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Measuring Container Port Productivity

The Australian Experience

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> "…the measurement of container productivity has more in common with a commercial art form than with science! The lack of uniformity in the data used for productivity measurement is enormous…. This lack of uniformity renders difficult valid comparison of the measurements of two terminals and the formulation of uniform standards for international, national, regional or portwide application." (Dowd and Leschine 1990, p.110).

1. INTRODUCTION[1]

Measuring container terminal performance is a tricky pastime, especially if a uniform system across terminals and ports is required. The data are hard to come by and interpret, and even access to good data does not guarantee a successful study. There are so many variables, even within a single terminal, that often similar performance studies produce differing conclusions. Moreover, the results of performance measurement can affect the interests of stevedores, unions, port authorities, shippers and governments, so there is an incentive for some to take advantage of the difficulties of measurement to promote their own interests. This has certainly been true in the Australian experience.

In this paper we begin by describing briefly the historical background to the development of Australia's system of uniform measurement of container port performance. Section 3 describes how the data are collected and presented in the Government's key publication, *Waterline*. Section 4 outlines the contents of *Waterline*, including description of the main indicators of productivity and reliability. The next section discusses some of the lessons that have been learned about the collection of performance indicators. Section 6 discusses the uses made of the indicators by some of the main players in the industry while the final section makes some concluding observations.

2. HISTORICAL BACKGROUND

In Australia, Federal government performance monitoring of different sectors of the stevedoring industry has been occurring for over ten years. The first publicly available series of indicators was produced in December 1989. This series was developed by the Waterfront Industry Reform Authority (WIRA) for the specific purpose of monitoring the progress of an ~~the In-Principle~~ agreement negotiated between the stevedoring employers, waterfront unions and the Commonwealth (WIRA 1992). In other words, Australia's system of monitoring waterfront performance came about as a result of a reform agreement between the industry, the trade unions and the Federal Government. Thus the system was initiated principally for industrial relations reasons rather than commercial ones. At the time, the Australian Labour Party, with strong traditional links to the trade union movement, occupied the Treasury benches.

The WIRA performance indicators were comprehensive, covering container and conventional stevedoring as well as bulk grain and fertiliser stevedoring operations. It was agreed that there

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[1] I am grateful to the Bureau of Transport Economics for assistance with this paper. The paper draws heavily on a draft analysis prepared by Tony Carlson of the BTE. However, all views expressed in this paper remain solely those of the author.

would be a number of indicators for each sector, and that reporting should occur on a quarterly basis over a period of three years to October 1992. The WIRA monitoring program was one of the most intensive industry performance monitoring programs conducted by a government agency in Australia.

The end of the WIRA monitoring program was met with a mixed reaction. In its final report, WIRA noted that:

> The Parties were unable to reach a consensus on the collection of stevedoring industry statistics in the future. Stevedoring employers considered that there was no need for the Industry to continue to collect or supply statistical information after 31 October 1992 as this was inconsistent with the enterprise philosophy in the restructured industry. Stevedoring unions considered that comprehensive industry wide statistics should continue to be collected (WIRA 1992, p. 18).

Calls for continued monitoring grew stronger in the period immediately after October 1992 when it appeared that container stevedoring performance in particular was actually declining. Consequently, the monitoring baton was passed to the Bureau of Transport Economics (BTE),[2] an existing Commonwealth transport agency.

However, the environment in which the BTE had to operate was not the same as it had been for WIRA and this would affect the resurrected monitoring program. In particular, the stevedores, whose interests and motives had always been mixed, were no longer willing to cooperate.

Under the WIRA agreement, the stevedores were obliged to provide the data needed to undertake performance monitoring. This obligation was partly due to the quasi-regulatory requirement, partly due to a sense of corporate moral obligation given the government's willingness to provide funding for workforce redundancies, and partly due to a genuine belief that the indicators would be valuable, by demonstrating the benefits of the reform program.

By the time the BTE sought data from the stevedores in 1993[3] attitudes had changed. The quasi-regulatory requirement of WIRA and the sense of corporate obligation had disappeared. On a personal level, there was some resentment about this new intrusion; some believed that the Government had already played its part and it was time to let the stevedores get on with the job. Others, while acknowledging there was a need to continue performance monitoring, despaired at the possibility of interminable data gathering by bureaucrats.

To a large extent, the Federal Government had created this environment of reluctant cooperation. The maritime sector in general had been put under the microscope for well over ten years by numerous commissions, inquiries, working groups and task forces, at both the state and federal levels of government. Many of the investigations overlapped and duplicated each other and, intensifying industry irritation, many of these investigations were conducted by completely

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2 Then the Bureau of Transport and Communications Economics (BTCE).

3 To be precise, the Federal Transport Department obtains the stevedoring data from the stevedores on behalf of the BTE.

separate government agencies. The major industry players were forced to repeat their cases to a seemingly never-ending stream of bureaucrats (Payne 1994).

As a result of industry reluctance, the BTE was unable to secure much of the data that was essential to improving the WIRA indicators. This was especially so in the case of reliability indicators, an essential addition in order to provide a more complete picture of stevedoring performance. For the BTE to achieve its objective of providing sufficient information to raise the level of the public debate on waterfront reform, the BTE had to rely on its own devices and learn the art of gentle persuasion. However, the BTE did not realise at that stage that a newly developed idea, a publication called *Waterline*, would play such a prominent role in achieving the Bureau's objective.

3. THE ORIGINS OF *WATERLINE*

Throughout the 1980's the BTE had played a role in providing the Government with expert, independent and balanced analyses on a broad range of maritime issues. However, the relatively small size of the BTE and the *ad hoc* nature of the required maritime research tasks made it difficult for the Bureau to establish an ongoing presence in the maritime reform debate. It was believed that this presence was essential for it to maintain its contacts and expertise.

The solution the BTE decided to try was the production of a newsletter entitled *Waterline* designed to provide current information and analyses. At the same time the BTE had been requested by Parliament to produce a six monthly indicator on port interface costs (HORSCOTCI 1992, p. 101). Combined with the task of producing container stevedoring productivity indicators, the BTE could now regularly report on the costs of container ports to users and the productivity of the container terminals in the same publication. In other words, for the first time in the Australian waterfront reform debate, reliable and independent information and analyses on aspects of the price and quality of waterfront services would be available on a regular basis.[4]

This frequency of output had an unexpected benefit. Regular reporting provides the opportunity for interested parties to comment on the usefulness and deficiencies of the indicators. By being flexible and improving the indicators to reflect feedback the Bureau established a reputation for understanding the industry, rather than imposing bureaucratic demands that seemed irrelevant.

This expertise takes time to develop. For example, throughout the 1990s a number of waterfront performance benchmark studies were undertaken by the Bureau of Industry Economics (BIE) and subsequently the Productivity Commission. The initial BIE studies estimated average productivity indicators for each port. That is, the average port indicator included productivity rates for ships that may not operate in the trades to which the ports being compared belong. Consequently, this approach suffers from the effect different trade and traffic characteristics at each port have on productivity. Inevitably, the BIE was criticised for not comparing like with

[4] From the first issue, information on port throughputs was also contained in *Waterline*.

like and it was not till the 1998 Productivity Commission report that the vessel tracking approach was adopted to benchmark port performance.[5]

4. WHAT'S IN *WATERLINE*?

Table 1 provides a list of the principal indicators regularly reported in *Waterline*. In addition to the measures of stevedoring productivity, waterfront reliability and stevedoring reliability, *Waterline* reports data on ship arrival advice, a port interface cost index, financial and non-financial port performance and crew-to-berth ratios (see the Appendix for more detail). In general, these indicators relate to the five major mainland capital city ports of Brisbane, Sydney, Melbourne, Adelaide and Fremantle. These ports are the main container ports of Australia. Although they also have significant trades in non-containerised commodities, many of Australia's iron ore and coal ports are much larger in terms of throughput in tonnes.

Since most container ships visiting Australia are similar in physical characteristics and visit most Australian container ports, one can generally compare the stevedoring productivity rates between Australian ports. However, there are some differences at each port that do need to be acknowledged when making such comparisons. An explanation of these differences may help to illustrate some of the difficulties of comparing stevedoring productivity indicators.

- Both Fremantle and Brisbane ports are end or beginning port calls for voyages around Australia. Consequently, stevedoring productivity rates are adversely affected by a higher proportion of restows than at the other Australian ports.

[5] The BTE first used this approach to compare Australian and New Zealand port performance in 1995 (see *Waterline* 5). The vessel tracking approach compares average stevedoring productivity only for ships visiting each port being compared. Therefore ship characteristics are kept constant while the numbers of containers exchanged are relatively comparable.

TABLE 1 *WATERLINE* INDICATORS

Indicators	Definition	Data providers	National figure[1]
Stevedoring productivity			
Elapsed rate	A ship productivity measure. The number of containers or teus moved per elapsed hour. Elapsed time is the total time the ship is worked, measured from labour aboard to labour shore.	Stevedores	20.7 containers
Net rate	A ship productivity measure. The number of containers or teus moved per net hour. Net time is the elapsed time minus time unable to work the ship due to award shift breaks, ship's fault, weather, awaiting cargo, industrial disputes, closed holidays, or shifts not worked at the ship operator's request.	Stevedores	24.2 containers
Crane rate	A crane productivity measure. The number of containers or teus moved per net crane hour. In theory, dividing the net rate by the crane rate provides a measure of crane intensity. However, due to the way some stevedores calculate crane time, it is possible to have crane intensities slightly less than one.	Stevedores	19.1 containers
Elapsed time not worked	A ship productivity measure, calculated as the difference between the net and elapsed rates as percentage of the net rate.	Stevedores	14.5 per cent
Waterfront reliability			
Berth availability	The proportion of ship arrivals where a berth is available within four hours of the scheduled berthing time.	Shipping lines	91 per cent
Pilotage	The proportion of ship movements where the service is available within one hour of the confirmed ship arrival/departure time.	Shipping lines	100 per cent
Towage	The proportion of ship movements where the service is available within one hour of the confirmed ship arrival/departure time.	Shipping lines	100 per cent
Other ship waiting time	Proportion of ship movements affected by factors other than the unavailability of a berth, pilot or towage causing a delay of one hour or more.	Shipping lines	57 per cent
Stevedoring reliability			
Stevedoring completion	A partial indicator of the accuracy with which stevedoring time is predicted.	Stevedores	na
Stevedoring rate	A partial indicator of the variability of stevedoring productivity at each port, defined as the proportion of ship visits where the average crane rate for the ship is within two containers per hour (plus or minus) of the quarterly average crane rate for the terminal.	Stevedores	na
Cargo receival	The proportion of receivals (exports) completed by the stevedore's cut-off time.	Stevedores	na

1. National figures are based on the information available from the 5 major Australian mainland capital city ports for the September quarter 1998.
2. AAPMA is the Association of Australian Port and Marine Authorities.

- Melbourne and Sydney are by far the largest container ports in Australia, and as such, tend to experience much larger exchanges per port call than the other Australian ports. All else being equal, this has a positive effect on stevedoring productivity.

- Adelaide is the smallest container port, with a throughput approximately half of the next largest port (Fremantle). Consequently, the low frequency of port calls compared to the capability of the single terminal in the port enables Sea-Land to work vessels more effectively than more congested Australian ports.

Each set of indicators in *Waterline* is accompanied by commentary. The commentary is offered as an explanation of some of the movements in the indicators. It assesses only some of the movements because there are often cases when the BTE is uncertain about factors influencing some performance measures. In these cases, it is considered better to let the reader make their own use of the data, rather than make an ill-informed comment.

Often it is necessary to repeat arguments in subsequent editions because it is the BTE's experience that overcoming misconceptions about the maritime industry and the process of reform can be drawn out process.

Waterline also includes feature articles which have ranged from a description of the bulk stevedoring industry in Australia to the results of BTE studies such as the benefits of waterfront reform.

Although the indicators in *Waterline* are generally well received, there are many areas that are not covered that perhaps should be covered to provide a better understanding of the performance of the container industry as a whole. For example, *Waterline* lacks a high quality indicator of the overall reliability of Australian ports.[6] Also, the focus of the performance indicators is on the sea-side of the stevedoring terminal, when, as a system, monitoring of the land-side interface may provide clues to other efficiency gains that may be achieved.

5. LESSONS FROM THE BTE EXPERIENCE

Since July 1994, *Waterline* has developed into the primary source of publicly available information on maritime matters. The topics covered have increased to include regular container port reliability measures and crew-to-berth indicators, as well as feature analyses of other maritime issues. Through *Waterline* the BTE has established itself as one the most significant voices on performance monitoring in Australia. However, there have been mistakes and there are still many important areas of the maritime industry that could profitably be monitored. Nevertheless, the BTE's experience in this area provides a number of useful lessons that others considering taking on the task of regular performance monitoring may find useful.

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[6] The BTE has made some attempts at this in the past (for example, see Carlson 1993), but have been unable to obtain reliable and consistent data to provide the indicators on a continuing basis.

Much of the following is commonsense and a team with good management and research skills should have little difficulty in preparing and implementing a sound performance monitoring program.

Clarify objectives

It may sound simplistic, but the most important step in performance monitoring is to be very clear about what one wants to achieve. Potential data suppliers are very proficient at identifying whether or not an inquirer understands the connection between a data request and the purpose of the monitoring program.

Provide a headline indicator

Waterline benefits from having a headline indicator˜ a national average of the individual port indicators˜ supported by a series of partial indicators. The headline indicator is used by the media, policy advisers and industry groups to provide an overall picture of what is going on. It gives the publication a much higher public profile. The industry itself and industry analysts use the more specific indicators.

In *Waterline* the port indicators used to develop the national average are themselves headline indicators for each port. In regional discussions, the headline port indicator is often used in a way similar to the use of the national indicator. Ideally, the port headline indicator should also be broken down into terminal indicators,[7] but this may not be possible given the need for commercial confidentiality.

Because of the dangers of misinterpretation, greater effort must be made to construct partial indicators where the factor causing the variability tends to vary regularly or has a significant influence upon the size of change in the headline indicator. In cases where an influencing factor does not change on a regular basis, a partial indicator may not be required. For example, changes in the mix of container sizes will have an effect on teu-based stevedoring productivity indicators. However, in recent years the mix of 20' and 40' containers in Australia has remained reasonably consistent and therefore development of a box size partial indicator has not been a priority.

Warn frequently about the dangers of inappropriate comparison

Experience has taught the BTE that when comparisons between performance measures are made,[8] it is precisely those influencing factors where partial indicators have not been constructed that cause the comparisons to be inappropriate. For example, comparing various Australian stevedoring crane rates is reasonably acceptable because many of the unmeasured influences, such as the type of ship and terminal capital equipment, are the same at each Australian port. However, comparing Australian stevedoring crane rates with other national crane rates is fraught with danger when the unmeasured influences are not considered.

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[7] At the time of writing, the BTE and the Department of Transport and Regional Services were negotiating with the stevedores to allow the publication of individual terminal indicators for the first time.

[8] Comparisons are inevitably made, regardless of warnings of the inappropriateness of doing so.

Identify stakeholders

In addition to the Federal government, the key stake holders in the publication of *Waterline* are the stevedores, the unions, port authorities, industry representatives, shipping lines, and state government agencies, as well as a number of individuals who either work or have worked in the maritime industry and are willing to verify anecdotal evidence through their own networks. Interestingly, cargo owners have never been key stakeholders, a situation not unique to *Waterline*.

Make it worthwhile for the data suppliers

One of the successful aspects of *Waterline* is the improved relationship between the BTE and the data suppliers. After the initial environment of reluctant cooperation, some data suppliers began to realise that they could legitimately use the BTE as their sole contact with the government (and other inquisitive bodies). This would allow the data suppliers to reduce their information burden. Other data suppliers, particularly one of the major stevedores, have been attracted to the idea of supplying the BTE with more data so that the BTE may develop new partial indicators which the supplier of that data will then use to improve their own operations.

Know the data suppliers

All the stevedoring productivity indicators contained in *Waterline* are based on data supplied by the stevedores. These data are based on definitions that have remained fairly consistent since 1989. However, people in critical positions change, information systems change and operating procedures change. Each time one of these changes occurs, it is possible that the definitions of each indicator are interpreted differently without anyone realising. Audits of the data suppliers information systems are critical, but can be considered intrusive.

The relationship with the agency supplying the data needs to be developed at both the management and operational level. Sometimes there is a gulf between what the management of the organisation supplying the data thinks it can supply and what the individual preparing the data will supply. It is not good enough to rely on the supplying agency to provide the data according to the needs of the monitoring program. Even if the supplying agency has excellent information systems, their systems may not be designed to report the data in way required for the monitoring program. Consequently, the individual responsible for the data may need to manipulate the output; a task that may not be high on the individual's list of priorities and creates an opportunity for errors to occur.

Share data and information

It has been the *Waterline* experience that strong networks can be developed by openly sharing data and information. These networks are essential for expanding the range of indicators and for verifying anecdotal evidence.

Providing *Waterline* free of charge means that the information permeates widely through the maritime community. This helps to provide a consistent starting point for debate and demonstrates the BTE's commitment to assisting in the reform process.

More than just numbers

The success of *Waterline* relies heavily on the accompanying commentary, which promotes a consistent message based on the available data. Without commentary, there are more opportunities for individuals and organisations to interpret the results inappropriately.

Try hard to be apolitical

Providing commentary with data can be a difficult exercise when balancing current political imperatives with the management of the monitoring exercise. But providing an apolitical account of the data strengthens the relationship between the BTE, data suppliers and other key stakeholders, and ensures the longer term viability of the publication.

It is interesting to note that being apolitical does not prevent *Waterline* being used as a political document. For example, during one stevedoring industrial dispute, a senior representative of the Maritime Union of Australia and the then Commonwealth Minister for Transport, appearing on a respected prime-time current affairs program, both began waving *Waterline* at each other while referring to selected passages from the latest issue.

6. USES OF PRODUCTIVITY MEASURES

Commercial uses

The purpose of the development of a national system of performance measurement for Australia's wharves was to enable monitoring of the reform process. But the provision of consistent, impartially produced comparisons of container port productivity and reliability has commercial uses as well. In particular, in selecting terminals shipping companies need as much information as is reasonably available on performance. While shipping companies collect their own data for their ships, any additional information assists in the decision process, especially if compiled by an outside source. Discussions with both shipping companies and stevedores indicate that they use productivity and reliability statistics from *Waterline* in their negotiations. Stevedores are not reluctant to refer to *Waterline* when the figures serve to strengthen their appeal to the customer. If shipping companies are skeptical about terminal performance, *Waterline* can be used as 'definite proof' in the words of one manager of an Australian stevedore.

While shipping lines collect their own information on terminal performance, they regularly consult *Waterline* to help form judgements about which ports are currently performing well and which are experiencing difficulties. The Australian system of collecting uniform performance figures on container terminals therefore makes it more difficult for stevedores to make extravagant claims about their performance although, in the words of one ship operator, 'we don't read the brochures anyway'.

At least one Australian stevedore has made its internal reporting on port performance consistent with BTE requirements in order to ensure consistency throughout its operations. However, one close observer of the industry has said that the key measure for shipping companies is the line-on

line-off measure of productivity, rather than the crane rates and elapsed time measures used by the BTE since costs are tied principally to the amount of time a ship is tied up at the berth.

The development and use of performance measurement is tied to management approaches and systems. In particular, when rewards for workers and managers are based on performance, performance monitoring goes beyond simple reporting requirements.

The precondition for implementing performance-based rewards is a transparent monitoring system that reflects all the dimensions of performance, including customer service and development goals as well as financial and productivity objectives (Meyrick 1998 p. xv).

There have been managerial benefits to stevedores from the system of uniform performance reporting, providing an added incentive to develop consistent reporting protocols within the company which assists with a number of management functions.

Economic and industry analysis

Waterfront productivity figures are essential to analysis of industry reform policies. Australian government organisations have used these data intensively in reports on waterfront reform. The most notable examples are the international benchmarking work of the Bureau of Industry Economics (BIE 1993, BIE 1995) and the Productivity Commission (1998). However, both of these organisations developed their own measures of waterfront productivity because they needed comparable data for a number of ports overseas.

The BIE noted that 'there is always a trade off in benchmarking studies between confining comparisons to strictly similar operations and casting the net wider to see what can be learnt from the way more diverse operations are run. Benchmarking can only perfectly reflect reality when confined to identical products and processes' (BIE 1995, p. 31). After criticisms of its earlier benchmarking study, in its 1995 study the BIE refrained from making productivity comparisons between Australian ports and the world's major hub ports, noting that the latter may have ten times the level of activity than the biggest Australian ports.

For analysis of productivity within Australia, several authors have relied on *Waterline* as the best source of reliable data. For example, Hamilton (1998) calculated benchmarks for Australian ports adjusted for differences in box exchange rates. Beed and Beed (1998) pursued the same line of analysis.

Policy and political uses

Productivity statistics were at the front line in the dramatic waterfront dispute in Australia during 1998. The BTE had gained a valuable reputation for independence which meant that its *Waterline* statistics were used by all sides in the debate and no party challenged the Bureau's impartiality.

Measuring waterfront productivity is complex and the danger of making invalid comparisons is ever-present. There is also a strong temptation to reduce the complexity to one or two key numbers which tend to take on much more significance than they intrinsically deserve.

This was undoubtedly the case during the recent waterfront dispute. In order to win public support the issues were grossly simplified, not least to capture a headline or a 10-second television grab, and the debate over container port performance at times was reduced to single measures of crane rates and annual wage levels.

The importance of the BTE's statistics on port productivity has continued after the dispute as the various parties attempt to vindicate their positions. Patrick Stevedore's chairman Chris Corrigan has given speeches claiming dramatic improvements in productivity levels since settlement of the dispute, including the claim that while the workforce had been halved, the number of boxes moved has increased by 20%. The union accuses Patrick of manipulating the figures (*Australian Financial Review*, December 2 1998).

Clearly, *Waterline* will be watched very closely over the next year or two for identifiable changes. In the only issue since the dispute (September 1998), the BTE decided to exclude data from Patrick noting that the company 'was unable to provide any meaningful productivity data' for the period of the waterfront dispute. As a result, the productivity indicators appeared to be unaffected by the dispute. However, the figures do show a worsening of reliability, with the berth availability measure falling from 88% in the March quarter 1998 to 68% in the June quarter 1998. *Waterline* notes that the differing effects of the dispute on the two measures 'demonstrates the value of having both measures of performance'.

7. CONCLUDING COMMENTS

Waterline enjoys a strong reputation for accuracy and reliability within the industry and is used extensively, especially to follow trends in productivity and reliability. It is noted for its strenuous attempts at accuracy and for its commitment to improving the coverage of its statistics over time. However, in the view of some in the industry this was not always the case. In the earlier years there was a tendency for the stevedores to overstate their performance so as not to appear to be poor performers, and as a result the figures were, in the words of one shipping company executive, 'bodgy'.[9] However, this has changed, and for an intriguing reason. In the early 1990s, at the height of the WIRA process, the problems of the waterfront were publicly attributed to a complex of management problems so that poor performance was seen to be principally the result of poor management.

But from around 1995 the political environment began to change, first under the Federal Labor Government, and especially under the conservative Coalition Government. Problems on the waterfront were increasingly attributed to the trade union monopoly which had resulted in widespread 'rorts' and excessive pay packets. Poor productivity levels reported by the stevedores thus came to be seen as the fault of the workers rather than management. As a result, the stevedores became more inclined to report their performance accurately and the figures in *Waterline* are now seen to be a more accurate reflection of the true situation. One consequence

[9] However, Tony Carlson of the BTE has suggested that early data problems were due more to the inadequacy of the stevedore's information systems and the lack of auditing of those figures.

of this change, if it is true, is that improvements in productivity since the early 1990s have been higher than they appear to be on the basis of *Waterline's* measures.

The lessons of the Australian experience with a national system of monitoring waterfront productivity are in some respects obvious. Firstly, it is essential to have acceptance by the stevedoring industry of the need for the system, since any system will depend heavily on the stevedores for the supply of data. This means that the system may need to be tailored somewhat to suit their management and data collection needs of the stevedores. In addition, it is essential to be able to ensure confidentiality where required.

Secondly, the indicators must be transparent, simple, accurate, meaningful and acceptable to the range of interests. Headline indicators need to be supported by partial indicators and guidance should be given on interpretation of the statistics in order to limit the possibility of misuse of the figures.

Thirdly, it is important to develop a wide base of public interest and support through a widely disseminated, easy to use publication. There will be several groups of users with divergent objectives – policy advisers, government ministers, stevedores, shipping companies, unions, academics and consultants. With all of these users having different objectives, measurement issues become politically contentious. It is therefore essential to have them collected and reported by an organisation that has a high level of perceived independence. The BTE has managed to develop such a reputation, and it is notable that at no time during the recent and intensely acrimonious waterfront dispute were the BTE's figures challenged. This is in part because the Bureau had an opportunity to develop its system of data collection and reporting over a period of relative peace.

A recent report reminds us of another important fact:

> There is an inevitable tendency for the measures that are more readily quantified and more easily interpreted to assume the greatest prominence. This tendency is greatly exacerbated when the debate on port performance becomes politicised (Meyrick 1998, p. ix).

This complexity is, of course, the critical quandary for measurement. Productivity and reliability measures are only of value if they allow comparison, either between container ports or within a container port over time. However, as we have seen, the wider the net is cast in order to include more terminals in a range of situations the less useful the productivity measures become for analytical, policy and commercial purposes. According to one view:

> Both the valid assessment of achievable targets and the definition of optimal trade-offs are local matters. The imposition of national targets is therefore inappropriate (Meyrick 1998, p. ix).

In the Australian situation, the Federal Government has for many years played a crucial role in bringing the parties together to promote reform on the waterfront. At times this has involved the allocation of large amounts of public funds. It has therefore been appropriate for the Government to undertake the process of data collection and monitoring. It has both enabled the

Government to 'account for' its spending by providing the information required to judge its success or otherwise in promoting waterfront efficiency. It has also been an important part of the reform process itself, providing impartial information to the main parties in the private sector.

Waterline has now become established as the 'Bible' of waterfront productivity measurement in Australia and is relied on heavily by all parties. The shipping trade newspapers and the financial press invariably report each issue of *Waterline*. However, just as the Bible is open to differing interpretations, so are waterfront productivity measures. Unlike the Bible, *Waterline* is not the word of God.

Appendix

Additional indicators reported in Waterline

Indicator	Definition	Data providers	National figure, Sept 1998
Ship arrival advice			
Advice at 24hrs	The proportion of ship arrivals within one hour (plus or minus) of the most recently advised arrival time available to the port authority at 24 hours prior to actual arrival.	AAPMA	na
Advice inside 24 hours	The proportion of ship arrivals within one hour (plus or minus) of the last scheduled arrival time advised within 24 hours prior to actual arrival.	AAPMA	na
Port Interface Cost Index	Provides a measure of shore-based shipping costs (charges) for containers moved in Australian mainland capital city ports.	AAPMA, port authorities, port service providers, customs brokers and land transport operators.	$665 per teu for imports and $611 per teu for exports in the January to June 1989 period.
Non-financial port performance	Various activity indicators such as total cargo throughput, number of containers exchanged, average total employment and vessel turnaround times.	AAPMA	
Financial port performance	Based on port authority annual reports, indicators reproduced include return on assets, dividend payout ratio and the debt to equity ratio.	Various port authority annual reports.	
Crew to berth ratios	The only specific shipping industry indicator. The crew to berth ratio is defined as the number of seafarer days paid over a period of time, divided by the number of berth days operated. Berth days operated is defined as the sum, over the period, of the number of people required each day by the relevant statutory authority and the ship operator to carry out the work of the ship(s) in a safe and efficient manner.	Australian merchant ship operators.	2.137 for the merchant fleet. 2.317 for the offshore shipping industry.

REFERENCES

Beed, Clive and Beed, Cara 1998, 'Australia's Waterfront Container Productivity and International Benchmarking' (unpublished)

Bureau of Industry Economics 1993, *International Performance Indicators: Waterfront*, BIE Research Report 47 (AGPS: Canberra)

Bureau of Industry Economics 1995, *Waterfront 1995: International Benchmarking*, BIE Report 95-16 (AGPS: Canberra)

BTCE 1992, *Quality of Service: Conceptual Issues and Telecommunications Case Study*, Report 75 (Australian Government Publishing Service, Canberra)

Carlson 1993, 'Monitoring the Australian waterfront: port performance and reliability,' *Papers of the Australasian Transport Research Forum 1993*, published by the Graduate School of Management of The University of Queensland

Dowd, T. J. and Leschine, T. M. 1990, 'Container terminal productivity: a perspective,' *Maritime & Policy Management*, Vol. 17, No. 2, pp. 107-12

Hamilton, Clive 1998, 'Productivity in Australian Container Terminals: New evidence from an international study', unpublished paper, The Australia Institute, Canberra, April

HORSCOTCI 1992, *Efficiency of the Interface Between Seaports and Land Transport: "From Warehouse to Wharf"*, Australian Government Publishing Service, Canberra

Meyrick and Associates and Tasman Asia Pacific 1998, 'Measures to Promote Effective and Efficient Container Port Practices', report prepared for Maritime and Ports Group of the Australian Transport Council (October)

Payne, Lachlan 1994, 'Industry Commissions, Inquiries and Inquisitions: What Did They Say and What Has Been Done in the Shipping Arena.' paper presented at the IC Ports, Waterfront and Shipping '94 conference, Sydney Marriot

Productivity Commission 1998, *International Benchmarking of the Australian Waterfront*, Research Report, AusInfo, Canberra, April

WIRA 1992, *Waterfront Industry Reform Authority Final Report*, October, Sydney