

What about skills? A discussion of the role of skills in the strategic positioning of ports as essential catalysts of trade and economic growth

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Abstract

The centrality of the role that ports have in world trade and the economic prosperity of nations is unquestionable. For a geographically isolated trading island such as Australia their role is even more critical. In an environment of projected steady economic expansion over the next two decades, with associated trade and port throughput growth, current discussions about port expansion and the strategic positioning of the ports industry become essential. An important part of this discussion is the sustainability of skills in key commercial and safety-critical areas of port operations. This paper reports on an on-going qualitative study commissioned by the Transport and Logistics Industry Skills Council (TLISC) on the future of skills in Australian ports. The research involves a case study of four key ports, independent interviews with key stakeholders as well as a secondary analysis of existing statistical data. The preliminary findings suggest that, whereas appropriate emphasis continues to be focussed on port facility expansion, sufficient thought is not given to the question of the associated skill demands. Furthermore, there seems to be a divide in opinion about how key skills should be developed and who should be responsible.

Key words: Port; critical port skills; strategic jobs; workforce shortages; marine operations; port expansion

1. Introduction

The vitality of ports in the global economy is well established in academic and policy literature (Goss, 1990; Haezendonck et al, 2000). Ports constitute critical nodes in the complex of global logistics chains which facilitate international commodity trade (Huybrechts, 2002). Furthermore, they are often central hubs of value-adding services which are essential for economic expansion and growth. In many places around the world, ports as hubs, have transformed into port cities with a high concentration of production, logistics and related services. For a resource-rich, geographically isolated island nation which is hugely reliant on

international maritime transportation for its imports and exports, seaports become particularly important. Furthermore, ports, as economic gateways, facilitate Australia's connection to the world and with its trading partners and enhance the capacity to reap the benefits of economic globalisation. Moreover, the historical significance of ports as settlement and economic centres still continue to define the Australian socio-economic landscape.

Having emerged from the financial crisis relatively unscathed the Australia economy is set to register significant growth in investment and trade over the next two decades as more resource development projects are implemented across the country. With this expansion port activity will increase as commodity throughput grows. According to the Australian Maritime Group (AMG, 2007), container throughput is expected to triple by 2020. A study by the Bureau of Infrastructure, Transport and Regional Economics (BITRE) estimates that the total cargo throughput of all Australian container ports will increase from 6,175, 000 to 15,214,000 TEUs between 2008 to 2030 (Lubulwa et al 2008). The government as well as the private sector are currently investing huge amounts of financial resources in port-centric infrastructure expansion, geared towards enhancing quay-side capacity to handle the increased trade (Hepworth 2010). Commenting on this investment Infrastructure Australia, which is currently developing a ports strategy, explains that the major focus is to make Australia;

“... more competitive in the global economy and making sure that we are not losing opportunity because of a disconnect in our infrastructure [...]. Where do we get the best bang for our buck? That is our focus”.

This objective of enhancing competitiveness by boosting resource development and port productivity is, however, somewhat undermined by increasing reports of workforce shortages in key and critical areas of port operations. Some of the areas affected include Vessel Traffic Control (VTC), marine engineering and port marine safety. In particular, the industry is experiencing a shortage in the number of people with the required skills and qualifications to perform the functions of Harbourmaster, marine pilotage and marine engineering (AIMPE, 2008; DEEWR, 2009). Such shortages indicate a weakness in the ports skills base which is likely to compromise productivity gains for ports and the economy over the next few years.

This paper reports on an on-going qualitative study commissioned by the Transport and Logistics Industry Skills Council (TLISC) on the future of skills in Australian ports. It explores the nature of the problem of workforce shortages and examines the implications for port productivity and competitiveness. The paper is organised into six sections: After this

introduction, section two briefly describes the research methods employed in the collection of data for the study. Section three examines the implications of workforce shortages on port productivity in an environment of growing resource development and trade throughput while section four outlines the broader context of industrial decline leading to the skills shortages being experienced currently. Section five discusses the increasing training burden placed on smaller ports as a result of staff poaching practices which now characterise the industry and, finally, the paper concludes with a brief discussion of the key findings.

2. The Study

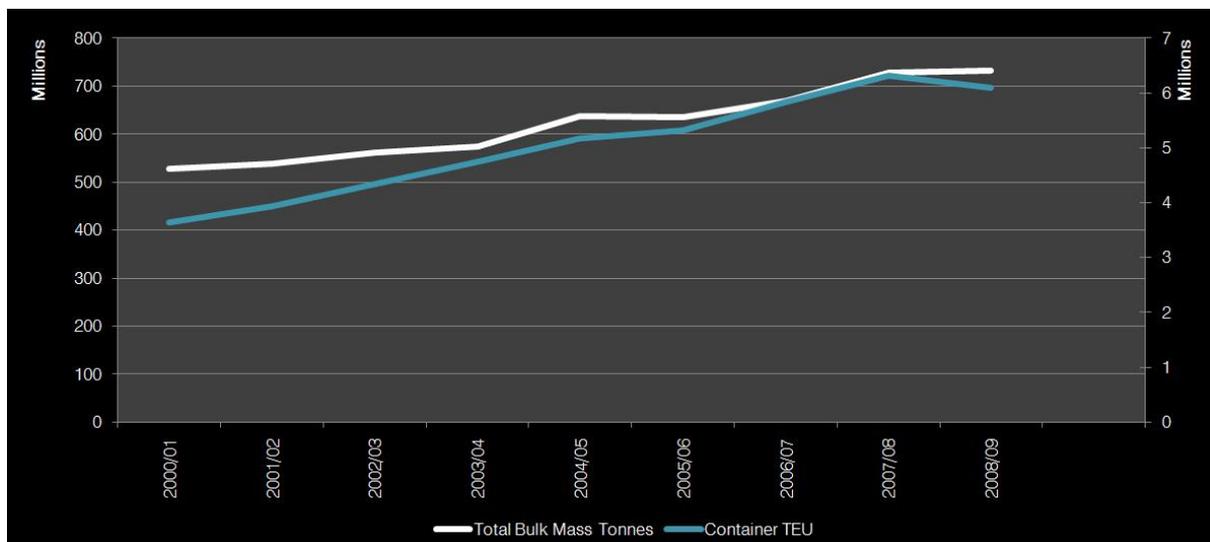
The data underpinning the discussions in this paper come from an on-going qualitative study commissioned by the TLISC examining the decline in the port marine skills base in Australia and its implications for the industry's productivity and safety of operations. The research involves data collection through a qualitative case study of four major Australian ports. Three main data sources are relied upon, including a Delphi group (a team of experts linked via e-mail), in-depth interviews with port management and key industry stakeholders and secondary data on port throughput and vessel calls. The Delphi is comprised of six participants selected on the basis of their expertise in various aspects of port ownership, management and operations. Their primary task is to assist in developing the framework for analysing work, skills and workforce shortages in the ports. They will also review draft reports and provide comments.

It is envisaged that at the end of the project a total of 40 in-depth interviews will have been conducted (lasting about one hour each) as part of the four case studies plus 6 key stakeholder interviews. So far two case studies have been completed involving a week-long visit to each site by the researcher. 23 interviews have been conducted to date. To further strengthen the case studies, formal interviews have been complimented by port-site tours, particularly at the waterfront, to observe firsthand what people do and, through engaging in informal discussions (particularly with those in jobs deemed to be strategic), trying to understand the key skills they require to do their jobs and determine what training they have received and what qualifications they hold. Participants in the formal interviews at the ports include Port Authority officials, port managers, harbour masters, marine pilots, stevedores, human resource managers and port development officers. Detailed field notes are taken during the site tours and informal discussions with relevant port employees and their managers at the frontline which have later been organised and analysed alongside the formal interview data. Formal interviews are usually professionally transcribed and analysed with the aid of a Computer Assisted Qualitative Analysis Software – Nvivo.

3. Workforce shortages and the threat of reduced port productivity

For Australia, being a resource trading country, the logistics sector plays a key role in delivering economic productivity gains. Ports occupy a central and important position in the overall picture. With the decline in the country's shipping sector, emphasis has shifted to the ports and logistics industries to maintain the country's competitive presence in the global economy and provide the necessary support for Australia's international trade. Over the past decade port activity has steadily increased as indicated by growing cargo throughput (Chart 1).

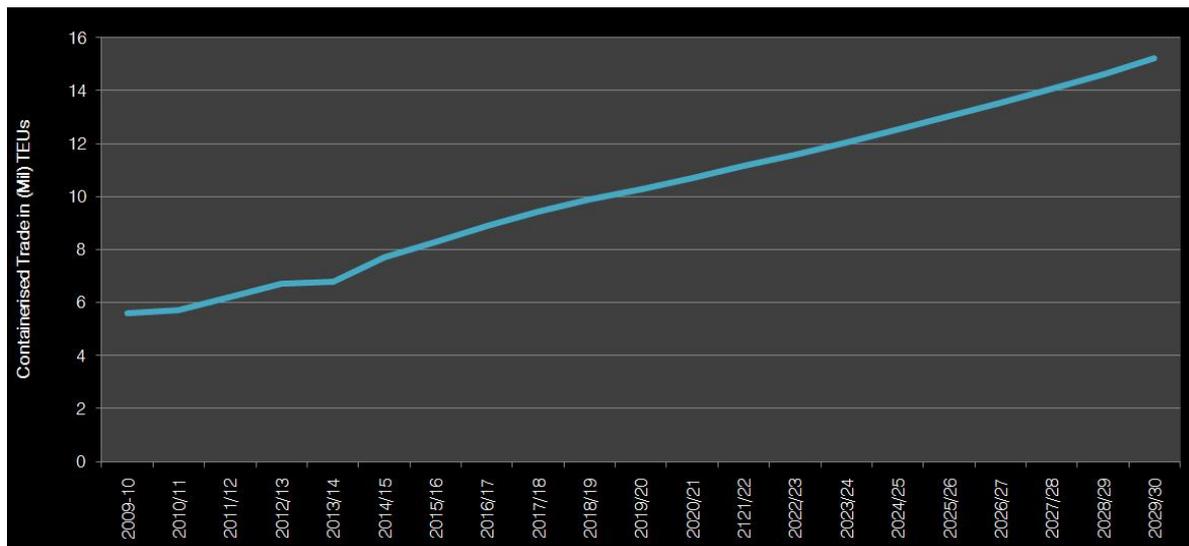
Chart 1: Total Bulk and Containerised Throughput 2000 - 2009



Source: Ports Australia trade statistics; <http://www.portsaustralia.com.au/tradestats/> [12/05/10]

After a slight slump between 2007 and 2009 caused by the global financial crisis, trade forecasts suggest that total container throughput is set to increase steadily to 15.2 million mass tonnes in 2030 (see chart 2) as the economy grows, more resources are developed and trade expands.

Chart 2: Observed and projected container throughput 2000 - 2030



Source: Bureau of Transport and Regional Economics (BTRE) [2009]

The federal government is currently undertaking extensive port-centric infrastructure expansion, geared towards increasing quay-side cargo handling capacity (Hepworth 2010) over the next two decades, to handle the anticipated rise in port throughput. As an indication, the government, as part of the Nation Building Program 2008-09 to 2013-14, has set aside A\$339 million for the proposed development of Oakajee Port common use infrastructure in Western Australia. The estimated total project cost is A\$4000 million. A\$50 million has also been approved for the expansion of Darwin Port in the Northern Territory; a project estimated to cost A\$325 million. The government initiated expansion projects are in addition to those being undertaken by private resource companies.¹ Such facility expansion will increase the demand for essential skills, including those in areas critical to safety such as Harbourmasters and Marine Pilots.

Seemingly, however, the capacity of the county's ports to handle the associated increase in ship calls and overall port activity is jeopardised by the decline in the skills base and a looming workforce shortage, particularly in the technical marine operations sections of the ports. The port is an intersection of three different but inter-linked operations requiring different skill sets – blue-water seafaring skills, brown-water seafaring skills and shore-based

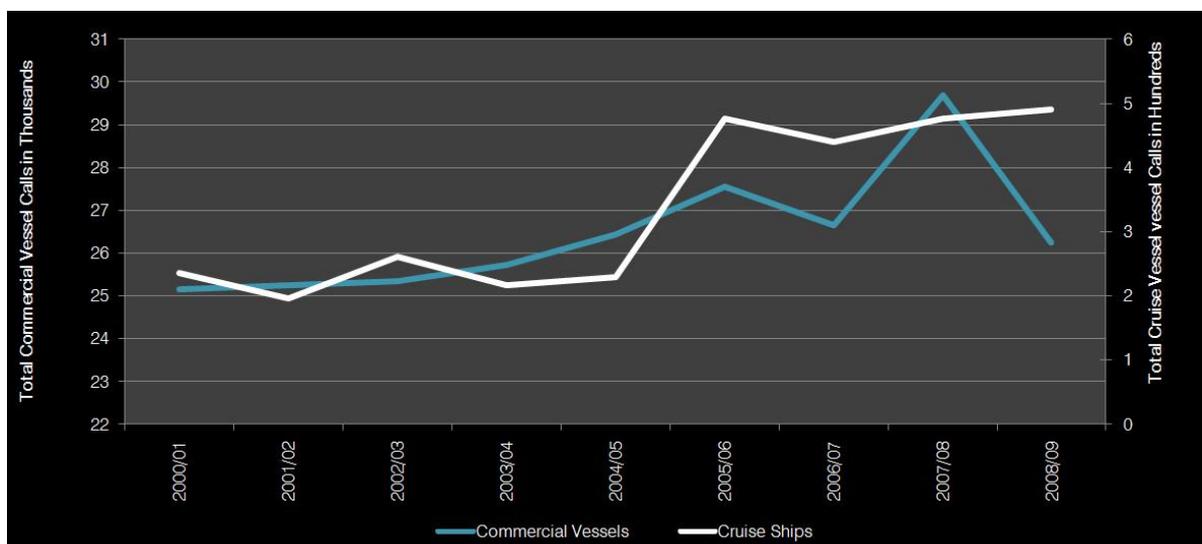
¹ Darwin; http://www.nationbuildingprogram.gov.au/projects/ProjectDetails.aspx?Project_id=035880-09NT-MIP [12/05/10]

Oakajee; http://www.nationbuildingprogram.gov.au/projects/ProjectDetails.aspx?Project_id=035897-09WA-MIP [12/05/10]

stevedoring skills. Though the paper focuses more on the second operation, i.e., the brown-water skills, it is important to understand that the three operations constitute an interlocking logistics chain so that a shortage in brown-water seafaring skills has implications for the other operations. A shortage of port marine pilots and tug-boat operators to facilitate fast and efficient vessel traffic at the port, for example, would create a bottleneck which would slow ship turn-around and quay-side cargo operations and disrupt operations down the logistics chain. The main difference between blue and brown-water seafaring skills is the location of their application whereby the former are applied in deep-sea international shipping. The latter are applied in coastal or near coastal shipping. In relation to ports, however, they this refers to skills required by personnel in marine related occupations who require seafaring skills. These include marine pilots, harbourmasters, marine engineers, tug-boat operators and other VTS (Vessel Traffic Control) staff. Generally stevedores and other quay-side cargo operations staff do not require marine skills, and the data here does not indicate a shortage of this category of skills.

Based on trends in vessel calls over the past decade (Chart 3), it is reasonable to expect that, with more trade expected to pass through the ports, the number of calls will expand steadily, thus increasing pressure on the current marine operations workforce.

Chart 3: Trends in cargo and cruise vessel calls 2000 – 2009



Source: Ports Australia trade statistics; <http://www.portsaustralia.com.au/tradestats/> [12/05/10]

Port Authorities have expressed great concern about the workforce shortages they are beginning to experience with predictions of the situation getting worse. One such stakeholder explained:

It is becoming harder to get qualified people for some of the key positions here, like Pilots and Harbourmasters and the situation will get worse as port activity increases. Because of growing demand overseas for our resources more terminals are being built and existing ones expanded. Where will the people come from to operate these facilities?

Such a skills shortage not only reduces the number of available people to perform the tasks but also means increased pressure on the existing staff whose workload is likely to increase leading to increased fatigue and the possibility of accidents (REF).

That shore-based maritime related industries in Australia are facing growing difficulties in recruiting suitably qualified technical marine skills is not new and has been documented in recent studies (Thompson Clarke Shipping, 2002; Parsons, 2004; Kinley, M. 2006). Seemingly, however, and as this study shows, the problem is getting worse and, according to port managers and other stakeholders, the problem is not being accorded sufficient priority at the policy level. The greater concern is that, without an immediate and effective solution and owing to the critical role of ports in Australia's trade, the economy is likely to suffer as a result of disruptions in the export/import supply chains. The core function of sea ports is to facilitate efficient import/export flows. If, however, they become logistics bottlenecks as a result of skills shortages then the entire economy's earnings would be affected. As the manager of a stevedore company explained:

Our ports, particularly those handling large quantities of resource exports, are hugely important to the economy. Our economy heavily relies on digging up earth and exporting it [...] if ports like Dampier which handle billions of dollars worth of resource exports cannot operate smoothly for any reason, we are in trouble

4. The context of decline and consequent marine skills shortages

The problem of workforce shortages being experienced by ports in Australia currently is related to a general decline in the core pool of trained and experienced mariners from which ports and other maritime related shore-based businesses have historically drawn their technical skills (DEEWR, 2009). As the Australian shipping industry has declined in terms of the number of registered vessels, the capacity to recruit, train and employ Australian junior officers has diminished. This is because ship-owners have traditionally borne the responsibility of recruiting, training and providing apprenticeships for cadets in a continuous process of staff replenishment. The absence of domiciled ship-owners engaging in cadet training has, therefore, led to the depletion of the existing pool of mariners due to natural wastage as well as sectoral migration. Furthermore, without any workforce replenishment at the bottom; in the form of new recruits and junior officers working their way up the ranks, the

pool has increasingly aged so that currently the average age is about 50 (AIMPE 2008; DEEEWR, 2009). Consequently natural wastage is another major factor contributing to the decline of this core pool of staff. Owing to the traditional reliance on the pool of qualified and experienced ex-seafarers to supply such skills and the drastic decline of the pool, many ports now face a difficult task in recruiting staff to positions such as Harbourmaster, Marine Pilots and Marine Engineers, as one port manager explained:

One of the reasons it's hard to get people is because the pool that you are drawing from is so much smaller. At least two of the ports have got Harbour Masters from overseas. To me it seems like nonsense but if that's where the best people are then that is where you would be looking. The Australian merchant navy is so small that we are all going to suffer from this sort of lack of pool... I mean the whole world is facing a shortage of mariners.

An interesting question occasioned by the shortages has been about the necessity of seafaring skills in shore-based maritime operations such as ports. A study in the UK in the mid-1990s found 11, 825 jobs where such skills were deemed to be essential by employers in the UK shore-side cluster of maritime related industries, including marine insurance, marine law, ports and maritime consultancies (Gardner and Pettit, 1996, 1999). A similar study in Australia (Thompsons Clarke Shipping, 2002) found the same about the Australian maritime sector.. For most of the positions in the port and other industries within the cluster, requiring ex-mariners, the requirement has traditionally been more than just seafaring training. For positions of Harbourmasters, Marine Pilots, Wharf managers and Marine Engineers, the recruitment criteria has included a requirement for qualifications up to Master/Engineer Class 1 and lengthy command experience. Increasingly, however, as the shore-based maritime clusters adapt to the decline of this pool of skills, it becomes important to re-examine the traditional recruitment criteria for these roles, which emphasises seafaring training, qualifications and experience for people employed ashore. A follow-up study to Gardner and Pettit's (1996) study in 2003 found a significant reduction in the initial estimate of jobs where seafaring skills were essential. An estimated total of 9, 784 jobs required seafaring skills essentially (Gardner et al, 2004), down from 11, 825 in 1996

From the data collected in this study, it is clear that the shortage is mainly in areas where this requirement has persisted. In discussions about strategic jobs and essential skills in port operations Delphi Group members, as well as case study interviewees, were asked to develop lists of jobs which they considered as constituting core port work. Table 1 is a compilation of various lists provided showing four broad job categories.

Table 1: A broad categorisation of jobs at the port²

Port Development and Administration	Port Marine Operations	Cargo Operations (stevedores) and Logistics	Port Security and Safety
Port manager Human resource manager Port development officers Berth/wharf manager	Harbourmaster Marine pilot Marine engineer Tug master Launch coxswain Ship scheduler Control tower operator	Terminal/ manager Ship supervisor/ Team leader Crane operator Straddle operator Forklift driver Lasher Monitors Planners Truckers Freight-train drivers	Port Security Officer Port Environment Manager Port Safety Officer

Out of the four categories, the jobs of Harbourmaster, Marine Pilot, Marine Engineer and Tug-boat operator (Tug-Master) were isolated as particularly requiring extensive seafaring training and blue-water experience. It was explained, however, that the requirement for seafaring qualifications for many of the other jobs in the categories had gradually been reduced or eliminated as a consequence of shortages:

It is only because there are no people... it was always a requirement that all those working in the marine operations sections of the port possess seafaring qualifications, at least to Master-class 3. [...] we can't afford to do that anymore.

There are no such people anymore

Apparently this reducing emphasis on blue-water seafaring qualifications and experience has seen non-mariners being recruited as Wharf/Berth Managers and into other positions traditionally reserved for ex-marine captains. The requirement in such cases, however, has been that such people are supported by a strong team of mariners in the form of marine pilots, Harbourmasters and marine engineers. It is therefore no surprise that most reports on shortages are about these three port occupations, which form the core concentration of marine skills at the port.

² Different ports were structured differently and the identification of individual jobs was not consistent across ports. The table therefore contains the author's interpretation of and compilation from different lists provided at different case-study sites.

Clearly, the data does not suggest that technical marine qualifications are not necessary for all the other marine related functions. As one harbourmaster explained, “ports will always need people with an understanding of the technical operations of vessels and ships’ needs”. In the identified jobs there is no question that seafaring skills are critical, where the data shows a tension is regarding how these skills should be produced.

Two dominant views are emerging in the debate: on one hand is the traditional view that these skills should be produced through a fully fledged seafaring training program. This view insists on retaining the traditional recruitment model whereby people acquire experience at sea and transfer skills ashore as the best way of producing high quality skills:

I don't like it [the suggestion]... traditionally it has always been the master mariner becomes assured to be a pilot and this new system is changing that. Get some kid out of school and they know nothing about going to sea, they just train to be a ship handlers ...they basically are ship handlers; they are [just] called pilots (Marine Pilot).

Another respondent argued that in his estimation, “the competency of people with seafaring skills working in ports [was] declining; it [was] certainly not getting better...” In his view this is as a result of the introduction of alternative skills development routes. The alternative routes that the respondent is referring to include a shore-based degree path being developed by the Australian Marine Pilots Association (AMPA) in conjunction with other stakeholders including port authorities and maritime training institutions. A Vessel Traffic Services (VTS) training program is also being developed for Harbourmasters and a wide range of other port vessel control personnel. Both of these pathways are geared towards producing people with the maritime skills and qualifications required by ports with reduced emphasis on blue-water experience.

A divergent view was expressed by respondents who saw the shortage as presenting an opportunity for the industry to explore, develop and refine other more efficient, models of skill formation. Many referred to a shore-based training program being developed for marine pilots by the Australian Marine Pilots Association (AMPA) in conjunction with maritime training institutions; pilot training experts and the port, shipping and towage industries, in which prospective pilots will be equipped with ship-handling skills and an in-depth understanding of the local navigational environment through an honours degree program. The argument, as one respondent explained is that:

What is important for effective pilotage is the ability to control the vessel and navigate tricky channels that might be unfamiliar to the ships' captain.... Some seafaring skills and understanding of how vessels work is needed, but what is the need for extensive experience at sea? What would be the value?

Another respondent explained that more importantly, "pilots require knowledge of the local environment, otherwise they are not useful". In presenting this view many respondents observed that even experienced pilots, including ex-master mariners, required extensive localised training when they changed ports, thus, in the view of one respondent, rendering "lengthy blue water experience [...] meaningless". Similar arguments were advanced about Harbourmasters with one interviewee wondering:

If an airport controller does not need to know how to fly the plane, why should a harbourmaster, whose role is to direct vessels through the port and provide information, need to know how to drive the ship? A general knowledge of ships' dimensions and characteristics is certainly necessary but one does not need to be a master mariner surely...

Whether it is as a result of the decline in the pool of seafarers available for employment in ports or not, the dominant view among respondents was that, while technical marine skills remain essential in port operations, more efficient ways of developing them were required; certainly not involving the long lead-time involved in the traditional sea-to-shore path.

5. Skill shortages, staff poaching and the training burden for smaller ports

The above analysis notwithstanding, the pool of ex-mariners continues to be the sole dominant source of essential technical marine skills for the ports industry and, while a more efficient alternative training model is debated upon, the depletion of this resource and consequent shortage is, in the meantime, creating an industry scramble for qualified people. Consequently an employee market situation has evolved with highly inflated salary rates for the people with the desired qualifications. Salary estimates provided by respondents; both employees in these jobs and employers, indicate salary rates for Marine Pilots as high as A\$300,000 a year. A report by the Australian Institute of Marine and Power Engineers

(AIMPE 2008) shows that Marine Engineers employed on FPSOs³ earn between A\$120,000 to A\$165,000 with generous additional bonuses.

This situation is creating a number of problems. Firstly, smaller and/or remote regional ports are finding it extremely difficult to attract people with the required skills, since not many of these people prefer to work and live in the remote regional areas with limited and basic facilities. Many tend to gravitate towards wealthier ports which offer higher wages as well as those located in the proximity of the metropolis. Many of the smaller ports cannot afford to pay the current inflated salary rates in the market. The manager of one such port explained:

... because we are a small State government entity we can't pay what the [company Xs] or the [company Ys] of the world pay so we struggle to get and keep good people

An external key stakeholder held the same view:

...the problem is that these smaller ports; the government ports especially, wouldn't pay much and that could be a problem.

Seemingly many of the state-run ports fall under the category of those that are increasingly affected by the shortage.

The second closely related problem is that most of the ports that have been unable to attract people from the existing pool because of restrictions of location and cost, are forced to shoulder a huge and constant training burden without long-term benefits. They often resort to recruiting people lower down the competency scale and investing in further training and skills upgrade. Unfortunately for them, however, they tend to lose these people as soon as they have attained higher qualifications and acquired the necessary experience, to their more resourced and/or more metropolitan competitors, as one interviewee explained:

... what tends to happen is that they get a guy who is 33 or 34, often not the top of the skills range, he will go and do his time there, they know and he knows that he is not going to be there for long, unless he falls in love with [place]; he will probably do his time, as soon as has gained the experience and been certified, he [...] he will move on. So the smaller out-ports have this huge training burden

³ Floating Production Storage and Off-take facility; usually a converted oil-tanker ship with water-separation and filtration of crude oil and onboard storage until 'off-take' to a passing oil-tanker ship. The number of such facilities has grown with the expansion of the oil and gas industry, thus increasing the demand marine engineers.

which is unfair ... and the thing is unless it is someone like [company X] or[port Y] or something like that where there is big bucks, it's hard to keep those people, the small port authorities can't afford to pay as much...

These problems are mainly caused by the fact that those operators who are better resourced and able to invest in the development of new skills through training are, at the moment, comfortable in the knowledge that the available people automatically gravitate in their direction. Such employers are therefore not contributing sufficiently towards replenishing and maintaining the industry skills base. This free-rider employer mentality has been highlighted in other studies on maritime workforce shortages (e.g. Beer and Meethan, 2007; Gekara, 2009)

Furthermore, a short-termist, 'just-in-need' approach seems to prevail in the industry with regard to staff recruitment. Particularly with those operators who currently have the ability to attract people easily, as illustrated by the following interview extract:

Respondent: At the moment we are not facing any problems because most guys out there would die to work for [company] but we know that this is not going to last very long and we will soon begin to struggle

Interviewer: So what are you likely to do then?

Respondent: Well, I am not sure at the moment, I guess we will have to find other ways; maybe recruit from overseas ... we can do that, as a matter of fact some ports have already started bringing foreign harbourmasters. Not exactly an attractive proposition but, hey, what do you do? We will know, I guess.

Because of this failure to look ahead these port operators are therefore not recruiting and training enough people to drive a regeneration of the pool. On the other hand, those that are forced to recruit and train continuously do not have the resources to support significant training activity. Hence, the combination of a 'predator' recruitment mentality that seems to be taking root in the industry, coupled with low training levels and high staff wastage rates because of an ageing workforce, creates a bleak picture of the future of skills in the ports industry which endangers the productivity and competitiveness of Australian ports and Australian Trade.

6. Conclusions

The data show that technical marine skills continue to be considered essential in port operations. There is wide acknowledgement that without a rich pool of such skills ports are likely to suffer reduced productivity; a development which is likely to have far reaching

negative economic implications for the country, since ports, as central and critical hubs of logistics, constitute important catalysts for economic growth. Furthermore, a shortage of such key skills is likely to compromise the safety of ports, ships and the entire marine environment. With more and bigger ships expected to call at Australian ports in the future (as a result of increasing expansion of port terminals, the dredging of channels and growing commodity exports) a strong marine skills base is critical. Unfortunately, however, it seems as if the situation is likely to get worse unless an effective and lasting solution is found to ensure a sustainable skills formation strategy with inbuilt mechanisms for continuous replenishment. There is a need for industry to agree on the most efficient and appropriate approach to training for skills development. Traditionally, the industry has relied on ex-mariners coming ashore to transfer their skills but this path is no longer sustainable because the pool of mariners has declined (Gardner and Pettit, 1999; Gekara, 2009). Industry stakeholders must therefore reach an agreement on a shore-based training program which is capable of satisfactorily producing people who can fill the necessary positions without compromising the quality, productivity and safety of port services.

Coming up with such a training program on its own is, however, not likely to conclusively tackle the problem since the history and nature of the skills shortage is complex. The problem has evolved as a result of ports, as well as other shore-based employers of technical marine skills, not investing sufficient resources in the recruitment and training of new people; instead, choosing to rely on the market to supply them. This has led to a situation where some ports are offering inflated salaries in order to attract staff from other ports.

Recommendations

1. Adopt a coordinated stakeholder partnership approach to skills development

A possible solution lies in a coordinated stakeholder partnership approach whereby, once an appropriate program is developed with the appropriate accreditation body in place, a central fund is created into which all employers; including the government, contribute. This would enable a sustainable system of continuous industry skills needs assessment, recruitment of new people and training to replenish existing supply. Such an approach would gradually influence the necessary shift from the current voluntaristic, short-term and 'just-in-need' recruitment practices to more sustainable, long-term resource development approaches. This calls for a detailed national maritime workforce development modal. The suggestion is, however, not as easy to implement as it sounds. Whereas similar approaches have been implemented with degrees of success in countries facing similar workforce shortages like

Britain and Germany (Brown and Lauder, 2001; Beer and Meethan, 2007; Gekara, 2009), the situation is somewhat different in Australia where port ownership and control is structured along territorial state lines. The political economy is therefore such that it is harder to create such a central fund and such a common resource. One way to deal with this might be to have a state-centred but federally coordinated modal.

2. Develop a comprehensive workforce database for the maritime industry

In order to develop such a modal, however, an effective system of workforce data collection and analysis must be adopted. One of the challenges faced in the process of this study has been a result of a lack of statistical data on the maritime workforce nationally showing, for example, accurate staff count, entry and attrition rates, and age and gender demographics.

3. Further research is required to determine the actual impact of the skills decline on productivity in the maritime sector. The data here has shown that port authorities are concerned about the future productivity of the industry should the marine skills decline continue. These concerns need to be converted into an accurate measure of productivity impact.

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