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## Strange things happen at sea: training and new technology in a multi-billion global industry

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It is not unusual to find that employers operating in low-pay sectors are reluctant to provide vocational training. Frequently they fear benefitting competitors as better-skilled employees command a more competitive position in the labour market and may choose to leave one employer and take their newly acquired skills elsewhere. However, in contrast the expectation might reasonably be that employers in more skilled sectors would be more enthusiastic about such training particularly when the financial, environmental, and human costs, of errors are high. This paper therefore analyses vocational training provision in the more skilled sector of professional seafaring. In this sector, accidents may cause massive environmental damage and loss of life, and may incur substantial fines and financial penalties. Using a mix of qualitative and quantitative data, the paper focuses upon the adequacy of the training that is provided to seafarer officers in relation to the introduction of new technology aboard their vessels.

**Keywords:** training; new technology; globalisation; seafarers; shipping

### Introduction

As with many employers in land-based industries (Cockrill 2002), employers in the global shipping industry are required to employ skilled personnel (as officers) but are frequently reluctant to offer training places to officer cadets (Gekara 2008; Gould 2010; Sampson 2004). Ashore there is evidence to suggest that in times of recession such tendencies are exacerbated. With profits under threat, training budgets are frequently squeezed as identified by Kamel and Ibrahim in their study of employer provision of electronic training in Egypt where they observe that ‘the training budget was the first candidate for cuts in times of recession’ (Kamel and Ibrahim 2003, 413). Furthermore, there are indications that during a recession, as unemployment rises, employers’ expectations alter such that they anticipate having their

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pick from a pool of unemployed workers all ready and able to ‘walk straight onto the job’. As Peter Cappelli suggests in an article in *Time*, ‘They want experienced candidates who can contribute immediately with no training or start-up time’ (Cappelli 2012). This expectation fuels the notion that there is no need for training under such circumstances and has a knock-on effect on skills development.

The shipping industry is highly cyclical in nature and is characterised by extended periods of bust and boom. Not only is the industry highly responsive to world trade (for obvious reasons, there is little insulation available to the transport sector when world trade takes a downturn), but it also experiences a significant time lag when it comes to capacity. New ship orders placed with shipyards in China, Korea and Japan<sup>1</sup> take several years to fulfil and new tonnage that is ordered when freight rates are buoyant may not be launched until such time as demand has slumped and profit margins have been wiped out. The additional capacity further increases pressure in an industry that is highly globalised and subject to significant competitive pressures. This context may help to explain the particular reluctance in the sector to provide adequate training for cadets as well as for established seafarers (Sampson 2004).

One response to the reluctance of employers to train workers (ashore and at sea) in the developed world has been for the state to continue to intervene (post-school) in education and training via the provision of apprenticeships and via other means of support. In Ireland, the model that was introduced in the 1990s has been reported to have been very successful in evolving to meet the developing needs of the economy (O’Connor 2006) whilst freeing employers from the significant burden of training costs. In the UK, the government has similarly invested in training for apprentices and for some age groups and smaller employers has extended this support to include wage subsidisation as well as contributions to training costs (Skillsforcare ‘Government Funding for apprenticeships’, Accessed 12/2/2015, [www.skillsforcare.org.uk/Document-library/Qualifications-and-Apprenticeships/Apprenticeships/Government%20funding%20for%20Apprenticeships.pdf](http://www.skillsforcare.org.uk/Document-library/Qualifications-and-Apprenticeships/Apprenticeships/Government%20funding%20for%20Apprenticeships.pdf)). Within the European Union, funds from the EU have also been utilised to support such training. In Wales, it was recently reported that:

A NEW (*sic*) £144 m initiative which the Welsh Government has said will create more than 50,000 apprenticeships in some of the most deprived parts of the country has been unveiled by First Minister Carwyn Jones. The investment financed by the EU with Welsh government match funding, will support 52,000 apprenticeships in West Wales and the Valleys .... (Barry 2015, 23)

Such state and regional strategies have been supplemented by efforts to encourage ‘lifelong learning’ and the introduction of policy strategies such

as the provision of ‘Lifelong Learning accounts’ (Roberts 2013). Where states have been unable to fund such schemes directly some (for example, South Africa at the turn of the century) have made efforts to levy employers for the required funding and to implement state policies utilising such resources (Davies and Farquharson 2004). Thus, state provision of training and particularly for younger people entering the labour market for the first time is relatively well established and widespread.

In the European shipping industry, this pattern is also observable with apprenticeships having recently been introduced for lower ranking seafarers in the UK and a range of support being made available across the European Union for officer training (Sampson 2015). This action is partly in response to the rapidly falling numbers of European seafarers and fears that such positions will all soon be filled by seafarers who come from non-OECD countries where wage rates are low and recruits are available in large numbers. In such states, there is generally little resource available to subsidise training and education and this begs the question of how it is that, with this move to a globalised work force, the costs of skills development and training are being met? Furthermore, there is also the pressing question of how it is that in such a globalised and casualised workforce continuous professional development is being attained. Many seafarers are employed on temporary contracts see Ellis et al. (2012)<sup>2</sup> and there is evidence in other sectors that employers are more reluctant to provide in-house training to temporary workers than their permanent workforce (Augustsson 2015). This pattern is likely to be exacerbated in relation to more expensive, externally provided, training courses. In the light of these concerns, this paper will focus upon the question of how training is being provided to seafarers in relation to the introduction of new equipment on-board vessels following developments in new technology and crucially, who is paying for it?

### **The importance of training in the shipping industry**

The shipping industry may be regarded as at the forefront of processes of globalisation (Sampson 2013). As the industry has taken advantage of opportunities to register vessels in countries other than those where ownership is established (a process known as ‘flagging out’), it has outsourced and ‘off-shored’ crewing to countries where labour is cheap and labour supply plentiful (Bloor and Sampson 2009). This has had implications for the maintenance of basic standards of education and training (Bloor, Sampson, and Gekara 2014) as well as for the international regulation of such standards (Bloor 2013; Bloor and Sampson 2009). In this context, concerns about the basic standards of education underpinning officer qualifications have been raised by employers (Sampson 2004, 2013) who have made use of a variety of screening techniques in an effort to recruit the best-educated seafarers that they are willing, or able, to pay for. This process has led to

some employers feeling confident about the basic education and training of new recruits (cadets) but it does not address the need within the industry to provide training for established seafarers as, and when, new technology is introduced to ships. Examples of such, recently introduced,<sup>3</sup> technological innovations relate to new aids to navigation such as Global Position Systems (GPS) and the use of electronic charts, new forms of communication such as the Global Maritime Distress and Safety System (GMDSS) which is useful in reporting/rescuing casualties, and the Automatic Identification System (AIS) which allows navigators to access basic information about the ships that appear on their radar screens (e.g. vessel name, destination, last port, and cargo). In the engine room, an important innovation has been the introduction of oily water separators (which filter oil from waste water to allow clean water to be discharged overboard) to aid the control of marine pollution.

These innovations vary in terms of their complexity and the degree to which seafarers may need to understand their operation. AIS is a relatively basic piece of equipment that may be regarded as lacking complexity, whilst GMDSS and electronic charts are more sophisticated and challenging for both operators and those charged with maintenance.

The consequences of operator error also vary considerably in terms of significance. However, in many cases incidents at sea can be highly costly. In the case of the vessel the *COSCO Busan*, for example, accident investigators who were called in following a collision with the Oakland Bay Bridge in San Francisco concluded that operator error in relation to the electronic chart played a significant role in the incident which in turn caused millions of dollars of environmental damage (53,000 gallons of oil were spilled in the incident in what is regarded as an environmentally sensitive area). The report describes how;

In his post-accident interview with Safety Board investigators, the pilot stated that when he was tuning the vessel's radars and testing the ARPA before departure, he also examined the electronic chart and noticed that 'the symbols on the ... electronic chart didn't look similar to me to the symbols that are on paper charts'. He stated: So I asked the captain, 'Where's the center of Delta-Echo span [of the Bay Bridge] on this electronic chart?' So he pointed to a position on the chart, and it had two red triangles on either side of the bridge. So I said, 'Well, what are these?' And he said, 'Oh, those are to mark the lengths for the center of the span'. (<http://www.nts.gov/doclib/reports/2009/MAR0901.pdf> accessed 15th March 2011)

This misunderstanding in relation to the electronic chart on-board the vessel directly led to the contact with the bridge and the environmental damage that ensued (happily there were no associated injuries or fatalities). It is not the only example of an incident associated with inadequate training however and an analysis of the accident investigation reports from the

USA, UK, Australia and New Zealand, over a 10-year period (2002–2011 inclusive) suggests that inadequate training and experience were the immediate cause of 7.5% of the incidents investigated and that inappropriate or ineffective use of technology/equipment was the immediate cause in 2.8% of cases and a contributory cause in a further 6% of cases (Tang et al. 2013).

Given the environmental damage that can arise as a result of poor use of technology, the fines that are generally associated with pollution, and the potential for loss of life, this would seem to be an environment in which it makes rational economic sense for employers to invest heavily in training prior to the introduction of new equipment on-board their vessels. The case for investment in training is strengthened by recruitment practices based upon the outsourcing of jobs to labour supply countries that do not have the resources to subsidise the costs of training at state level. In this context, we therefore consider the extent to which employers in the global shipping industry are providing and paying for training associated with new technology on-board and the extent to which such support for training is differentiated in terms of the nationality of employees.

## **Method**

This paper is based on an analysis of the findings of both questionnaires and qualitative interviews undertaken with serving seafarers and maritime education lecturers in three different colleges. 1007 questionnaires were completed by seafarers of officer rank and additionally face-to-face interviews were conducted with 43 seafarers and six maritime lecturers based in three different colleges. Initially, questionnaires were sent to chaplains working in port locations in the UK and they kindly gave them out to seafarers and generally collected them once completed.<sup>4</sup> In this way, 305 questionnaires were completed and returned to the research team for analysis. To boost numbers and speed up the response rate, a further 702 questionnaires were taken by researchers to port welfare centres and were distributed and collected by them in person.

Questionnaire data were analysed using SPSS software. Where reference is made to significant differences in our findings, these are reported at the 99% confidence level. Interview data were analysed with the assistance of NVivo software and data were analysed thematically with consideration for patterns and deviant cases.

The sample for the seafarers completing the questionnaire comprised large groups of seafarers from Philippines (33%), India (18%) and China (13%). These three countries are amongst the most significant labour supply countries in relation to the global shipping industry. The Philippines is the largest supplier of seafarers to the global fleet and India and China are also significant labour suppliers. In order to facilitate analysis, single nationality

groups comprising smaller numbers (than included in these large groups) were combined to create groupings that have been termed 'European (25%), ASEAN<sup>5</sup> (4%) and 'Others' (8%). A relatively even split between officers working as navigators (known as 'deck officers') and officers working as engineers was achieved with 478 questionnaires completed by deck officers and 524 completed by engineers. In relation to seniority, 9% of the sample were cadets (trainee officers), 51% of the sample were classed as junior officers and 40% of the sample were made up of senior officers (either Captain, Chief Engineer, Chief officer, or second engineer).<sup>6</sup> A variety of ship types were represented (container 46%, bulk carrier 27%, tanker 13%, general cargo 8%, and 'other' 7%) and respondents in younger age groups were disproportionately represented in comparison to the general population reflecting the tendency in the industry for seafarers to remain working at sea for a limited duration before seeking work that is based ashore.

### **The need for training relating to new technology in the shipping industry**

The need for further training was highlighted by the findings from the questionnaire relating to seafarers self-rated knowledge of a variety of equipment on modern vessels. Evidence suggests that individuals tend to overstate their knowledge when engaged in self-rating exercises (Taylor 1989; Taylor and Brown 1988) which increases the significance of these findings. The questionnaire indicated that engineers were confident about some systems such as the main engine manoeuvring system (83% self-rated knowledge of this as 'excellent') but were far less confident about others (only 40% considered their knowledge of oily water separators to be 'excellent'). At the other end of the scale, we found that significant numbers of engineers (37%) considered their knowledge of high-voltage equipment to be 'basic' or 'zero'. In relation to navigators (on what is termed the 'deck side'), we found that there was more confidence with regard to the more simple pieces of equipment such as AIS and GPS but that navigators were less confident about more complex systems such as ECDIS, GMDSS and ARPA (essentially electronic charts, communications, and radar). ECDIS was the equipment that navigators were least confident about with 9% rating their own knowledge as 'zero' and a further 21% rating it as 'basic'.<sup>7</sup>

Thus, the responses of seafarers to questions about their own competence with regard to new equipment on-board provide further evidence of a need for training associated with the introduction of new technology and the accounts of active seafarers are corroborated ashore by maritime lecturers. As one explained at interview:

We are seeing a lot of accidents happen because of accidents where ships are using electronic chart systems that have been put on-board and nobody has had any training in them, and we have had accidents last year *The Pride of*



*Canterbury* that went aground because the officers didn't understand their chart system, and the ship is still out of service and it is costing the company tens even hundreds of millions of dollars now. There is another one where a Dutch ship ran aground in the UK and subject to the report of the MAIB and that, the officers on-board even though that was meant to be an ECDIS ship [i.e. reliant on ECDIS and not paper charts] none of the officers had any ECDIS training. There was another one in the Dover straights where an Italian container ship ran at full speed on the (Varn bank) because of problems with operating the ECDIS<sup>8</sup> [...] there are a lot of issues out there which the seafarer just has not been exposed to, he has not be trained for there is no compulsory training and there are a lot of companies, in fact the majority of companies just expect their officers to just go on the ship and cope without training. (Interview with Maritime College Lecturer 2)

Another suggested that:

The industry seems to have adopted AIS without having to do any form of training on it ... I think the IMO is about to develop a model course, but we have very little demand. (Interview with Maritime College Lecturer 14)

### **Paying for seafarers training**

Almost half of the seafarers who completed a questionnaire reported that they were expected to pay for any training they underwent in connection with the introduction of new technology out of their own pockets.

There were significant differences in these responses according to respondent nationality with almost three quarters of Chinese respondents (74%) reporting that companies paid for their training (this was the largest

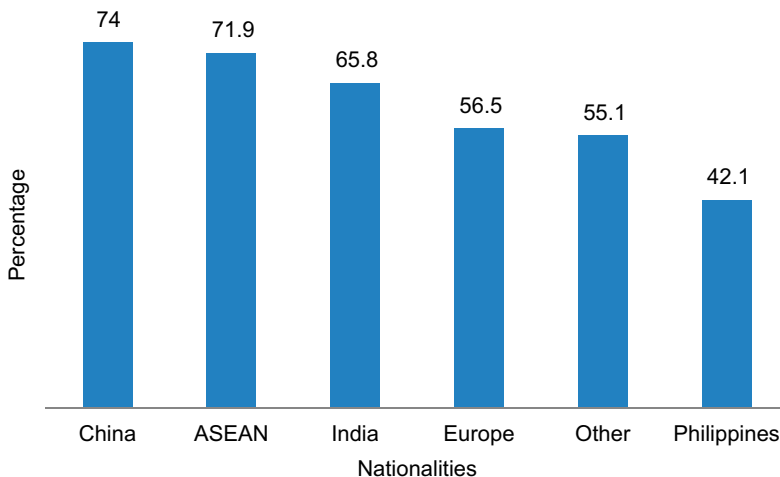


Figure 1. Percentage of respondents identifying companies as paying for training.



group required to do so<sup>9</sup>) compared with just 42% of Filipinos (who were the smallest group) (Figure 1).

We also found significant differences in relation to the type of ship seafarers were working on, seafarers' age and the department (i.e. deck, engine or galley) that seafarers were working in. Younger seafarers were more likely than older seafarers to have their training paid for, engineers were more likely than deck officers to receive training that was paid for by companies, and seafarers working aboard bulk carriers were the least likely to receive training paid for by companies as compared with other ship types (general cargo ships, tankers, container ships and a miscellaneous 'other' category).

The qualitative interviews revealed how the situation with regard to paying for training varied across companies. Some companies compensated seafarers for lost 'leave time' when they undertook training courses and also met the full training costs and the costs of travel and subsistence. Others left all of the costs for seafarers to bear. The questionnaire revealed that 28% of seafarers were never compensated for leave time that was lost in undertaking training and that a further 19% were not usually compensated for such lost leave. The variations in provision were reflected in the interviews we undertook. One participant, for example, described how 'The company training is provided free, our travel and fee, everything is taken care of by the company' (British chief officer). Another was satisfied with the contribution his company made to his training costs because he knew that many others provided no support at all. He explained that although his company did not compensate him for lost vacation time he felt better off than others working in different organisations:

They provide accommodation and travelling cost. Because I live in Bombay and only half an hour from the training centre, the company does not give me those things [...] But I still feel satisfied because they give me free training. I remember that people from other private companies coming to do the course have to pay for the course. They have to pay themselves and it is quite expensive. Their companies do not pay. (Indian 2nd officer)

While on the other hand some seafarers struggled as a result of the lack of support they received from their companies when undertaking training as the following comment illustrates:

It is a bit hard. We have no salary doing training and have to pay [for] the courses.

Here we found that once again there were significant differences in provision depending upon seafarer nationality. European seafarers were the most likely to suggest that if they lost leave time in undertaking training this was always compensated for by companies (38% of European seafarers

suggested this was the case), whilst Filipino seafarers were least likely to suggest that they were 'always' compensated for lost leave time (only 19% reported that this was the case).

It was particularly interesting to note that in some cases seafarers recognised that market conditions determined the demands made of seafarers by companies and the kinds of support they were willing to provide. Thus, at times of seafarer shortage some companies required applicants for jobs to come with additional training that they had paid for themselves and at other times when qualified officers were in short supply companies would be prepared to completely overlook such 'requirements'. As one officer explained when he applied for a job on one occasion he was required to go and take additional training at his own cost before he would be considered, whilst on another occasion in a different market a company which gave him a job went so far as to relax normal certification requirements and did not demand such 'extras'. He said:

I said I don't have that course with me. He said 'You have to do that course'. So then I said, 'But Sir, bridge team management or bridge resource management, these courses are conducted by company'. ... And he said, 'Yeah I know, but you have to do. But our company will not pay you, you will have to do. You do it off your own ... and when you do that course you can join us'. So to me it's very frank, I tell you, it's like supply and demand. It's like, if they need you urgently ... because once I remember, on one ship I joined without reporting to office, without signing any contract, I signed my contract in the airport. I did not go to office, I did not collect any papers, nothing, all the papers, everything, they came to the airport. One person brought it, I signed it. Because they were in urgent need of all this. Even like, my medical and all that, from my previous ship, they said 'Okay, don't worry, that same medical will be valid. Don't worry'. And I said I don't have this. 'Don't worry, we'll take care of it'. It's like this, with that company, what I was about to join, he said 'You have to do this course'. I said I have not done this course but you should pay for this because it's more of a company specific, rather than me doing it. He said No. 'You have to do, you do'. ... This company, I think they were not in that much need of an officer at that time, so they said 'You go off and do that course and then we'll see'. It's like this. But if company's in great need, they say 'Okay, come come'.

This perspective adds weight to the suggestions made by Peter Cappelli quoted in the opening paragraphs of this paper that in times of recession, employer expectations rise with regard to the qualifications, skills and/or experience of potential employees and that they anticipate being able to provide less support to employees in relation to training (Cappelli 2012).

It is important to note that even where employers were reported by seafarers to have provided training and related support in relation to the introduction of new equipment on-board, most seafarers (52%) described such training as being provided after they were first required to use such equipment. As with our other findings, there was a nationality divide in this case

that was marked. When Filipino seafarers' experiences were compared to all non-Filipino seafarers, we observed that 77% of Filipinos received training after they had first used the equipment concerned compared with just 40% of non-Filipino seafarers.

In this context of inadequate training, where seafarers<sup>10</sup> ran into problems with the operation of equipment on-board, as a result of their lack of knowledge or experience, they tended to resort to reference to manuals (93%) and to a lesser extent to colleagues (57%). In both cases we can deduce, in the context of multinational crewing practices, that a high proportion of seafarers do not receive advice (from colleagues or manuals) in their mother tongue and thus instruction in such formats has the potential from the outset to be flawed.<sup>11</sup> Furthermore, and perhaps relatedly, some seafarers are inclined to experiment with equipment to try to find out how to operate it. This may be a high-risk strategy and a potential cause of accidents.

## **Conclusion**

The data gathered from maritime lecturers and seafarers indicate that officers in the shipping industry are not being adequately trained in relation to new on-board equipment. This is despite the high risks associated with the misuse of such equipment and the high penalties that are imposed on both companies and seafarers in the event of a maritime incident involving pollution and to a lesser extent loss of life (Sampson 2011).

Whilst noting that the observation that “training firms” train all the time, “non-training firms” do not train at all’ (Schøne 2006, 252) may be pertinent here,<sup>12</sup> we also note that in the case of the labour market for seafarers, there are variations in practice which are indicative of companies adjusting their global practice according to seafarer nationality. Thus in the Philippines, it is much less likely that seafarers will be provided with training that is paid for by companies than in China and Europe. This could reflect the state of the internal labour market in the Philippines (supply here is buoyant and the response of employers may thus be to cut back on support). However, it could also be a consequence of differentials in labour power and representation across the constituent nationalities represented in the global labour market for seafarers. This is an area of enquiry that was beyond the scope of the research underpinning this particular paper but we suggest it is an area where further investigation would be useful.

Trends relating to employees being required to meet their own costs of training and continuous professional development are not confined to global sectors such as the shipping industry, but following European ‘austerity measures’ these are increasingly becoming evident in relation to the public sector in areas such as social work (Moriarty and Manthorpe 2014). However, the example of the shipping industry demonstrates that there are significant problems associated with the shift in responsibility for training

from employers to employees. Such trends may result in the provision of lower quality training as employees are likely to be more price sensitive (and to enjoy less bargaining power), when it comes to the selection of courses than employers and may therefore sacrifice training quality for training affordability. Equally, employees are likely to be less well placed than employers to judge the quality of training. In countries such as the Philippines, there is evidence to suggest that the demand for certification accompanied by financial pressures on potential trainees (which make physical attendance at a course prohibitively expensive as accommodation may be expensive for example) produces an incentive for the introduction of fraudulent practices whereby certificates are issued to seafarers on receipt of a fee regardless of whether or not they attend a specific training course (Bloor and Sampson 2009; Sampson and Bloor 2007). Such practices undermine subsequent employer efforts to recruit the best-qualified seafarers available. They may also present a danger to the inadequately trained seafarers concerned along with any colleagues that they may sail alongside.

As time passes, it would be reasonable to anticipate that technological innovations on-board would come to be covered in the syllabi of maritime and education training colleges charged with educating new officer cadets. As such it could be expected that over time seafarer levels of competence on-board would improve at least in relation to the use of new technology (cadets could also pass on knowledge to older established seafarers). In most cases in the shipping industry, employers place reliance on states, and on the global regulation of education and training (via the IMO), when it comes to the provision of adequate initial training for seafarer cadets in relation to new technology on-board. However, this reliance may also be problematic as resource-pressed nation states may be more concerned about producing seafarers for the labour market (and benefiting from the future earnings they will remit) than investing in quality training provision (Bloor, Sampson, and Gekara 2014). Previous research in this area has highlighted considerable deficiencies when it comes to the physical and human resources available in many colleges which often make use of highly outdated equipment in their training regimes<sup>13</sup> (Sampson 2004). This highlights the extent to which problems pertaining to competence with regard to the introduction of complex new equipment on-board vessels may persist for long periods of time. It also emphasises the considerable importance of employer participation in training given the prevalence of global recruitment practices.

It seems that the example of the shipping industry serves to demonstrate that in shifting to recruitment from global labour markets (away from localised labour markets in OECD countries), employers have yet to fully appreciate the extent to which they need to be prepared to shoulder a far greater proportion of the costs associated with both initial training and continuous professional development if they are to maintain the stock

of competence within their workforce. Given the differences in training provision that have previously been identified between small firms and large companies (see Bishop 2012), this may seem particularly surprising in a sector where there are many global players of significant size and worth billions of dollars (a single vessel costs very many millions of dollars to purchase and a great deal to operate). It is also counter-intuitive when the costs of accidents have the potential to be so high. In this respect, there are parallels with the airline sector and it is logical to ask why shipping seems so different to the airline industry with respect to training and the updating of operator skills?<sup>14</sup> The answer lies in the fact that although there are superficial similarities between the industries, there are also very significant differences. The world fleet is estimated to stand at approximately 50,000 internationally trading cargo ships<sup>15</sup> and this compares with an international aircraft fleet (cargo and passengers) of less than 20,000.<sup>16</sup> Airlines are highly conscious of the importance of their safety record when attracting passengers whilst vessel operators need not have the same level of concern when it comes to carrying freight (see Sampson et al. 2014). Put simply, boxes don't book seats! Furthermore, many aircraft are operated by state-owned companies and most are regulated by their home states. The picture in shipping is very different in relation to ownership, with very few vessels operated by state-owned companies (outside China) and the majority registered ('flagged') somewhere other than their country of ownership. This separation of registration/regulation and ownership has had negative consequences for the governance of shipping (Sampson and Bloor 2007) and has also driven the globalisation of the labour market, whereby contemporary operators rarely recruit 'their own' nationals to crew their ships but instead employ labour from third-party agents in cheaper labour supply countries (Sampson 2013). De-regulation and the associated offshoring of recruitment has had consequences for the quality of seafarer training, as a whole, and these have been highlighted elsewhere (Sampson and Bloor 2007). Some companies have responded to such inadequacies by taking further responsibility for training 'in-house'. However, the data presented here suggest that many have not. In the final analysis we can conclude, therefore, that given the contextual features of the shipping industry, the particular reluctance to train is likely to relate to the highly competitive, and cyclical, nature of the sector which in turn has led to a globalised and 'casualised' labour market. This competitiveness produces a particularly strong incentive to attend to the 'bottom line', rather than considering longer term risks that may be associated with human resource and training policies. In this context, it is challenging to see how anything other than stronger and more responsive international regulation can effectively address the current situation.

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### **Disclosure statement**

No potential conflict of interest was reported by the authors.

### **Notes**

1. The three main shipbuilding nations.
2. This study in 2012 found that 75% of seafarers working in the global fleet were employed on fixed term (temporary per voyage) contracts.
3. In the last few decades.
4. Reply paid envelopes were supplied with questionnaires to allow seafarers to return them to SIRC having left the port. However, few questionnaires were returned via this route.
5. Excluding Philippines, India, China.
6. Confusingly on some ships, the second engineer is termed the 'first engineer' however in both cases the rank denotes the position immediately beneath that of the chief engineer.
7. 4% of respondents rated their knowledge of ARPA as 'basic' and 13% rated their knowledge of GMDSS as 'basic'.
8. As a result of a series of accidents involving ECDIS systems and the reluctance of employers to provide appropriate training ECDIS training was eventually made mandatory for seafarers by the IMO in an amendment in 2010 to the STCW convention. However this will not come fully into effect until 2017, <http://www.ics-shipping.org/docs/default-source/resources/safety-security-and-operations/industry-recommendations-for-ecdis.pdf?sfvrsn=6>.
9. Many Chinese seafarers are still employed by large state-owned companies such as COSCO that have traditionally provided their own training to seafarers who have often remained with them throughout their career. This stability is unusual in the modern context, where flagging out and 'crewing out' are commonplace, and it is likely to be a factor with regard to this finding.
10. Cadets have been excluded.
11. NB where courses ashore are taught in English and this is the second language of the trainers and trainees, the level of fluency held by the associated lecturers is likely to be far higher than that frequently found amongst officers on-board vessels.
12. We did not collect data that were company specific.
13. Sometimes where real equipment is not available colleges make use of mock-up models of equipment, and role-play, in their teaching. Whilst the efforts of staff are laudable, in this respect, such methods are inadequate when it comes to cadets learning how to use complex equipment and may be regarded as akin to attending a computer course using a mock-up computer rather than a real machine. Despite significant outside investment in new technology for colleges in new labour supply countries (often supplied by traditional maritime nations), these practices still persist in a small number of providers.



14. Airline pilots are generally required to renew their instrument rating and take a skills test for specific aircraft every 6–12 months. Accessed 4/8/15, <https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/AirlinePilot.aspx>.
15. Accessed 4/8/2015, <http://www.ics-shipping.org/shipping-facts/shipping-and-world-trade>.
16. Accessed 4/8/2015, <http://www.live-counter.com/number-of-aircraft/>.

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