using the newly developed profit composition analysis framework which links productivity to profit. To date, a case study on a NSW water corporation has been undertaken using this framework. ([back to contents page](#))

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## **5.2. Budget Sector Agencies**

Reforms to the financial management of the NSW Budget Sector over recent years include the introduction of forward estimates, global budgeting, accrual accounting and publication of output and outcome measures in the Budget Papers. The task now is to strengthen the linkages between these various reforms.

An approach to resource allocation, which is designed to achieve better quality services for the consumer and greater accountability to the taxpayer, is being developed in New South Wales under the umbrella of performance budgeting. It involves:

- Developing a better understanding of the services or outputs (for example, court cases and immunisations) produced by Government agencies and of the results or outcomes (for example, crime rates and mortality rates);
- Linking resource allocation decisions at both the whole-of-government and individual

- portfolio levels with identified Government policy objectives and priority outcomes;
- Ensuring greater efficiency in the delivery of outputs by encouraging agencies to use benchmarking and other related techniques; and
  - Moving towards defining the funding of agencies according to the outputs that the Government has agreed will be produced over the Budget period and formalising the Government's purchase of outputs in performance agreements with agencies.

The performance approach is intended to make agencies more accountable for delivering the outputs and achieving the outcomes for which they have been funded.

The implementation of performance budgeting in New South Wales involves several stages:

- The development of output, outcome and performance measures as budgetary tools;
- The implementation of performance agreements, similar to the sfps used for government businesses; and
- More explicit separation of the Government's purchaser and provider roles and the implementation of service competition policy.

The first two stages of this process are well under way. Performance agreements have recently been implemented in three key portfolios: health, transport and community services, to enhance the budgetary focus on outputs and outcomes. These agreements contain key indicators against which the performance of agencies can be measured. It is intended to introduce performance agreements progressively throughout the Budget Sector.

The development of new measures of performance will assist in refining such agreements in future. The Budget process should improve, since agencies with performance contracts have stronger incentives to cooperate in identifying potential gains from more productive use of resources. Treasury will advise the Government on the extent of efficiency gains achieved.

Efforts to improve the performance of government service require both efficiency and effectiveness measures. Accordingly, performance agreements will list outputs (which require efficiency measures) and their link to Government policy and outcomes, reflecting effectiveness issues. A Government service provider might increase its efficiency by sacrificing the effectiveness of its service. For example, an 'efficient' technical and further education college may have enrolled students in a course beyond the optimal class size, thereby reducing the quality of teaching. By contrast, an 'inefficient' college may have smaller class sizes to provide more thorough teaching. This illustrates why it is important to maintain a balance between efficiency and effectiveness indicators for Government service providers - for example, are students acquiring knowledge and skills?

Viewed together, effectiveness and efficiency indicators provide a more comprehensive understanding of the performance of government service providers. Assessment of the appropriateness of Government activities (the link between targeted outcomes and community welfare and Government policy) is a matter primarily for Ministers rather than government agencies. ([back to contents page](#))

### **DEA studies in Budget Sector agencies**

The NSW Treasury is beginning to use DEA to assist in the financial management of Budget Sector agencies. The results of DEA studies will contribute to the information used in the monitoring process.

DEA provides a comprehensive picture of technical efficiency, by constructing a total

production function and adjusting for the influence of environmental factors, such as population density. The technique can handle multiple inputs and outputs and does not require price information, which makes it particularly suited to Budget Sector agencies which do not price their outputs. It is a linear programming technique that identifies the best performers at a point in time according to their ability to produce the greatest level of outputs with a given set of inputs or to produce given outputs with the least inputs. Other service providers receive an efficiency score that is determined by their performance relative to the best performers.

The technique can determine whether the main source of technical inefficiency is the managerial capabilities of the service provider or the scale of operations, that is whether a unit is too large or too small. Further, we can incorporate environmental variables that influence the efficiency of a service provider but are beyond its control, for example the education or wealth of clients. The method to calculate technical efficiency and its components is presented in Lovell (1993). The Steering Committee for the Review of Commonwealth / State Service Provision (SCRCSSP) has just released an information paper on DEA<sup>6</sup>.

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<sup>6</sup> SCRCSSP (1997b) *Data Envelopment Analysis - A technique for measuring the efficiency of government service delivery*, AGPS, Melbourne.

The NSW Treasury has undertaken DEA studies of NSW police patrols, minimum security correction centres (prisons) and motor registry offices. Summaries of these studies are presented in Pierce and Puthuchery (1997) and in SCRCSSP (1997a) and (1997b). Studies have commenced to determine the technical efficiency of local courts, fire brigades and hospitals in New South Wales and Treasury is examining further opportunities to use the technique.

The DEA studies so far have involved a partnership between Treasury and the agency. The agency provides detailed knowledge of its services and provides information on which units are to be compared, the inputs and the outputs, and what data is available.

The DEA results provide an efficiency score for each unit, appropriate best practice role models and output and input targets. The peers identified by the DEA study are based on similar input and output ratios and may differ from those traditionally used such as organisations of a similar size or organisations operating in the same geographic area.

The agency contributes further by examining the results of the study. It can assess whether sensible comparisons between service units are being made and may be able to explain the reasons for inefficiency. This may lead to further refinements of the study to include different combinations of inputs and outputs, better measures for inputs and outputs, correcting errors in the data or considering the influence of environmental variables. Early models need to be interpreted with the understanding that the models may not adequately describe the production process.

The modelling process is iterative and accordingly, assistance and liaison need to be ongoing. Such cooperation is also vital for the successful adoption of DEA as an internal management tool.

Treasury's approach to performance measurement for Budget Sector agencies is to work with agencies on benchmarking their performance. Its aim is to set agencies on the path of

continuously examining the performance of their operational units in comparison with counterparts within or outside the organisation. This process yields insights that help under-performing units to pick up better practices. Leading performers are also prompted to improve, due to the heightened emphasis on performance.

The results of the DEA studies of NSW agencies show that differences in the performance of individual police patrols, prisons and motor registries exist. Some of these differences may be due to errors in the data, inputs, outputs or environmental variables not adequately captured in the model.

In most cases the studies have identified managerial inefficiencies which the agencies are now investigating. The agencies have found DEA a useful addition to their suite of management tools.

The studies to date have found that managerial efficiency is more significant in explaining differences in performance than is scale. This is pleasing, because it indicates that technical efficiency can be improved without dramatic structural changes. However, DEA only provides comparisons with existing performance. Efficiency may be further improved through substantial organisational restructuring, although the technique provides little advice on this score.

There may be social, demographic or geographic reasons why a motor registry is a particular size. If there are no barriers to amalgamation or separation of registries, then information on scale efficiency can assist management in determining the optimal size of registries. If barriers do exist, information on scale efficiency provides an indication of the costs incurred in maintaining the existing level of service provision in a particular region. This can be compared with the costs that would be incurred by customers if the level of service provision were reduced.

The results of the motor registry study are presented below. Before presenting the results, it should be noted that DEA efficiency scores are derived relative to best practice within the sample. The average efficiency scores reflect the technical efficiency of the units in the sample and cannot be compared to efficiency scores in other studies. The studies provide no information on the relative efficiency of the samples or on how NSW government service providers compare with Australian or world-best practice. The Steering Committee for the Review of Commonwealth / State Service Provision is encouraging the establishment of national DEA models so that more extensive comparisons can be made.

Additionally as with any other technique, a DEA study will only be as good as its data. If major inputs or outputs are omitted from the model, the results may be meaningless. Additionally, DEA is a non-stochastic technique and is particularly sensitive to data outliers, random events and errors in the data. Errors in the data may be a problem in some of the studies presented below and the results should be considered with these limitations in mind. Many of the agencies are establishing better information systems to improve the data for future studies.

### **DEA motor registry case study**

Vehicle registration and driver licensing are handled by 131 motor registries throughout the State. In addition, some council agencies and police stations provide services in rural areas. Spending on motor registries is about \$140 million a year.

## **Inputs**

Net hours worked by registry staff

Expenditure on materials (licences, plates, postage and stationery)

Number of computer terminals used in customer transactions.

## **Outputs**

Volume of weighted transactions

Reciprocal of customer waiting time (minutes)

The 1995-96 average DEA managerial efficiency score for the registries was 88 per cent. A similar model was run for the previous year and found that the best practice registries were similar in both years. The results suggest that if all motor registries were to operate at best practice, they could produce the same level of outputs with 12 per cent less inputs. The DEA results provide an efficiency score for each unit, appropriate role models and targets.

### **Exhibit 4. Summary of DEA efficiency scores of motor registries, 1995-96**

	<b>Overall technical efficiency</b>	<b>Managerial efficiency</b>	<b>Scale efficiency</b>
Mean	0.85	0.88	0.97
Standard deviation	0.08	0.07	0.04
Minimum	0.66	0.67	0.76
Number of 100% efficient registries	9	17	9

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How are the scores in this table to be interpreted? Each registry should be able to improve its performance to *at least* the extent necessary to reach its DEA benchmark (as indicated by its managerial efficiency score). Note that the efficiency score is relative to the benchmark firms identified as role models. Accordingly the managerial efficiency score of a given registry is comparable with the score of another registry only if the two registries have broadly similar role models (Kang and Feeney 1997).

Prior to developing the DEA efficiency scores for registries, management relied entirely on partial productivity indicators, primarily weighted transactions per net hour worked and total cost per weighted transaction, to assess registries' performance and to identify areas of possible improvement. It is intended that these partial productivity indicators will be monitored in conjunction with the annually updated DEA efficiency scores.

The DEA study indicated that the overwhelming majority of registries were operating at or near constant returns to scale: they were, on average, 97 per cent scale efficient. This means that if it were possible for registries to adjust to their optimal scale, inputs would be reduced, on average, by only 3 per cent. The results suggest that improving managerial efficiency, rather than addressing scale inefficiency, is the more significant avenue for improving the overall technical efficiency of registries.

Whether a registry opens on Saturday or undertakes extra data entry for agents affects the measured efficiency of registries was tested using Tobit regression analysis, and the hypothesis was rejected.

Further consideration is being given to whether the trade-off between increasing the utilisation of capital (by reducing the number of terminals) and reducing customer waiting time has been adequately captured, along with the tradeoff between increasing the utilisation of inputs and increasing the quality of outputs reflecting the convenience to customers of extended-hours service.

Area managers will be provided with training in the nature and specification of DEA models and in the interpretation of DEA results. In this way, area managers will be confident when explaining to registry managers, and where appropriate to registry staff, the reasons for follow-up action prompted by the modelling. ([back to contents page](#))

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## 6. Conclusions

Performance measures can be used to drive large structural changes such as the reform of the electricity supply industry. Performance measurement is also being used to drive less radical changes, such as ongoing improvement in the performance of agencies by providing information to internal managers and to the Government.

Over time NSW Treasury plans to integrate the information provided by performance measurement techniques such as DEA, TFP and SVA into the financial management process. Such information may be used in negotiations between Treasury and agencies to assist in improving performance and achieving objectives.

Treasury plans to extend the use of DEA and TFP to more government agencies and to press for appropriate follow up action by agency managers based on DEA study results. ([back to contents page](#))

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## Glossary - Key performance measurement concepts

<b>productivity</b>	the ratio of all outputs to all inputs
<b>partial productivity</b>	a ratio of outputs to inputs which does not include all inputs and outputs, for example, output per employee
<b>efficiency</b>	how well an organisation uses its resources to produce outputs relative to best practice at a point of time
<b>technical efficiency</b>	refers to the conversion of inputs such as employees and machines into outputs relative to best practice. Technical efficiency is affected by managerial practices and the scale or size of operations.
<b>allocative efficiency</b>	refers to whether, given input prices, inputs are chosen to minimise the cost of production

<b>dynamic efficiency</b>	refers to the timeliness of changes to technology and products in response to changes in consumer tastes and productive opportunities
<b>economic or cost efficiency</b>	refers to whether an organisation is technically, allocatively and dynamically efficient
<b>effectiveness</b>	how well the outputs of a government agency achieve the objectives expected by the Government, for example are the activities of hospitals having an effect on the general health of the community
<b>Data Envelopment Analysis (DEA)</b>	A linear programming technique which measures efficiency by identifying best practice in terms of the conversion of inputs into outputs.
<b>Total Factor Productivity (TFP) index</b>	The ratio of outputs (weighted by revenue shares) to inputs (weighted by cost shares).
<b>Shareholder Value Added (SVA)</b>	Economic profit - operating profit after tax and a charge for debt and equity.

[\(back to contents page\)](#)

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