New Shipboard Technology and Training Provision for Seafarers

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Lloyd's Register Educational Trust

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*** The Lloyd's Register Educational Trust (The LRET) is an independent charity working to achieve advances in transportation, science, engineering and technology education, training and research worldwide for the benefit of all.**

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Executive Summary

Background

This report is based upon a study funded by The Lloyd's Register Educational Trust (The LRET). The study was conducted at the Seafarers International Research Centre (SIRC) and its focus was upon new shipboard technology and training. The study was questionnaire-based and data from 1,007 completed questionnaires is presented herein.

Relevant context

Handover

When seafarers join a vessel, part of their understanding of new equipment and technology may develop as a result of a handover period during which they may consult with the individual who they are due to replace. They may also be provided with detailed notes relating to the work and equipment they will be dealing with. In this research, the last handover experienced by respondents did not incorporate explanations of how new equipment worked in almost one in ten cases. One in ten junior officers, and seven percent of senior officers, described an inadequate handover. There were significant differences in the experiences of respondents which were identified in relation to ship type, nationality, and department. Furthermore, seven percent of respondents did not feel that the time made available for their last handover was adequate.

Makers' Updates

Makers' updates and company circulars provide another source of information for seafarers concerning shipboard equipment and new technology. In this research eight percent of seafarers were not aware, at all, of any company circulars or makers' updates being circulated to sea-staff in their current/most recent company. In relation to the responses to this question, seafarer nationality played a particularly significant role.

Problem Solving

Having encountered a problem with the operation of a piece of equipment the overwhelming majority of respondents would consult a manual (93%). Additionally, around a half of all respondents would consult colleagues. Department, ship type, seafarer age and nationality, were all found to influence the responses offered to this question.

Existing confidence and competence in relation to specific equipment

In relation to the main engine manoeuvring system engineers were very confident about their knowledge and understanding with 83% self-rating their knowledge of this equipment as 'excellent'. Engineers were less confident about their knowledge of oily water separators however with only 40% claiming 'excellent' knowledge of this equipment. Overall engineers were least confident about high voltage equipment and 37% of engineers self-rated their knowledge of this equipment as 'basic' or even 'zero'.

Navigation officers were markedly more confident about their understanding of AIS and GPS than they were about their understanding of ARPA, GMDSS, and ECDIS. ECDIS was the equipment which officers were least confident about overall, with 9% self-rating their understanding of ECDIS as 'zero' and a further 21% suggesting it was 'basic'. Respondents were more confident about ARPA than they were about GMDSS with four percent self-rating their knowledge of ARPA as 'basic' compared with 13% self-rating their knowledge of GMDSS as 'basic'.

The identification of training needs

If employees play a part in identifying their own training needs this can improve the targeting of training and also increase the motivation of trainees. Amongst our respondents only around a quarter of the sample stated that they played some role in the identification of their own training needs. Fourteen percent discussed training needs with senior officers on board who passed their comments on to shore-based managers, whilst ten percent of respondents had the option of requesting training directly from shore-based managers if they wished to. Responses varied significantly depending upon rank, nationality and also ship type.

Paying for training and compensating for lost leave time due to training

Although only a quarter of seafarers had an input into the identification of their training needs, almost half of respondents were expected to pay towards their training (in part or full). Nationality, ship type, department, and age, all impacted upon the responses of seafarers to this question.

In relation to compensation for lost leave almost half our respondents stated that it was not usual for them to be compensated for leave time lost as a result of required training in relation to new shipboard technology. Nationality impacted significantly on the responses to this question.

Training Adequacy

The majority of seafarers (82%) felt that training relating to new equipment was adequate. Nationality impacted upon the responses given by seafarers to this question as well as to subsequent questions about refresher training.

In terms of refresher training almost three quarters of the sample had experienced such training. Of those who experienced it, the vast majority (92%) suggested that it was adequate.

Computer Usage and Training

Computers were reported to be widely used on board. Eighty-eight percent of respondents described using computers frequently or very frequently whilst on board, whereas only five respondents (0.5%) reported never using computers on board. Further examination of the data revealed that there were strong nationality variations in reported computer usage on board with Indian and European seafarers being the most likely to report frequent usage. Navigation officers were also more likely than engineers to report using computers often and senior

officers were more likely than junior officers to report frequent usage. Ship type was also found to be a significant factor differentiating responses.

In relation to how seafarers learnt to use computers the data highlighted the significance of informal methods of learning. Such methods include: consultation of manuals, colleagues, and friends ashore; the use of help/tutorial functions built into software packages; and the use of handover information. However some seafarers had benefitted from more formal training relating to computers and there were found to be significant differences in learning methods according to nationality, which was strongly influential, and also department, rank, and ship type.

Training experiences relating to individual pieces of equipment

Automatic Identification System (AIS)

In relation to the contribution that various forms of training had made to the acquisition of knowledge about AIS the majority of respondents (almost three quarters) reported that manuals had been important. This was by far the most commonly reported useful 'training'. Some way behind manuals, on shore training, the consultation of colleagues, and handover notes were reported by approximately one third of respondents to have contributed to knowledge of AIS. When current cadets were excluded from the analysis only 22% of respondents reported that cadet training had contributed to their knowledge of AIS. This is not considered surprising given the relatively recent introduction of this equipment.

Nationality variations were found in relation to all forms of reported learning. However in relation to the usefulness of cadet training there were also rank, age, and sea-time variations.

Global Positioning System (GPS)

As with AIS, most seafarers reported that they had consulted manuals in order to acquire knowledge of GPS (over three quarters had done so). Similar proportions (a third) had also undertaken training ashore as part of their cadet training programmes and just over a third referred to handovers and familiarisation. Computer based training (CBT) and training on board by an installation technician or dedicated trainer were reported by around a quarter of respondents.

There were significant variations in response with nationality, rank, age, and sea-time.

ARPA/RADAR

The picture for ARPA/RADAR was different to the overall picture presented in relation to AIS/GPS. Whilst manuals were still important in acquiring knowledge they were reported as important slightly less frequently than in relation to AIS/GPS and concurrently training ashore was reported to be of importance much more frequently. Just over two thirds of respondents said that training ashore had been of importance in their acquisition of knowledge about ARPA/RADAR and almost a half (44%) had found cadet training useful in relation to their understanding of this equipment.

Variations of response in relation to nationality were found to be significant as were those associated with rank, age and sea-time.

Over half of the respondents who had benefitted from training relating to ARPA/RADAR ashore reported that such training had been of more than five days duration. This contrasted with lower reporting of longer training periods for shore based training relating to AIS and GPS. Most shore based training about GPS and AIS was reported to be of less than five days duration.

Global Maritime Distress and Safety System (GMDSS)

In contrast with AIS, GPS, and ARPA/RADAR, training manuals did not feature as the most frequently selected option with regards to what had contributed to knowledge acquisition about GMDSS. Instead, training ashore was cited most frequently by respondents (78%) as having contributed to their knowledge of GMDSS. Manuals remained important and were cited by nearly two-thirds of respondents as contributing to their knowledge of GMDSS. Fewer respondents mentioned the consultation of colleagues, cadet training and hand over notes/familiarisation. On board training by an installation technician/dedicated trainer was cited by fewest respondents as contributing to their understanding of GMDSS.

Nationality, rank, age and sea-time all underpinned significant variations in response.

As with AIS, GPS and ARPA/RAAR, more than half of the respondents who had received training on GMDSS received this after they were first required to use the equipment.

Similarly, as with AIS, GPS, and ARPA/RADAR, respondents expressed a clear preference for training ashore in relation to GMDSS.

Electronic Chart Display and Information System (ECDIS)

As with GMDSS, respondents cited training ashore most frequently when asked what had contributed to their knowledge of ECDIS. Consulting manuals was also cited frequently but significantly fewer respondents cited manuals, colleagues, handovers, cadet training or CBT as important in their acquisition of knowledge about ECDIS.

There were nationality, rank, age and sea-time variations in response.

Training had generally been of less than five days duration when it came to training on ECDIS. Of those who had received training, the majority, had received training ashore, and more than half of these indicated that they had received training after they had first used ECDIS. This was also the case in relation to other forms of training such as CBT and training from a dedicated on board trainer/installation technician.

Most respondents expressed a preference for training ashore or training on board by an instructor/installation technician in relation to ECDIS.

Main Engine Manoeuvring and Control System (MEMCS)

Engineers overwhelmingly stated that manuals were important in their acquisition of knowledge about the MEMCS. Colleagues, cadet training, and on shore training were also regarded as having been useful as were on board training and CBT (but to a lesser degree).

There were variations in response with nationality, rank, age and sea-time.

Where engineers had received training ashore or had undertaken CBT relating to MEMCS this had been of more than five days duration in slightly over half of all cases. Fewer respondents benefitting from training from an installation technician/dedicated trainer on board suggested their training had been of more than five days duration (37%).

Almost three quarters of the engineers who had received training relating to MEMCS had done so after they had first been required to use it. The preference amongst engineers was for either training ashore or training with a dedicated on board trainer/installation technician with regard to MEMCS.

Oily Water Separators (OWS)

Manuals were cited most frequently (in over three quarters of cases) as of importance to seafarers in relation to the acquisition of knowledge about OWS. In contrast colleagues, handover, cadet training, and training ashore, were cited less frequently and fewer than one third of engineer respondents cited on board training by a dedicated trainer or on board CBT as useful.

Responses varied with nationality age and sea-time. In most cases where training had occurred it had taken place after OWS equipment had been first operated/used/maintained by engineers. In contrast with other equipment in the engine room and on the bridge most respondents favoured on board training from a dedicated trainer/installation technician to help them learn about OWS. This was closely followed by a preference for on shore training.

High Voltage Equipment (HVE)

About two thirds of respondents had acquired the knowledge they had of HVE from manuals. Training ashore, cadet training, colleagues, on board training, handovers, and CBT had all also been useful to more than a quarter of respondents.

There were variations in response according to nationality and age.

Where they had experienced training ashore more than half of respondents had enjoyed a period of more than five days training. This was not the pattern in relation to other forms of training where the duration of training was less than five days for the majority.

Training ashore was the preferred form of training amongst engineers in relation to HVE.

Seafarers' experiences of training relating to new shipboard technology

Seafarer training is an important issue in relation to the overall safety of the shipping industry. As technical standards and ship design have improved, so too have accidents, relating to the structural failure of vessels, reportedly declined. Accidents relating to human errors have not been seen to have reduced at the same rate however. Concomitantly they make up the greater proportion of all accidents at sea today.

> The UK Club identified in its first Analysis of Major Claims in 1990 that 'human error' accounted for 58% of all its claims over US$100,000. In the years since, despite marked falls in certain identified causes (for instance, structural failure), human error has remained stubbornly high as the prime cause of accidents and claims. (http://www.ukpandi.com/loss-prevention/risk-management-advice/the-human-element/ accessed March 16 2011)

In tackling the underlying causes of such 'human error', training has a key role to play. This is generally the case with regard to the provision of cadet training but is also of relevance to the on-going training of seafarers at sea (including pilots). One of the challenges for maritime education and training (MET) colleges ashore, and for ship management companies, ship owners, and crew supply companies, is the introduction of new technology aboard many vessels. Such technology is designed, and introduced, with the intention of improving safety and assisting in the maintenance, operation, and navigation of vessels. However, the inappropriate use of such technology, or at a more fundamental level complete unfamiliarity with it, can result in dire consequences and major accidents. The collision of the *COSCO Busan* with San Francisco's Bay Bridge provides a dramatic example of this. Following a misunderstanding of the ECDIS system on board, the pilot navigated the vessel directly into a bridge tower causing 53,000 gallons of oil to be spilled in an environmentally sensitive area. In a report from the Department of Justice the following comment is made highlighting one of several causes in a chain of events that led to the accident which took place in thick fog:

> The tape recorded conversations from the ship's bridge show that Captain Cota [the pilot] was confused regarding the operation of the electronic chart system upon which he chose to rely including the meaning of 2 red triangles that marked buoys marking the tower of the bridge that he eventually hit. (http://www.opposingviews.com/i/pilot-who-crashed-ship-into-golden-gate-bridge-imprisoned accessed March 16 2011)

One such conversation on board, highlighted by the National Transport Safety Board report into the accident, demonstrates the confusion clearly. In it Captain Cota (the pilot) asks the vessel Captain about symbols on the electronic chart. The vessel data recorder captured the exchange as follows:

> "What are these… ah… red [unintelligible]?" The master responded, "This is on bridge." The pilot then said to the master, "I couldn't figure out what the red light… red… red triangle was." (http://www.ntsb.gov/doclib/reports/2009/MAR0901.pdf accessed March 15th 2011)

Later the report notes that:

> 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.ntsb.gov/doclib/reports/2009/MAR0901.pdf accessed 15th March 2011)

Thus a lack of understanding relating to the Electronic charts was compounded by poor pilot/master communication (the VDR shows that a rather different conversation took place regardless of how the pilot understood it). Ultimately in this case the underlying medical condition of the pilot was a crucial element in relation to the cause of the accident. However, the accident report also serves to highlight both problems resulting from the use of new and unfamiliar equipment on board and the considerable pressures on adequate training for crew members. This can be particularly problematic when new crews take over a vessel as was the case on the *COSCO Busan* prior to its voyage to San Francisco. Later in the course of the aforementioned accident report the following remark is made:

> [...] the chief officer later testified to Federal law enforcement officials that he did not receive any training before the vessel got under way in Busan. His training on the vessel's electronic chart system, radar, master's standing orders, bridge procedures, SMS, and so on, took place during the transit to California. (http://www.ntsb.gov/doclib/reports/2009/MAR0901.pdf accessed 15th March 2011)

Furthermore it reports that:

> The chief officer and the third officer both stated that, before the accident voyage, they had not received any training from Fleet Management on the master's standing orders, on passage planning, or on bridge team management. The chief officer also stated that he had never before worked on a ship with an electronic chart system. The second officer stated that, before the voyage, neither the ship's master nor Fleet Management superintendents had provided him with any training, instruction, or guidance on the master's standing orders or on Fleet Management's *Bridge Procedures Manual.* He said he had not prepared a berth-to-berth passage plan when the vessel departed Busan, Long Beach, or Oakland. The third mate stated that, in contrast to his experience sailing with other technical management companies, he and fellow crewmembers were given limited opportunity to meet with the off-going *COSCO Busan* crewmembers and had little time to become acquainted with the ship and to review Fleet Management's policies and procedures before they undertook their first voyage on the vessel. (http://www.ntsb.gov/doclib/reports/2009/MAR0901.pdf accessed 15th March 2011)

The introduction of new technology is always likely to pose a challenge to operational personnel who are familiar with other ways of doing things. Occasional accidents may perhaps be expected in such circumstances. However well-designed and adequately delivered training, as well as effective handovers and accessible technical information, are all essential

in the minimisation of such unintended consequences. This report outlines the extent to which such training, handovers, and information are currently available in the shipping industry. In addition it considers broader relevant factors which are likely to impact upon the overall effectiveness of training – notably factors which impact upon trainee motivation.

Methods

The study which underpins this work was undertaken with support from The Lloyd's Register Educational Trust[1]. The research consisted of two main phases. Initially the introduction of a new piece of equipment was the focus of attention. This equipment, widely known as AIS, was made a mandatory item for vessels greater than 300 gt as of December 2004. Following its introduction we carefully considered its use and reported our findings in an earlier report (see Bailey, Ellis, Sampson 2008).

Whilst retaining an interest in the use of AIS, and the training associated with it, phase two of the study has focussed more broadly on the training seafarers receive in relation to new on board equipment. As such we have administered a questionnaire to seafarers of different nationalities serving aboard cargo carrying vessels. The questionnaire was distributed and collected via a variety of means. Initially we requested the assistance of personnel at seafarer centres who were a great help in passing out questionnaires and sometimes in returning these once completed. A total of 305 questionnaires were collected in this fashion. To boost numbers and avoid placing too excessive a burden on our collaborators at the seafarers' centres the questionnaires were then administered by SIRC personnel. A further 702 were gathered in this fashion. In this particular study, we did not distribute questionnaires via companies nor via training colleges as we felt that this would have posed problems in the interpretation of data (which may have been biased) and for the confidentiality of some responses.

At the end of this process we collected and entered the data from 1007 questionnaires. Data were cleaned and analysed utilising SPSS software. Throughout the report reference is made, where relevant, to limitations of the data and the inferences which may, reasonably, be drawn from it. Where reference is made to 'significant' or 'strongly significant' differences in findings these are at the 99% confidence level whilst 'slightly significant' differences are occasionally reported at the 95% level.

The Sample

The largest nationality group amongst respondents was Filipino (33%). Seafarers from India (18%) and China (13%) constituted the other most significant single nationalities in the sample and we have ultimately chosen to present the data retaining these three single nationality groups. The remainder of the seafarers in the sample have been combined into groups of European seafarers (25%), ASEAN seafarers (4%) and 'Others' (8%). Further details of these groups are provided in Appendix One.

The questionnaires were designed to be administered to active officers on both the deck (478) and the engine (524) side of cargo vessels. As such, officers were divided into two major

[1] The Lloyd's Register Educational Trust (The LRET) is an independent charity working to achieve advances in transportation, science, engineering and technology education, training and research worldwide for the benefit of all.

groups representing 'senior officers' (40%) and 'junior officers/cadets' (60%). Less than a tenth of the sample (9%) were cadets. However, because of the different nature of their experiences on board the responses of cadets are separated out from the responses of qualified officers and where appropriate are reported separately. Further details of these groups are contained in Appendix Two.

Seafarers were serving on a variety of ship types and these were classified as container (46%), General Cargo (8%), Bulk (27%), Tanker (13%), and 'Other' (7%).

Respondents were grouped according to their age as follows: officers under 30 (35%); officers in their 30s (30%); officers in their 40s (21%); officers in their 50s or older (14%). They were also grouped according to their experience and as such have a 'sea-time' of less than 50 months (41%), 50-99 months (25%), 100-149 months (12%), 150-199 months (10%), 200 months or more (12%).

Contextualising the need for training

Handover

It is accepted as good practice within the industry for seafarers to undergo a process of handover in the course of crew changes. We therefore asked respondents questions relating to the form that their last handover took (a personal handover or written notes for example) and the length of time that was available for their most recent handover.

The most common experience of handovers was that they combined written notes and being shown around in person by the officer that respondents were relieving. Fifty-three percent of respondents (55% when cadets are excluded) suggested that this was the form that their last handover took. Some seafarers reported being shown around by their predecessor and being given a verbal explanation of how relevant equipment was operated (13% when cadets are included and 12% when cadets are excluded) and some reported being given handover notes which included a written explanation of how relevant equipment was operated (10% when cadets are included and 11% when cadets are excluded). Some seafarers reported that they hadn't needed handover time as they were already familiar with the on board equipment because they were rejoining a ship they sailed aboard for their previous contract (10% when cadets are included and 11% when cadets are excluded).

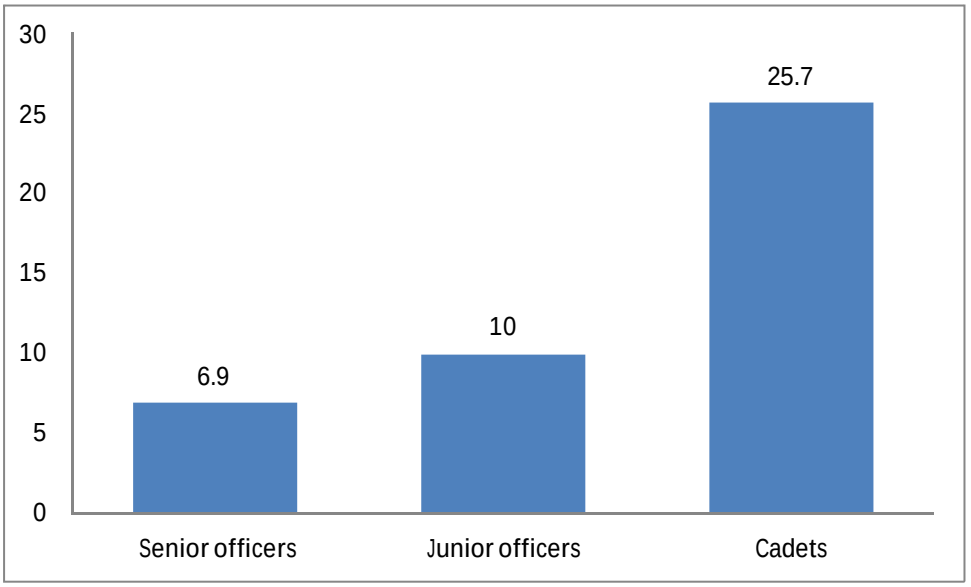
When cadets are excluded from the analysis, it is disturbing to note that nine percent of seafarers reported that their handover either did not explain how relevant equipment was operated (regardless of whether written or in person) or that they did not receive a handover at all (2%).

We grouped the responses offered into two major categories 'adequate handover', and 'inadequate handover'. 'Adequate handover' incorporated all those respondents who stated that they had been either shown around by their predecessor and given an explanation of how equipment worked, or received written notes explaining how relevant equipment worked or both. 'Inadequate handover' was deemed to be either a verbal/written handover where the operation of relevant equipment was not explained or alternatively no handover at all. The respondents who said they had not required a handover because they were rejoining a familiar vessel were not included in either group.

When the responses are combined to consider adequate versus inadequate handover we can consider the impact of various variables, such as rank, on the adequacy of handovers experienced by our respondents.

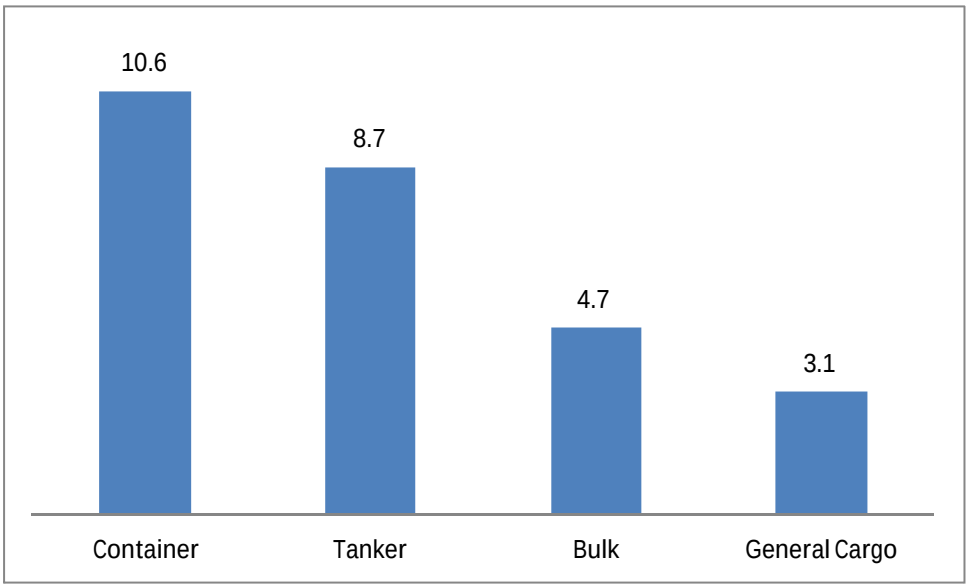
In relation to rank we found that there were strongly significant differences between rank groups in relation to the adequacy of handover. Whilst seven percent of senior officers fell into the 'inadequate handover' category, 12% of junior officers did so. When cadets and junior officers are separated we find that 10% of all serving junior officers report inadequate handovers (see Figure 1).

Figure 1: Percentage of inadequate handovers by rank



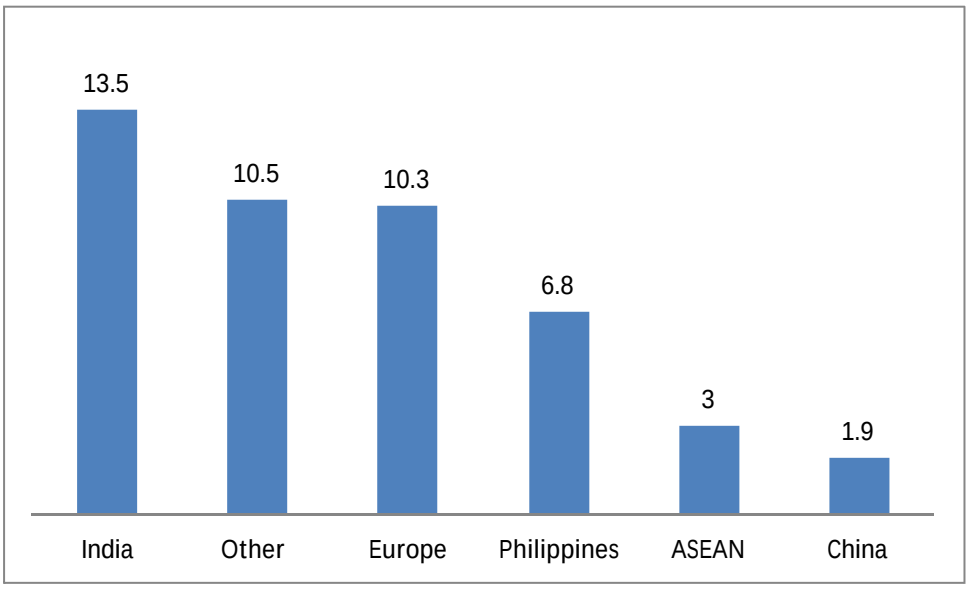
The type of ship that respondents were working on strongly impacted upon the adequacy of the described handover (see Figure 2). When we exclude cadets from the analysis (to avoid inflating the figures inappropriately) we nevertheless find that aboard Container vessels more than one in ten respondents (11%) were categorised as experiencing 'inadequate handover' whilst for tankers the proportion of seafarers was only slightly smaller at nine percent. Seafarers aboard Bulk Carriers and General Cargo vessels appeared to enjoy more thorough handovers with only 5% and 3% respectively falling into the 'inadequate' category.

Figure 2: Percentage of inadequate handovers by ship type



We also identified strongly significant differences in the reported handover of respondents according to nationality. Excluding cadets, 14% of Indian and 10% of European seafarers reported 'inadequate' handovers whilst only seven percent of Filipino and two percent of Chinese respondents reported handover categorised as 'inadequate'.

Figure 3: Percentage of inadequate handovers by nationality



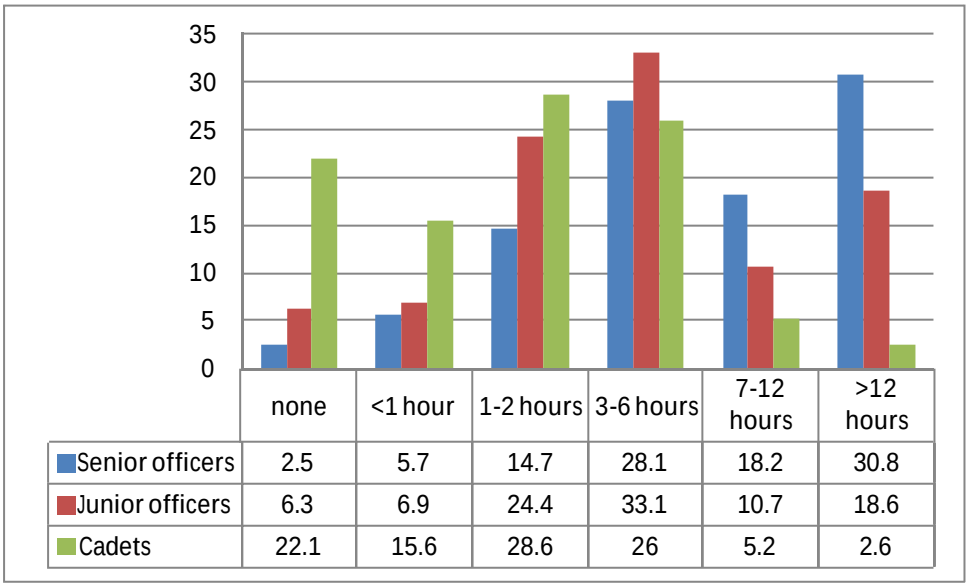
There were also strongly significant differences identified between engineers and deck officers. When cadets were excluded from the analysis, engineers were almost twice as likely to report inadequate handover (11%) as deck officers (6%).

As well as asking about the form of handover, we also asked respondents how much *time* had been allocated to their most recent handover (i.e. on joining their most recent ship). Thirteen percent of respondents (11% when cadets are excluded) had a handover of less than an hour

or no handover at all[2]. A fifth of respondents (21%) had just between one and two hours handover (20% when cadets are excluded) and almost a third (30%) had between three and six hours handover (31% when cadets are excluded). Thirteen percent of respondents had seven to twelve hours of handover (14% when cadets are excluded) whilst a relatively small proportion (22%) had more than a relatively modest twelve hours of handover (this rose to 24% when cadets were excluded).

Once again rank appeared to strongly impact upon handover when it came to the time available (see Figure 4). Senior officers were more likely to experience long periods of handover than juniors. Amongst senior officers nearly one third (31%) had a handover of more than twelve hours compared with just 17% of junior officers (19% when cadets are excluded). Whilst at the other end of the spectrum only 2.5% of senior officers did not have any handover time compared with 8% of junior officer respondents (NB this figure drops to 6% when cadets are excluded).

Figure 4: Handover time by rank



	none	<1 hour	1-2 hours	3-6 hours	7-12 hours	>12 hours
Senior officers	2.5	5.7	14.7	28.1	18.2	30.8
Junior officers	6.3	6.9	24.4	33.1	10.7	18.6
Cadets	22.1	15.6	28.6	26	5.2	2.6

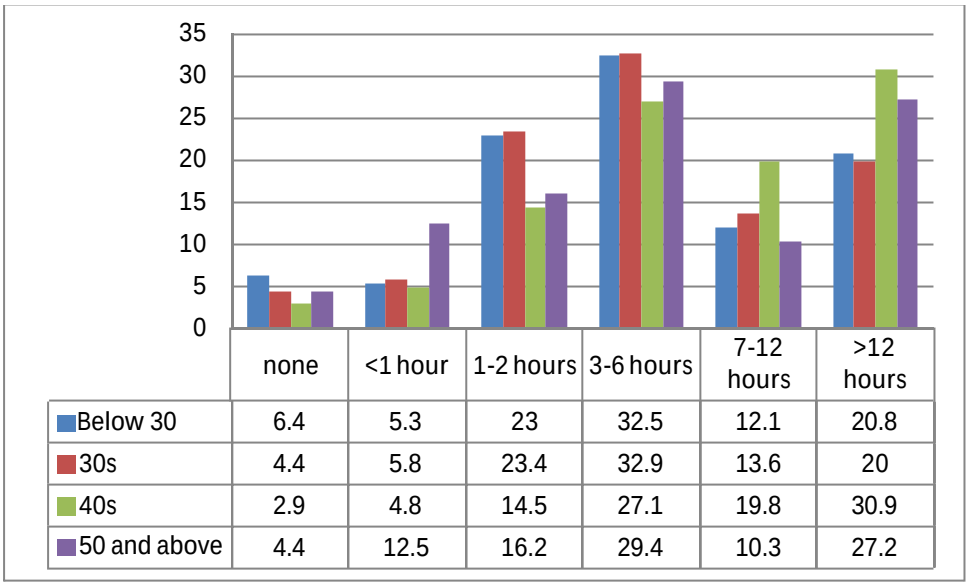
When considering the ship type which respondents served on (or last served on) we found that this did impact on handover time allocation but not as strongly as rank or indeed age. Excluding cadets from the analysis we identified that a surprisingly high proportion of respondents working aboard tankers (6%) reported no handover time compared with relatively few of those who worked aboard both General Cargo ships (0%) and Bulk Carriers (3%). However over a quarter of respondents aboard tankers (28%) also reported more than twelve hours handover. The proportion was similar for respondents from Bulk Carriers (28%). However, fewer seafarers working aboard container vessels enjoyed more than twelve hours of handover time (22%) and an even smaller proportion of seafarers aboard General Cargo ships (16%).

Age appeared to be a strongly significant factor in relation to hand over time. Amongst older respondents handover periods were longer. When cadets were excluded from the analysis we

[2] This figure only dropped to 9% when those who said they did not need a handover as they were rejoining a vessel were excluded alongside cadets.

found that respondents over forty years of age were much more likely to have a handover time of more than twelve hours than seafarers in their twenties and thirties (see Figure 5).

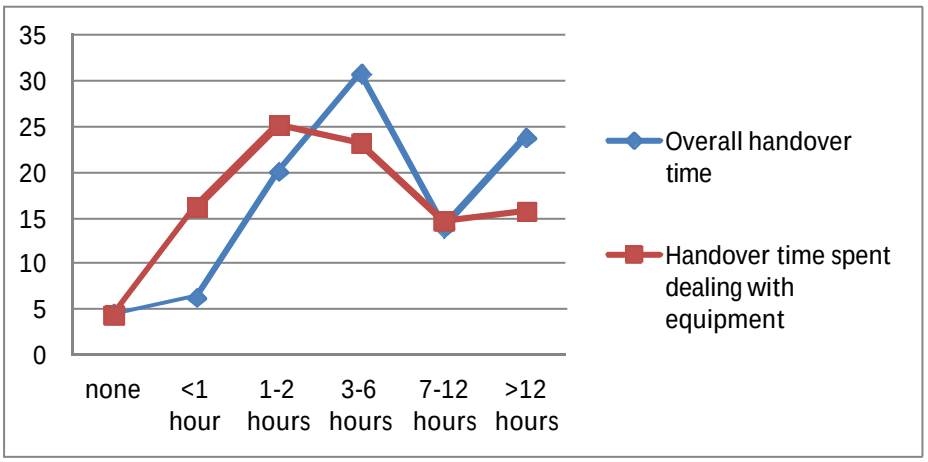
Figure 5: Handover time by age (cadets excluded)



	none	<1 hour	1-2 hours	3-6 hours	7-12 hours	>12 hours
Below 30	6.4	5.3	23	32.5	12.1	20.8
30s	4.4	5.8	23.4	32.9	13.6	20
40s	2.9	4.8	14.5	27.1	19.8	30.9
50 and above	4.4	12.5	16.2	29.4	10.3	27.2

In relation to the specific issue of handover relating to equipment and shipboard technology seafarers reported slightly less time spent than for handover more generally. Twenty two percent of respondents spent less than an hour of handover time dealing with shipboard equipment and technology (21% when cadets are excluded). At the other end of the spectrum sixteen percent of seafarers (this figure remained the same when cadets were excluded) spent twelve hours or more dealing with new equipment/technology (see Figure 6).[3]

Figure 6: Handover time (Cadets excluded)

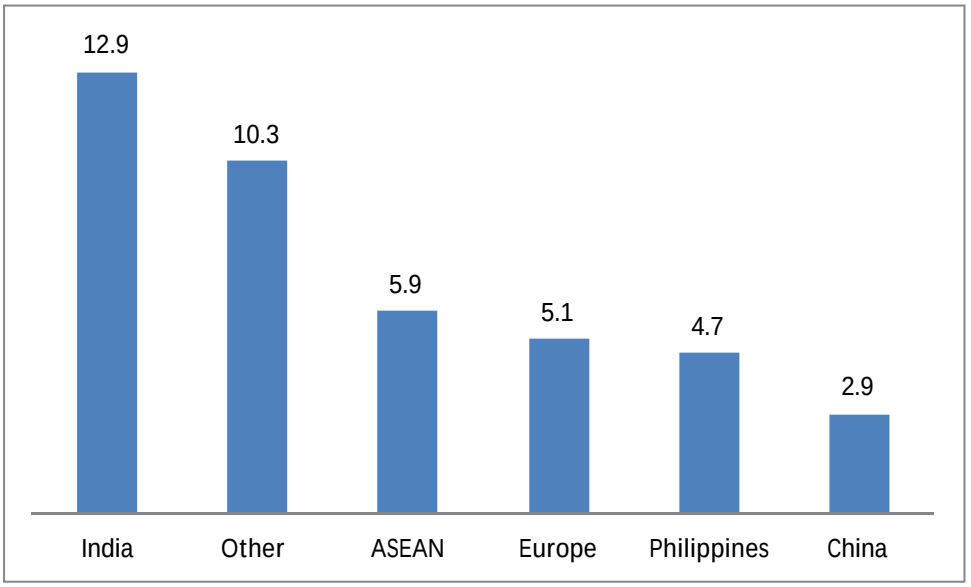


[3] NB when those who said they did not require a handover because they were rejoining a vessel were excluded the figures did not change a great deal. Eighteen percent of respondents stated that they spent one hour or less dealing with shipboard equipment and technology in a handover period.

The majority of seafarers (68% when cadets are excluded) regarded the handover time they had received in general as adequate. A further 19% did not feel that they required familiarisation time as they were rejoining a vessel they had sailed with on their previous contract. However, seven percent did not regard the time available as adequate and a further 6% were only offered time to read the manuals as their 'handover'. This latter practice is something which many in the industry would regard as inadequate.

Indian seafarers were more likely to answer that they had not been given sufficient time for handover than others of different nationality. Excluding cadets, 13% held this view compared with just 3% of Chinese and 5% of European and Filipino seafarers, and 6% of seafarers from ASEAN countries (excluding the ASEAN nationalities individually considered throughout the report).

Figure 7: Percentage of insufficient familiarisation time by nationality



When cadets are excluded from the analysis, department (i.e. deck or engine) and age are both found to impact upon the responses of seafarers relating to their own view of the adequacy of their handover time. Six percent of deck officers felt their handover period on joining their last ship was inadequate whilst this was slightly higher for engineers (7%). A clear pattern is not identifiable in relation to age as seafarers under thirty (8%) and in their forties (7%) were more likely to report inadequate time for handovers than seafarers in their thirties (5%) or fifties and over (6%).

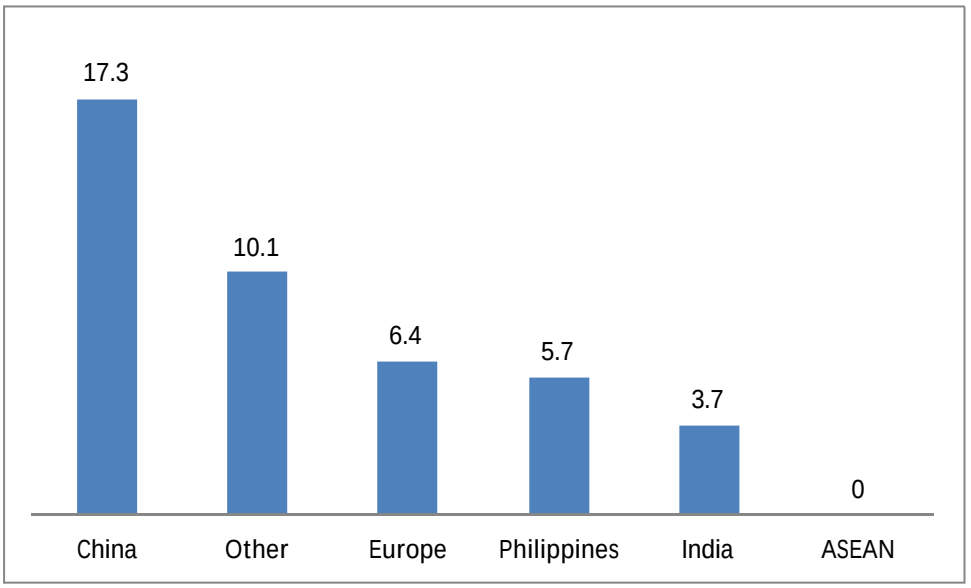
Technical information/updates

The majority of seafarers were aware of company circulars and the circulation of makers' updates by their company and stated that these were at least occasionally sent out (93% excluding cadets). However, eight percent stated that either their company did not circulate such material or that they were not aware of it.

A strongly significant difference was found with regard to the nationality of respondents and their awareness of company circulars/makers' updates. Seventeen percent of all Chinese respondents were not aware of them compared with only four percent of Indian respondents

(see Figure 8). It is possible that there may be a relationship between the first language of seafarers, the languages in which technical manuals are written, and seafarers' awareness of such manuals. This would be worthy of further/future investigation.

Figure 8: Percentage of respondents not aware of company circulars/makers' updates by nationality (cadets excluded)



Problem solving with regard to unfamiliar equipment

Seafarers were asked how they dealt with situations where they were required to use a piece of equipment which they were not confident about using. In response to this question (excluding cadets) very few respondents (one percent) stated that they avoided using the equipment and most stated that they consulted a manual (93%). Many of these respondents also stated that they learned from other officers in such circumstances with 53% of respondents suggesting that this was the case.[4]

Senior officers were a little more likely[5] to consult a manual in such circumstances than junior officers or cadets. Ninety-five percent of senior officers stated that they would consult a manual if they were not confident about using a piece of equipment, 91% of junior officers gave this response and only 63% of cadets.

In terms of Department (deck or engine) the differences between respondents in relation to consulting manuals if they were uncertain about a piece of equipment were not statistically significant. However, the differences were strongly significant when it came to consulting other officers in these circumstances. Excluding cadets, deck officers were far more likely to consult with their colleagues (60%) than those in the engine room (46%).

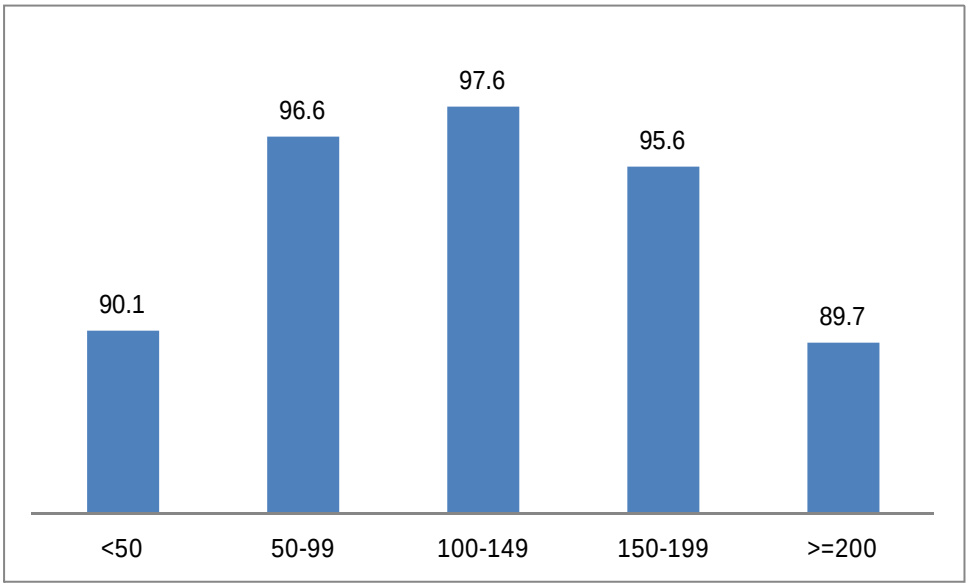
There were also slightly significant differences (at the 95% level) found between seafarers working aboard different types of ships (excluding cadets). Those aboard General Cargo

[4] NB This was a multiple response question where respondents could select all the responses which applied.
[5] This result was only significant at the 95% level

ships and Tankers were less likely to select the option of consulting a manual (86% and 89% respectively) than those aboard other types of ship (bulk carriers 94%, container 94%, 'Other' types 97%). However the seafarers aboard General Cargo ships were not that different to their colleagues aboard many other ship types when it came to consulting other officers. Fifty-one percent of respondents working on General Cargo ships would learn from other officers, 52% of respondents aboard bulk carriers, 53% aboard container vessels, and 47% aboard tankers would do likewise.

Whilst there were no significant differences in responses according to respondent nationality, there were slightly significant variations (at the 95% level) with respondent experience (aka 'sea-time'). Excluding cadets, those with the least sea-time and those with the most sea-time (more than 150 months) were the least likely groups to consult a manual if they lacked confidence in terms of using a piece of equipment (see Figure 9).

Figure 9: Percentage of respondents who chose 'I learn from the manual' by sea-time groups



Differences in experience were also paralleled to some extent by differences in age although in contrast to experience these were found to be strongly statistically significant (rather than slightly significant). Excluding cadets, respondents in their thirties were most likely to state that they would consult a manual if they were uncertain about a piece of equipment (97%). The group which was least likely to state that they would use a manual in such circumstances was aged under thirty (88%).

Seafarers were also asked what they would do were they to experience an actual problem with a piece of equipment whilst they were using it. Excluding cadets, the majority once again favoured consulting a manual (93%) and most also stated that they would consult other officers (57%). However a further 12% stated that they would 'experiment with the equipment'. It should be noted that such action (experimenting with equipment) is not without risk.

When cadets were excluded from the analysis there were no significant differences between ranks in relation to checking manuals in these circumstances. However when cadet responses are included in the analysis there is a strongly significant difference with cadets demonstrating a strong reluctance to consult a manual in such instances (only 63% of cadets selected this option). Conversely cadets were more likely (84%) to consult other officers than junior officers (57%) or senior officers (56%)[6].

In relation to Department there were slightly significant differences (at the 95% level) between the responses of engineers and deck officers in relation to the idea of checking a manual if they experienced a problem with a piece of equipment. Excluding cadets, whilst the vast majority of respondents stated that they would check the manual in such circumstances, engineers were slightly more likely to say they would do so (95%) than deck officers (91%). The picture was different when it came to consulting colleagues if a problem arose with a piece of equipment. In these circumstances there were strongly significant differences between engineers and deck officers with many more deck officers (65%) being willing to consult with colleagues than engineers (50%)

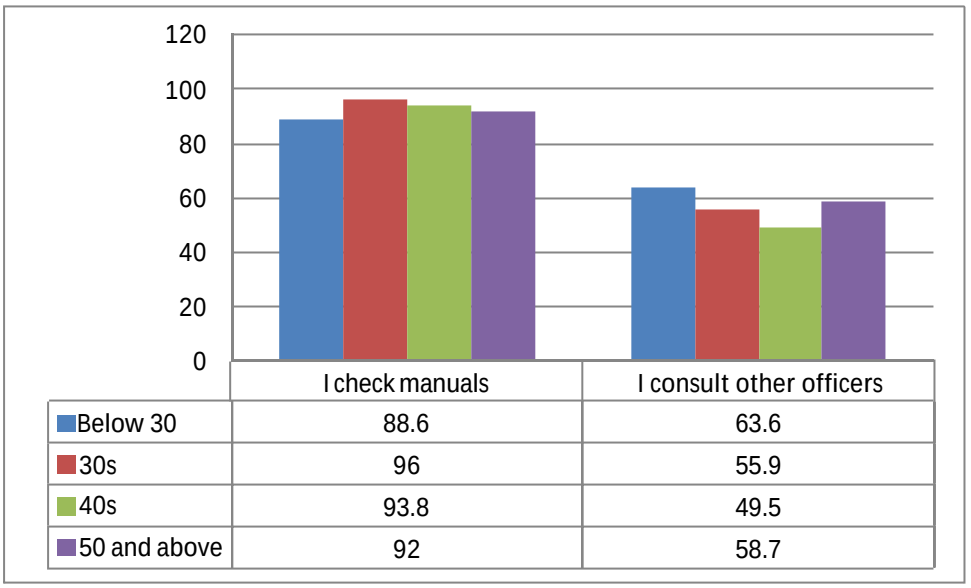
There were strongly significant differences when it came to the nationality of respondents and their selection of the option to 'consult with other officers' and to 'experiment' with equipment. Excluding cadets, Indian (67%), European (58%) and Filipino (58%) officers were more likely to consult with other officers if they experienced a problem with a piece of equipment than Chinese seafarers (51%) and seafarers from other ASEAN countries (53%). In relation to experimenting with equipment, Chinese and European seafarers were much more likely to select this option (21% of Chinese seafarers and 20% of Europeans stated this) whilst Filipino seafarers were least likely to suggest that they would experiment with equipment (4% gave this response).

Once again there were slight differences in response according to the type of ship respondents had most recently worked on. Excluding cadets, seafarers aboard tanker vessels were the least likely to suggest they would consult with colleagues if equipment caused them a problem (47%). Conversely those aboard 'other' vessel types (70%) and General cargo ships (61%) were the most likely to consult with other officers.

Excluding cadets, younger seafarers (aged below thirty) were more likely to consult other officers and less likely to consult manuals than other groups (see Figure 10).

[6] NB It is only when cadets are included in the analysis that this result is statistically significant.

Figure 10: When you experience a problem in using onboard equipment, what do you generally do?



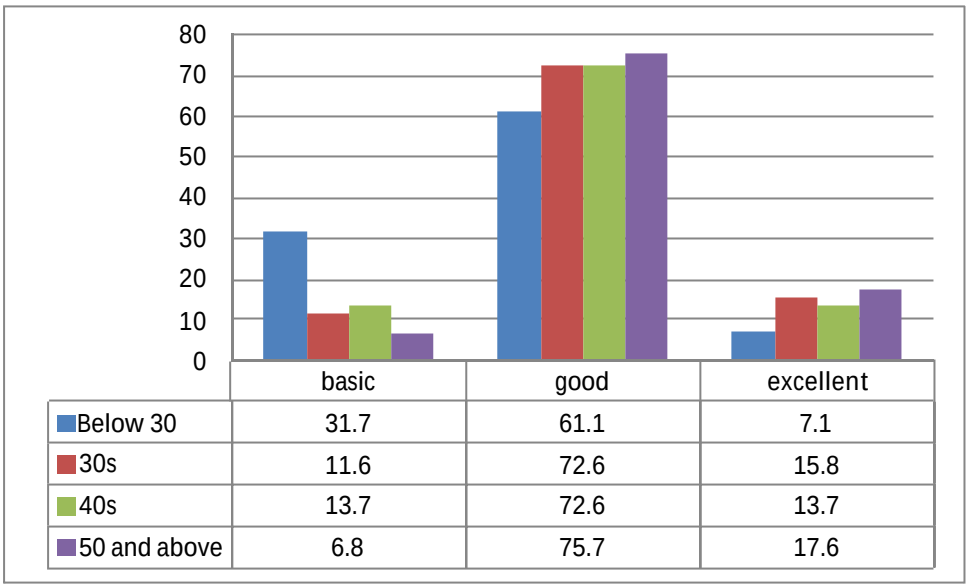
	I check manuals	I consult other officers
Below 30	88.6	63.6
30s	96	55.9
40s	93.8	49.5
50 and above	92	58.7

Confidence and competence relating to specific items of equipment

We asked seafarers to self-rate their own knowledge of different pieces of equipment aboard.

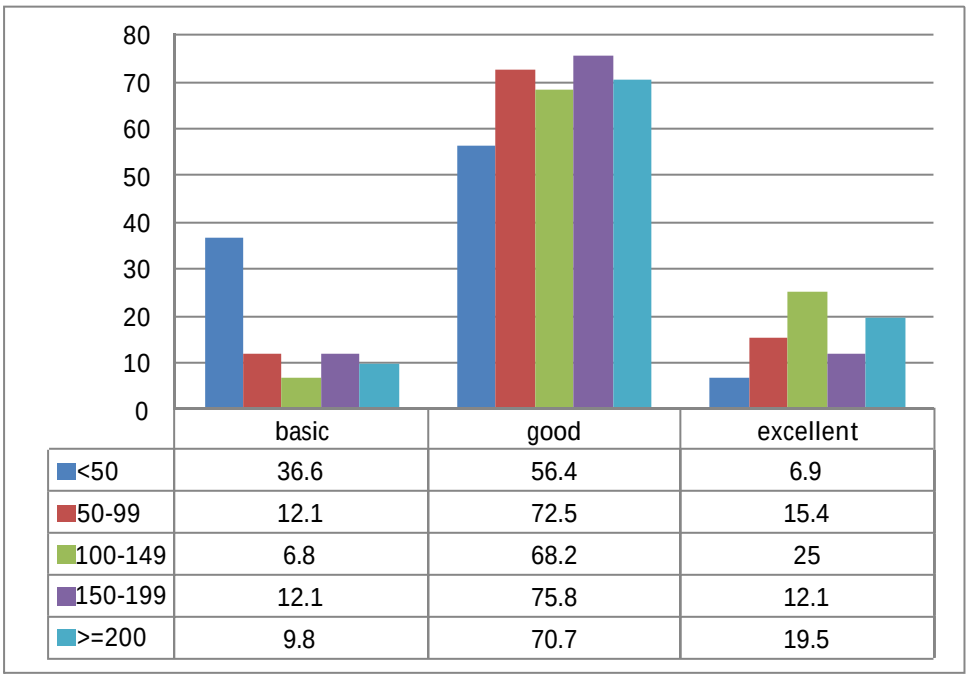
Excluding cadets we found that, all engineering officers rated their own knowledge of the main engine manoeuvring and control system as basic or better. The vast majority of respondents rated it as good or excellent (83%). Senior officers were more likely to evaluate their own knowledge as excellent (21%) than Junior officers (6%). The logical converse of this also applied and senior officers were less likely to self-rate their knowledge of the main engine manoeuvring and control system as basic (6%) than junior officers (26%). Even when cadets were excluded from the analysis age and sea-time nevertheless impacted upon the responses of engineers. Engineers below the age of 30 were much less likely to consider that they had an 'excellent' knowledge of the main engine manoeuvring and control system (7%) than older seafarers (see Figure 11). Similarly engineers with the least sea-time (less than fifty months) were the least likely to describe their knowledge of the main engine manoeuvring and control system as excellent (7%). However, the pattern here (see Figure 12) is not as clear as it is for age given that engineers with between 150 and 199 months at sea were less likely to describe their knowledge as excellent than some less experienced respondents (i.e. those in the 50-99 and 100-149 month categories).

Figure 11: Knowledge level of Main Engine Manoeuvring and Control System by age



	basic	good	excellent
Below 30	31.7	61.1	7.1
30s	11.6	72.6	15.8
40s	13.7	72.6	13.7
50 and above	6.8	75.7	17.6

Figure 12: Knowledge level of Main Engine Manoeuvring and Control System by sea-time



	basic	good	excellent
<50	36.6	56.4	6.9
50-99	12.1	72.5	15.4
100-149	6.8	68.2	25
150-199	12.1	75.8	12.1
>=200	9.8	70.7	19.5

In relation to the oily water separator two junior officers across the whole sample suggested they had 'zero' knowledge of this equipment. Amongst the remainder of the sample, many senior officers (40%) suggested that their knowledge of the oily water separator was 'excellent' and most suggested it was 'good' (58%). Junior officers, excluding cadets, on the other hand were much more likely to suggest their knowledge was either basic (17%) or good (65%) and less likely to state that it was 'excellent'. Younger seafarers (excluding cadets)

were the least likely to rate their knowledge of oily water separators as 'excellent' (21%) and the most likely to rate it as 'basic' (20%). These variations were strongly significant.

Engineers who responded to the questionnaire were not as confident about high voltage equipment as they were about some other items. Excluding cadets, 5% rated their knowledge of high voltage equipment as 'zero' and 32% as 'basic'. Younger seafarers (aged under 30) were significantly more likely to rate their knowledge as 'zero' (7%) and less likely to rate it as either 'excellent' (8%) or 'good' (40%). It follows that they were more likely than all other age groups to rate their knowledge of high voltage equipment as 'basic' (44%).

Navigation officers (deck officers) were asked similar questions about items of equipment relevant to their work. Excluding cadets, over ninety percent (93%) of them regarded their knowledge of AIS as 'good' or 'excellent'. There were no statistically significant variations between officers of different rank, age, experience, or nationality in relation to their responses to this question.

In relation to GPS fractionally more navigation officers (excluding cadets) were likely to suggest that their knowledge was 'basic' than they were with regard to AIS. However, once percentages were rounded up/down the proportion remained at 7% in both cases with 93% rating their knowledge as good or excellent. There were no statistically significant variations between groups of officers.

With regard to ARPA radar very few navigation officers (excluding cadets) described their knowledge as 'basic' (4%). Just over a third (36%) described their knowledge of ARPA radar as 'excellent'. The number of respondents rating their knowledge as excellent was slightly higher for ARPA radar than for GPS, or AIS. There were no statistically significant variations between different age groups, ranks, levels of experience, or nationalities.

In relation to GMDSS, officers were less confident of their skill levels. Thirteen percent of officers rated their knowledge as 'basic' and only 21% rated their knowledge as 'excellent'. There were slightly significant differences (at the 95% level) between senior and junior officers, with junior officers more likely than seniors to rate their understanding as 'basic' (17%) and less likely to rate their knowledge as 'excellent' (18%). There were no significant variations between different nationalities, ages, levels of experience, or ranks.

However, the area where navigation officers were least confident about their knowledge levels was in relation to ECDIS. Here, just under a tenth (9%) of all officers responding to the question (excluding cadets) rated their knowledge of ECDIS as 'zero'. A further 21% rated their knowledge as 'basic' leaving just 70% of navigation officers confident that their knowledge was either good (51%) or 'excellent' (19%). There were no significant differences between groups of officers.

Thus whilst there were officers on both the engineering and navigation side who rated their knowledge of equipment as 'excellent' they were more likely to do so in relation to some pieces of equipment than others. Similarly whilst only a small number of officers rated their knowledge of various pieces of equipment as basic and/or zero, there were clearly some who could or, perhaps, should know rather more about it than they did. In this context it should be noted that other research indicates that in self-report studies respondents generally tend to overestimate their qualities/knowledge/skills rather than to underestimate it (Taylor 1989;

Taylor and Brown 1988). There may therefore be more seafarers who should/could know more about new onboard technology than these self-report statistics indicate.

Taking the figures at face value, however, we nevertheless find that they imply that seafarers themselves may be motivated to undertake training in some areas however this does not indicate to us their preferred forms of training nor, indeed, the circumstances in which most of their training takes place.

Circumstances of training provision in current/most recent company

The identification of training needs

Perhaps the first issue to consider, with regard to the provision of training, is the identification of training needs. Seafarers are more likely to be motivated to undertake training when they have a say in what training they require and in some circumstances they may be the best placed to be able to identify areas of training need (Baldwin et al., 1991; Mathieu and Martineau, 1997).

A variety of methods for the identification of required training were in place, some of which involved seafarers in the process and some which did not.

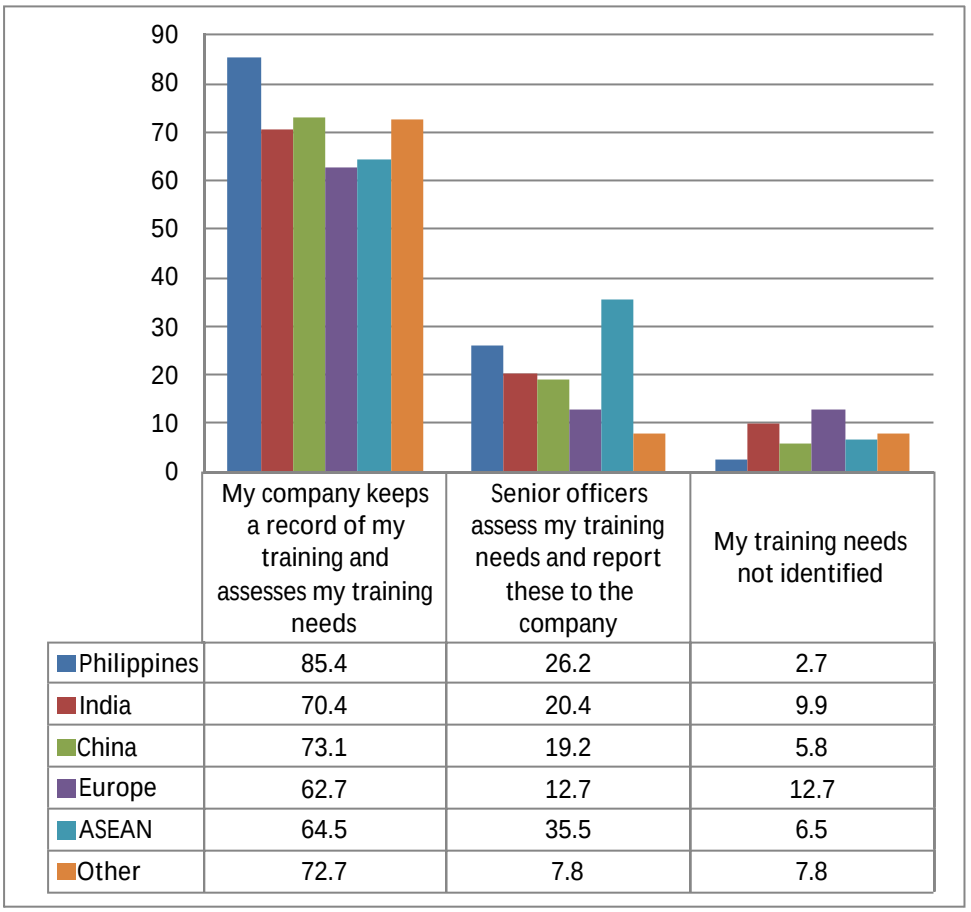
In the majority of cases (74%) respondents (excluding cadets) suggested that companies kept a record of their training to date and identified their future training needs. Many seafarers (20%) also suggested that senior officers identified their training needs and reported these to the company. However, relatively few officers played an active part in the identification of their own training needs with only 14% suggesting that senior officers on board discussed their training needs with them and then reported these to the company, and fewer still stating that they are able to request training from managers/supervisors directly (10%). A minority of seafarers (7%) stated that their training needs were not identified at all[7].

In relation to the methods by which training needs were identified there were some interesting statistically significant variations between groups of seafarers.

Filipino seafarers were much more likely than other nationality groups to state that their companies keep records of their training and assess their training needs. While 85% of Filipino seafarers gave this response this contrasted with just 73% of Chinese seafarers, 70% of Indian seafarers, 65% of seafarers from other ASEAN countries, and just 63% of European seafarers. A similar pattern emerged in relation to the response that senior officers on board assess training needs and report these to the company. Here, whilst ASEAN seafarers were the most likely to offer this response (36%), Filipino seafarers were the next most likely group to report this (26%) followed by Indian seafarers (20%), Chinese seafarers (19%) and European seafarers (13%). Finally significant differences were found in relation to nationality and the response that training needs were not identified at all. Here it is very interesting to note that European seafarers were the most likely group to make this response (13%) followed closely by Indian seafarers (10%). Filipino seafarers were the least likely group to offer this response with only 3% selecting it. Figure 13 presents the examples where nationality significantly impacted upon the responses given to a question about the identification of training needs.

[7] NB This was a multiple response question so reported percentages add up to more than 100.

Figure 13: Training identification by nationality



	My company keeps a record of my training and assesses my training needs	Senior officers assess my training needs and report these to the company	My training needs not identified
Philippines	85.4	26.2	2.7
India	70.4	20.4	9.9
China	73.1	19.2	5.8
Europe	62.7	12.7	12.7
ASEAN	64.5	35.5	6.5
Other	72.7	7.8	7.8

As might reasonably be anticipated rank also impacted strongly upon the responses of seafarers to the question about the identification of training needs. Senior officers were predictably less likely to say that other senior officers on board identified their training needs with (10%) or without (12%) discussion with them. A quarter of junior officers (25%) stated that their training needs were identified by senior officers on board and a further 16% stated that this took place in discussion with them. There was also a slightly significant difference (at the 95% level) between ranks when it came to making their own requests for training directly to managers. Here, senior officers were more likely to do this (13%) than junior officers (8%).

There were also variations in the identification of training needs according to the type of ship that seafarers were working on or had most recently worked on. Aboard bulk carriers (82%) and tankers (77%) seafarers were most likely to suggest that companies kept a record of their training needs whilst aboard container vessels (70%), general cargo ships (68%), and 'other' ship types this was less commonly the case.

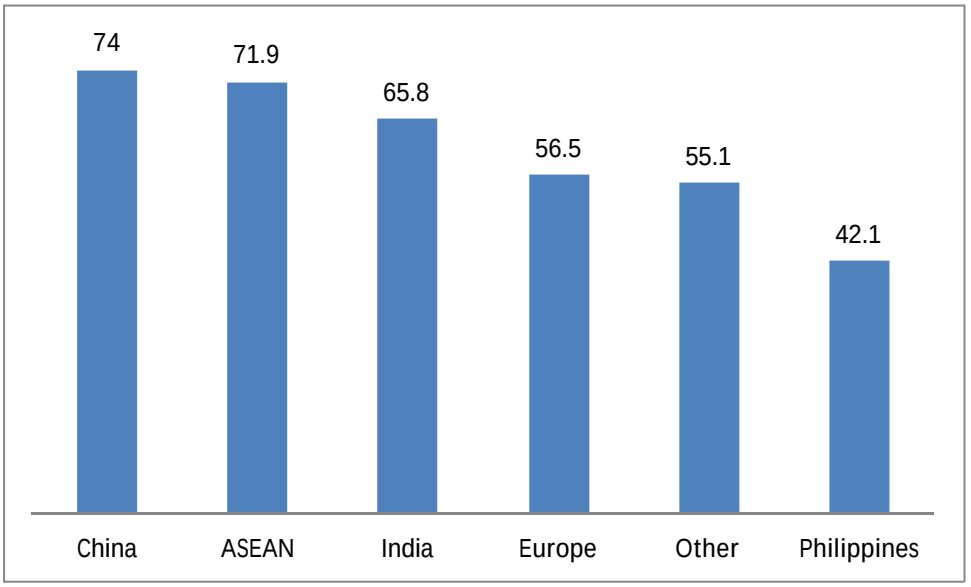
It is likely that where seafarers have a say in the identification of their training needs they will be more motivated to undergo training and will therefore gain more from it. However, several other factors may impact upon seafarer motivation with regard to training. If companies pay for training and compensate seafarers for any lost leave time associated with training it is likely, for example, that motivation will be higher.

Meeting the costs of training

Despite the fact that less than a quarter of seafarers (excluding cadets) suggested that they played a part in the identification of their training needs, almost half were expected to pay for training that they underwent (in part or full) in relation to the introduction of new equipment.

There were significant differences identified between different nationality groups with regard to the payment of training costs. Chinese seafarers were the most likely to identify companies as paying for their training (74% did so) whilst seafarers from the Philippines were the least likely to do so. Only 42% of Filipino respondents stated that their companies paid for training on new equipment (see Figure 14 for more details).

Figure 14: Percentage of respondents identifying companies as paying for training



There were also significant differences in relation to department, ship type and seafarer age. Engineers were more likely than officers from the deck department to receive training on new equipment that was paid for by the company. Fifty-nine percent of engineers as opposed to 52% of navigation officers said their companies paid for such training.

Aboard General Cargo ships (62%), tankers (60%), container vessels (59%) and 'other' ship types (62%) seafarers were more likely to suggest that companies paid for their training on new equipment than aboard bulk carriers (46%). In relation to age it was the youngest (66%) and the oldest seafarers (56%) in the sample (excluding cadets) who were the most likely to suggest that companies paid for their training.

Just as many seafarers were expected to pay for their training in relation to new equipment, so too were many expected to lose leave-time when taking a training course. Twenty-eight percent of seafarers stated that they were *never* compensated for losing holiday time in undergoing training whilst a further 19% were not usually compensated for lost leave time.

Once again significant differences were identified amongst different nationality groups. European seafarers were the most likely to state that they were always compensated for lost leave time when undergoing training (38%) and seafarers from India (25%), other ASEAN

countries (19%) and the Philippines (19%), were the least likely to **always** be compensated for lost leave time. Similarly, it was seafarers from the Philippines who were most likely to **never** receive compensation for lost leave time. Chinese seafarers were the least likely group to state that they **never** received compensation for lost leave time. Thus it seemed that in relation to compensation for lost leave time Filipino seafarers fared worst overall and Chinese and European seafarers generally fared best.

The adequacy of training provided in relation to new technology/equipment

Not only is it important that seafarers regard training as adequate from the point of view of their competence and performance (from a company standpoint) but given that they are often paying for their own training and giving up their leave time to undertake it the adequacy of training is also particularly relevant to them as individuals. It is reassuring therefore that the majority of respondents (excluding cadets) regarded training as generally adequate (82%). Nevertheless, many seafarers did not know if it was adequate or not (7%) and a further 11% regarded it as inadequate.

Significant differences were identified between nationality groups. Chinese seafarers who were not amongst the worst off in relation to paying for training or giving up leave time were nevertheless the group who were most likely to regard training as inadequate. Eighteen percent of Chinese respondents suggested training was inadequate or completely inadequate. In contrast Filipino seafarers appeared to be the most satisfied with the training they had received (88% of Filipino respondents suggested training was generally adequate). European and ASEAN seafarers were the groups who were least likely to 'know' whether training was adequate or not (11% and 13% respectively). It is likely that many of these seafarers did not know if training was adequate or not because they had not undergone such training.

As well as asking seafarers about the adequacy of training in relation to new equipment/ technology, we also asked about the availability of 'refresher' training. Almost three quarters of respondents (excluding cadets) did have the opportunity to undertake such training (72%). However, the opportunities for refresher training seemed to be significantly more available to some nationality groups than others. European seafarers were the least likely to state that they had opportunities to attend refresher training (63%) whilst ASEAN (84%) and Filipino seafarers (79%) were the most likely to acknowledge such opportunities.

Of those who had experienced refresher training (n=759), it was regarded as adequate by 92% of the sample (excluding cadets) and was regarded as inadequate by 4% of the sample. The remaining 5% suggested that they did not know if refresher training was adequate or not.

There were significant differences in the views of different nationality groups with regard to the adequacy of refresher training. European seafarers were the group that was most likely to regard such training as inadequate (8.2% of European respondents thought this) and Chinese and ASEAN seafarers were the least likely groups to regard refresher training as inadequate (1% and 0% respectively).

Computer usage and training

In the last two decades computers have been increasingly utilised for a range of tasks on board ship. In many contexts, in the developed world and amongst younger generations, competence with computers has become taken for granted. However, computer competence

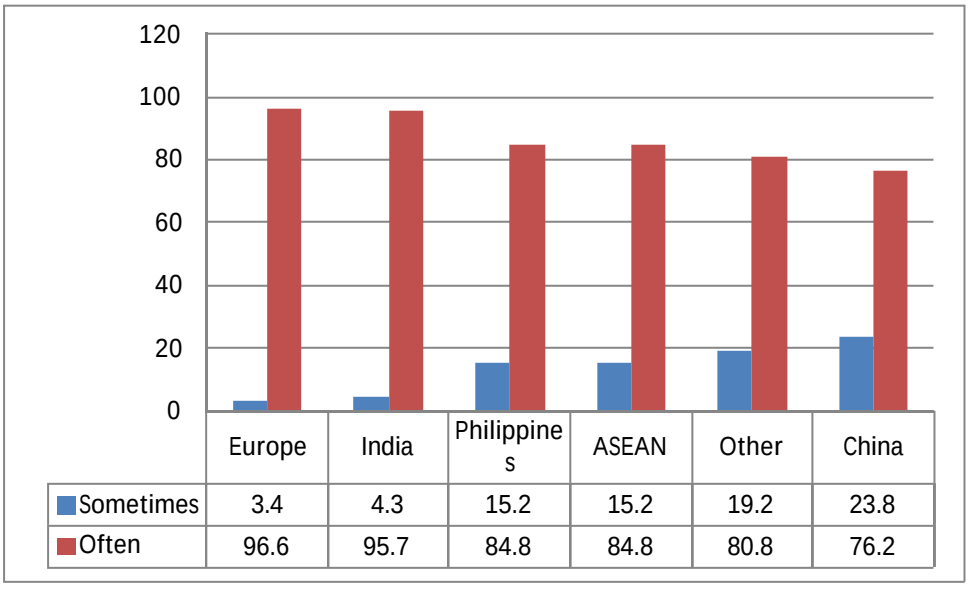
cannot be assumed in all cases. In many new labour supply countries resources are limited and schools may not have the access to computers that schools in OECD countries can expect. Furthermore, many older seafarers will not have been exposed to computers in their school-time education and will have gained any skills and knowledge they possess, as adults. In addition they are quite likely to be largely self-taught. Computer skills and the use of computers on board is worthy of some specific attention therefore.

Use of computers

Almost all officers (excluding cadets) used computers on board from time to time with 88% using them frequently or very frequently. Twelve percent of respondents used computers either rarely or occasionally and just five respondents stated that they 'never' used computers on board. Excluding cadets from the analysis, we found some interesting variations between the groups who used computers frequently or very frequently (which we combined together as a category of 'often') and those who used computers rarely or occasionally (which we combined together as a category of 'sometimes').

In relation to nationality, Chinese seafarers were the least likely group to indicate that they used computers 'often'. Seventy six percent of Chinese seafarers used computers often compared with 97% of Europeans (who were the most likely group to use computers often). European and Indian seafarers were the most likely groups to be using computers often (see Figure 15 for a more detailed picture). Chinese, Filipino, ASEAN and 'other' seafarers were the least likely to use computers 'often' on board.

Figure 15: Computer use frequencies by nationality



	Europe	India	Philippines	ASEAN	Other	China
Sometimes	3.4	4.3	15.2	15.2	19.2	23.8
Often	96.6	95.7	84.8	84.8	80.8	76.2

There were also significant variations in computer usage between departments. Navigation officers in the deck department were more likely to use computers 'often' on board (94%) than engineers (84%).

Between ranks significant variations were also identified. Senior officers were more likely to use computers often on board (93%) than junior officers (85%).

The type of ship seafarers were working on also seemed to impact on the frequency with which they utilised computers on board. Seafarers working aboard tankers (93%), container ships (93%), and 'others' (90%) were more likely to use computers 'often' than seafarers aboard Bulk carriers (81%) and General Cargo ships (79%).

Age was not found to be a strongly significant factor in determining the frequency with which seafarers utilised computers on board.

Computers were reported to be utilised for a variety of work-related tasks on board as well as for communication with families and friends back home (via email).

With regard to how seafarers (excluding cadets) had learned about computers we found that informal methods of learning had played a significant role. Whilst on shore training (19%) and on board training (17%) featured in their acquisition of knowledge many seafarers had acquired their knowledge via various other routes. Many had consulted manuals (18%), colleagues (14%) and friends ashore (10%). Some had also made use of handover and familiarisation notes (11%) and 'help' functions and tutorials built into the software (8%).

Amongst these practices there were significant variations between groups of respondents. Seafarers from China were much more likely to have received onshore training (67%) than their colleagues from Philippines (57%), India (57%), ASEAN (56%), other nationalities (48%) and Europeans (42%). However, in relation to on board training it was Filipino seafarers who were the most likely to have acquired their knowledge of computers in this way. Sixty-four percent of Filipino respondents had gained knowledge of computers through on board training compared with fifty-one percent of Indian respondents, and thirty-three percent of European seafarers. Chinese seafarers were the least likely to have acquired knowledge from on board training and only 29% stated that they had done so.

There was a slight tendency (95% significance level) for Europeans and 'others' to learn from friends more often than other groups. Whilst 35% of European and 32% of 'other' respondents selected this option only 25% of Chinese, 24% of Filipino, 24% ASEAN, and 22% of Indian respondents did so.

There were strongly significant differences in the numbers of respondents who indicated that they consulted manuals to build their knowledge of computers. Filipino seafarers were the most likely to select this option (60%). Indian and Chinese seafarers were quite likely to consult manuals (52% of respondents in both cases) whilst others (41%), European (37%) and ASEAN respondents (32%) were much less likely to do so.

Similarly it was Filipino seafarers who were the most likely to indicate that they had acquired some knowledge of computers from handover familiarisation and notes. Forty-three percent of Filipino respondents stated this compared with 30% of Chinese seafarers, 29% of Europeans and fewer ASEAN (21%), 'other' (20%) and Indian (19%) seafarers.

The pattern of variation according to nationality was different when it came to use of the 'help function'/tutorials built into many software packages. Here Chinese seafarers were the most likely to have acquired knowledge in this way (39%). Indian seafarers were less likely to have done so (27%) followed by Europeans (22%), Filipinos (20%), and others (20%). Very few of the ASEAN category of seafarers had acquired knowledge of computers using

the ‘help function’/tutorials built into computer software packages (6%) although they represented a very small subset of the overall sample.

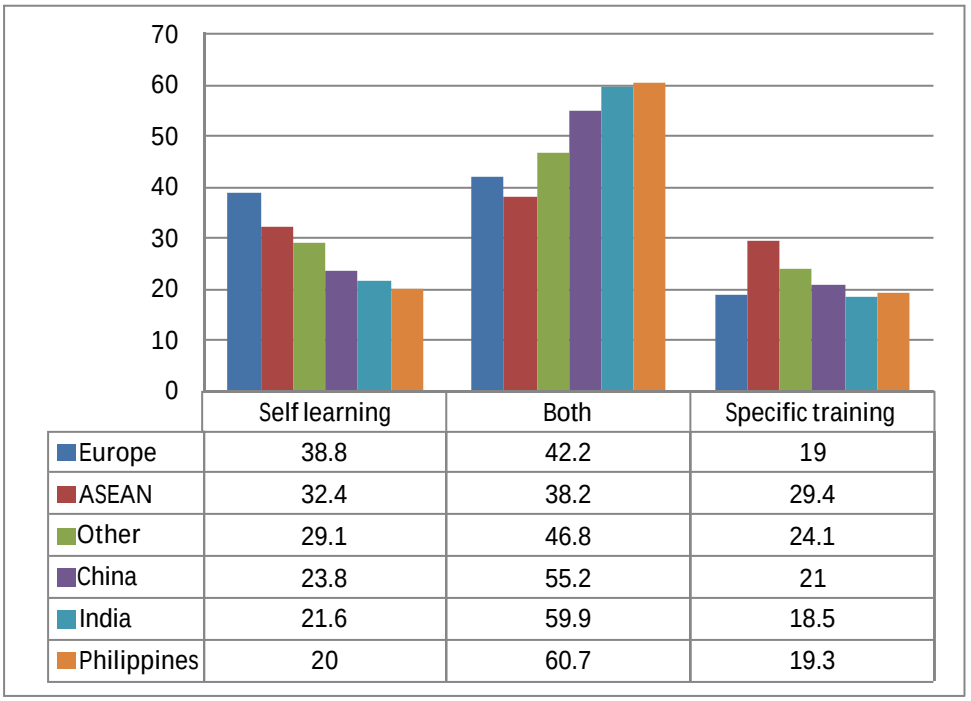
Whilst it was between different nationality groups that there were the most significant variations when it came to the ways in which computer knowledge had been acquired, there were a few other differences to note. Deck officers (36%) were much more likely than engineers (27%) to have acquired knowledge from hand over familiarisation and notes and were slightly more likely (at the 95% significance level) to have acquired such knowledge from consultation with colleagues (43% as opposed to 36%).

Senior officers (31%) were slightly more likely (at the 95% significance level) to have learnt about computers from friends ashore than junior officers (24%). They were also much more likely than their junior colleagues to utilise the ‘help function’/tutorials built into computer software (30% of senior officers used this as opposed to 18% of junior officers).

Seafarers aboard tankers (57%) and ‘other’ vessel types (60%) were much more likely than their colleagues aboard bulk carriers (49%), General Cargo ships (42%) and Container vessels (41%) to have acquired knowledge of computers via on board training. Conversely seafarers aboard tankers were slightly less likely (at the 95% level) to have acquired knowledge from their colleagues (tankers 28%, Containers ships 40%, Bulk carriers 40%, General Cargo 43%, ‘other’ 52%).

Overall when these different forms of learning are grouped into ‘self-learning’, ‘specific training’, and ‘both’ we find significant differences between nationalities. European seafarers are much more likely than some other groups to fall into the ‘self-learning’ category. Thirty-nine percent of Europeans had acquired their knowledge of computers via ‘self-learning’ as compared with 32% of ASEAN seafarers, 29% of ‘other nationalities’, 24% of Chinese respondents, 22% of Indians, and 20% of Filipino seafarers (see Figure 16).

Figure 16: How respondents learnt to use computers



	Self learning	Both	Specific training
Europe	38.8	42.2	19
ASEAN	32.4	38.2	29.4
Other	29.1	46.8	24.1
China	23.8	55.2	21
India	21.6	59.9	18.5
Philippines	20	60.7	19.3

Training experiences relating to individual items of equipment

Automatic Identification System (AIS)

As reported earlier, respondents (excluding cadets) generally rated their knowledge of AIS as good or better (only 7% suggesting it was 'basic'). They had acquired this knowledge in a variety of ways. The most common method of learning was via the consultation of manuals (74%). Just over a third of respondents (34%) had received on shore training relating to AIS and twenty-two percent of seafarers (excluding current cadets) had received training relating to AIS as part of their cadet training programmes prior to becoming certificated officers. Consultation with colleagues (33%) and handover familiarisation notes (32%) also played a part in the acquisition and transfer of knowledge about AIS as did on board training provided by both dedicated trainers (26%) or via computer-based training (CBT) modules (24%).

In summary then, the picture for AIS learning was rather mixed with formal instructor-led training playing a relatively minor role and, perhaps as a consequence, with a greater emphasis on self-learning and the transfer of knowledge between colleagues.

Some significant variations in the patterns of learning were identified, particularly in relation to respondent nationality. Excluding cadets, seafarers from ASEAN countries (46%), China (35%), and India (33%) were much more likely than respondents from Europe (18%) and the Philippines (16%) to identify cadet training as having played a role in their learning about AIS.

Conversely Filipino seafarers were much more likely than any other group to identify CBT as assisting with their learning about AIS. Forty percent of Filipino seafarers indicated that on board CBT had assisted them with their learning compared with just 23% of ASEAN respondents, 20% of Indian seafarers, 13% of Chinese respondents and 12% of Europeans.

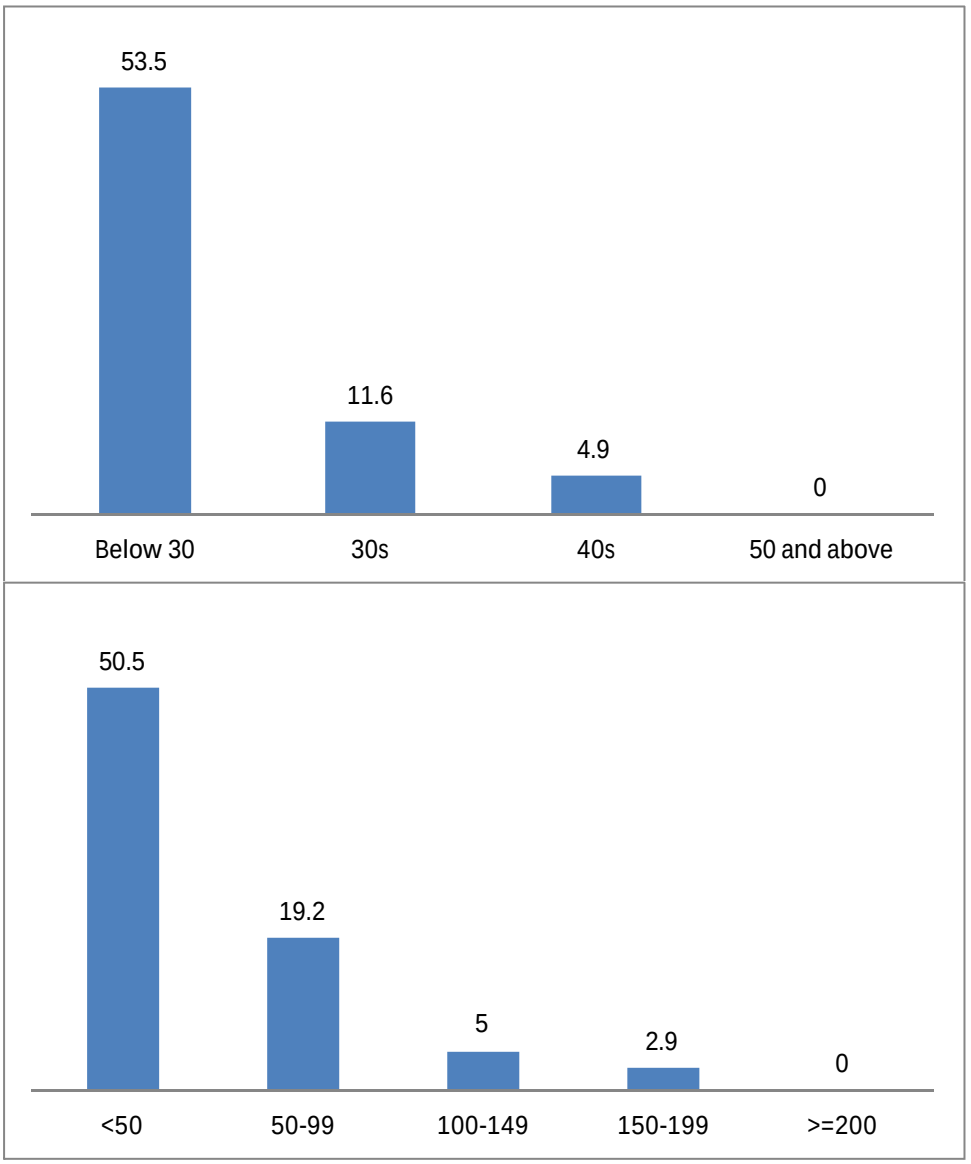
Indian seafarers were the most likely to suggest that reference to manuals had assisted in their learning about AIS. Eighty-eight percent of Indian respondents indicated that manuals had assisted them compared with 80% of Filipinos, 75% of Chinese respondents, 62% of Europeans and also seafarers from ASEAN countries.

In relation to handover and familiarisation notes these were more important for Filipinos and Chinese respondents than they were for other nationality groups. Forty percent of both Filipino and Chinese groups of respondents indicated that these were important in their learning about AIS. Whilst fewer Europeans (29%), ASEAN (15%) and Indian respondents (14%) indicated that this was the case.

There were rank associated differences in response to the importance of cadet training in relation to the acquisition of knowledge about AIS. However, given the relatively recent introduction of AIS these are likely to be a proxy for differences between age groups. When many senior officers undertook their cadet training AIS would not have existed. Only four percent of senior officers identified cadet training as important in their acquisition of knowledge about AIS whereas 35% of junior officers indicated that it had been of relevance. Similarly whilst only 5% of all respondents aged over 40 indicated that cadet training contributed to their knowledge of AIS, 12% of seafarers in their thirties indicated that this was the case, and 54% of seafarers in their twenties stated that cadet training contributed to their knowledge of AIS. A similar pattern was found in relation to sea-time and the

importance of cadet training in the acquisition of AIS understanding. Once again sea-time may often relate to age and in some senses can be regarded as a proxy for age. Seafarers who had less than fifty months sea-time were much more likely (51%) than others to indicate that cadet training had been of importance in their acquisition of knowledge about AIS (see figure 17.

Figure 17: Percentage of respondents identifying cadet training as contributing to their knowledge of AIS by age and by sea-time



With regard to three forms of training (onshore, computer-based, and onboard training from an installation technician or dedicated trainer) the number of days training provided to respondents was explored. However these questions were only relevant to seafarers who had actually received these forms of training so that those who had not received training of these types were excluded. This is of particular relevance when considering variations in response as the numbers of seafarers in particular groups, for example nationality or age, falls making the percentage differences appear more compelling than they actually are. It is important to reference the numbers as well as the percentages when considering these data therefore and

where relevant tables offering both percentages and numbers are provided for reference in Appendix Three.

In general, when seafarers had received training from a dedicated trainer or installation technician this had been for a short period of five days or less. Only 16% of seafarers suggested they had been in receipt for more than five days training of this kind. Training ashore was of slightly longer duration for a small proportion of seafarers with 20% indicating that they had received more than five days on shore training relating to AIS. The longest periods of training related to computer-based training where 31% of respondents indicated that this was for more than five days.

There were significant variations according to nationality with regard to length of training. Chinese seafarers were by far the most likely to indicate that they had received more than five days on shore training. Seventy-three percent of Chinese seafarers had received more than five days on shore training compared with 23% of Indians, 22% of Europeans, 20% of ASEAN seafarers and just nine percent of Filipinos. However, the small numbers in some of these nationality groups (e.g. Chinese) undermine the strength of the conclusions that can be drawn here. We have therefore divided the respondents into two groups for further consideration: 'Filipino' and 'non-Filipino'(n=86 and 105 respectively). We found significant variations between these two groups in relation to the duration of on shore training with just 9% of Filipinos receiving five or more days on shore training and 28% of non-Filipinos receiving five days or more on shore training relating to AIS.

Similar variations were found in relation to the duration of CBT training associated with AIS. All of the Chinese respondents (ten in total) who had undertaken CBT training on AIS indicated that this was for more than five days. This compared with fewer Europeans (30%), Filipinos (24%) and Indians (18%)[8]. However when grouped into Filipinos and non-Filipinos a statistically significant variation was not identified.

Seafarers (excluding cadets) were also asked about whether training took place before or after they were required to use equipment. In the majority of cases respondents had received training on AIS after they had been required to use it. Seventy-five percent of seafarers had undertaken CBT-based training on AIS after they had begun to use the equipment, similarly 61% had received on-shore training after they had first used AIS. Of those who had received training from an equipment installation technician or dedicated trainer, 46% had actually received the training prior to beginning to use the equipment. However the overall numbers who had received such training were relatively small (n=74).

When seafarers were grouped into 'Filipino' and 'non-Filipino' respondents we observed significant differences between the groups in relation to whether training had taken place before or after equipment was first used. Eighty percent of Filipinos had been in receipt of training after they had first had to use AIS whilst amongst non-Filipinos the figure was much lower with 46% of respondents describing receiving training after they were first required to use equipment.

The two forms of training which respondents (excluding cadets) were most likely to recommend in relation to the provision of AIS training were on board training delivered by an instructor (30%) and training ashore. Self learning (20%), CBT (12%) and learning from

[8] The numbers of ASEAN seafarers are too small to comment on in this section of the report.

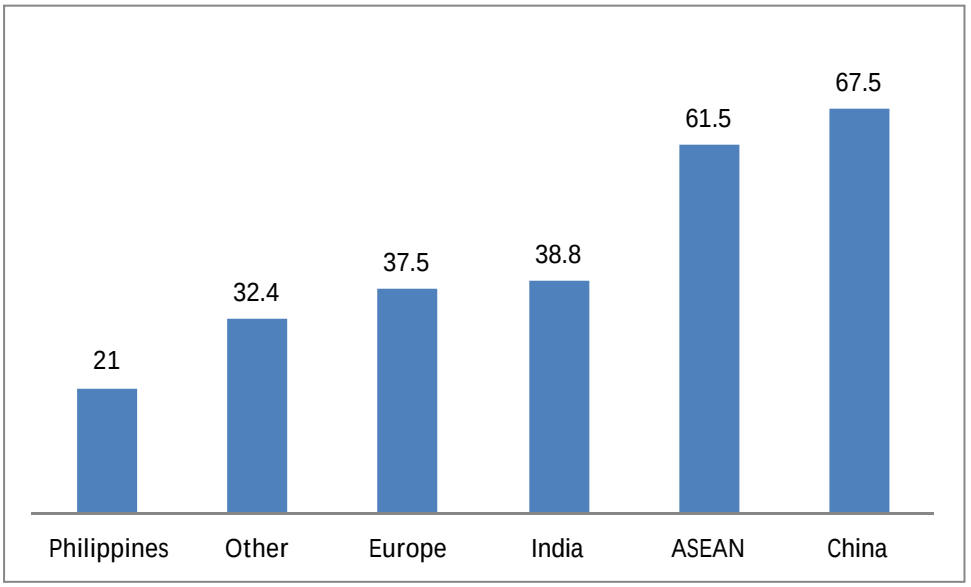
colleagues (11%) were less favoured options. In these responses we did not find any variations by nationality, age, sea-time, or rank, which were of statistical significance.

Global Positioning System (GPS)

In relation to the use of GPS, seafarers were roughly as confident as they were in relation to the use of AIS. The forms of training they had received in relation to GPS were also broadly similar. However, there were small variations. Slightly more seafarers had undertaken training ashore relating to GPS (33%) and training as part of their cadet programs (35%). Seventy-seven percent had consulted manuals in order to build their knowledge of GPS, forty percent had consulted colleagues, 37% percent had referred to handover familiarisation and notes, 24% percent had undertaken CBT on board and similarly 24% percent had received on board training from a dedicated trainer or installation technician.

Significant variations were identified in relation to nationality and the forms of learning which seafarers had undergone in relation to GPS. Like AIS, it was Filipino seafarers (21%) who were the least likely to identify GPS training as having been included in their cadet training program. Chinese seafarers were the most likely to identify GPS training as having been included in their cadet training program (68%) (see Figure 18 for a more detailed picture of these variations).

Figure 18: Percentage of respondents identifying cadet training as contributing to their knowledge of GPS by nationality



As with AIS, Filipino seafarers were the most likely to have undertaken CBT in relation to the use of GPS. Thirty-seven percent of Filipino respondents identified this as having contributed to their knowledge of GPS compared with 23% of ASEAN respondents, 15% of Chinese seafarers, 14% of Europeans and just 13% of Indian respondents.

Similarly, it was Filipino seafarers who were the most likely to reference handover familiarisation and notes as having contributed to their knowledge of GPS. Forty-eight percent of Filipino respondents indicated handover and familiarisation were important

compared with 43% of Chinese, 27% of European, 25% of Indian, and 23% of ASEAN seafarers.

As with AIS, differences between senior and junior officers were identified as significant in relation to receipt of training on GPS as part of cadet training programs. These are likely to be associated with age differences and the relatively recent introduction of GPS. Twenty-two percent of senior officers had received training about GPS as part of their cadet training compared with 45% of junior officers. The majority of seafarers (excluding cadets) aged under thirty indicated they had received training about GPS as part of their cadet training (66%) whilst only 32% of respondents in their thirties, 12% in their forties, and five percent aged fifty or over did so. This pattern was also echoed in relation to sea-time. Sixty-nine percent of seafarers with less than fifty months sea-time had received training on GPS in the course of their cadet training compared with 42% with between fifty and ninety-nine months, 15% with between one hundred and one hundred and forty-nine months, 9% with between one hundred and fifty and one hundred and ninety-nine months sea-time and 7% with two hundred months sea-time or more.

Fewer seafarers had received training ashore relating to GPS (n=175) than had done in relation to AIS (n=192). However, it seemed that if they had received training ashore, respondents (excluding cadets) were likely to have received training ashore of longer duration relating to GPS than they were in relation to AIS. Thirty-five percent of respondents had received more than five days of training relating to GPS compared with just 20% in relation to AIS (as previously reported). Similarly, fewer respondents had benefitted from training from an installation technician or dedicated trainer (n=101) on GPS than had in relation to AIS (n=116). However, where they had received such training, they were more likely to have received training of more than five days duration about GPS (20%) than they were about AIS (16%). In relation to CBT the picture was slightly different. Whilst once again fewer respondents had undertaken CBT relating to GPS (n=113) than in relation to AIS (n=143), in contrast to the findings for training ashore and from an installation technician aboard where they had received this training it was less likely to be of more than five days duration (27%) for GPS than it was for AIS (31%).

There were some differences between nationalities when it came to the duration of on shore training concerning GPS and also with regard to the duration of CBT training for GPS. When the sample was divided into 'Filipinos' and 'non-Filipinos' we found that just 13% of Filipino respondents described five days or more on shore training relating to GPS whilst almost half (46%) of 'non-Filipinos' had been in receipt of five days or more on shore training relating to GPS. The picture was similar for CBT. Just 14% of Filipino respondents described five days or more CBT relating to GPS whilst 41% of non-Filipinos reported five days or more CBT considering GPS.

Where they had benefitted from training ashore relating to GPS, 53% of respondents had done so after they had first used the equipment. This was also the case when it came to CBT (58%) and on board training provided by an installation technician/dedicated trainer (57%).

As with AIS we found significant nationality variations between Filipinos and the remainder of the sample. Seventy-seven percent of Filipinos had received on shore training relating to GPS after they had first used GPS on board. This compared with just 40% of 'non-Filipinos'. In relation to GPS training respondents once again showed a preference for training delivered by either an on board installation technician/dedicated trainer (33%) or delivered ashore

(29%). Only 15% favoured self-learning, 13% favoured learning from colleagues and 10% favoured on board CBT.

ARPA/RADAR

Respondents (excluding cadets) were relatively confident about their skill levels in relation to ARPA/RADAR. Thirty-six percent of respondents rated their knowledge of ARPA/RADAR as excellent and 60% rated their knowledge as 'good' (as previously reported).

As with both AIS and GPS related knowledge, the majority of seafarers had consulted manuals to build their understanding of ARPA/RADAR (71%). In contrast with the picture for GPS and AIS, however, a great many respondents (65%) had also benefitted from training ashore relating to ARPA/RADAR and additionally training as part of cadet programs (44%). Thirty-six percent of respondents had added to their understanding of ARPA/RADAR as a result of handover familiarisation/notes, and 40% had learned from consulting colleagues. The use of CBT and the benefit of on board instruction from a technician/dedicated trainer were referenced as having helped to build their knowledge of ARPA/RADAR by fewer respondents (24% in each case).

There were some variations in response to be taken into account. Chinese (73%) and ASEAN seafarers (69%) were the most likely to identify training on ARPA/RADAR, as part of their cadet programs, as having contributed to their understanding of this equipment. Europeans (47%) and Indian seafarers (47%) were less likely to suggest that their cadet training contributed to their understanding of ARPA/RADAR and Filipino seafarers were the least likely of all the nationality groups to suggest that this was the case (31%).

Training ashore was the most likely to be identified as having contributed to respondent understanding of ARPA/RADAR by Indian (75%), European (66%), and Filipino seafarers (68%). It was least likely to be regarded as having contributed to understanding of ARPA/RADAR by Chinese seafarers 30%.

Filipino seafarers (39%) were the most likely, of all the nationality groups, to suggest that CBT undertaken on board had contributed to their understanding of ARPA/RADAR. They were followed in descending order by ASEAN seafarers (31%), Chinese (23%), Indian (22%), and European seafarers (8%).

Filipinos (33%) were also the most likely seafarers to suggest that their knowledge of ARPA/RADAR owed something to the conduct of on board training from dedicated installation technicians or trainers. They were followed in descending order by Chinese respondents (28%), Indians (17%), Europeans (14%) and ASEAN seafarers (8%).

In terms of the contribution that handover familiarisation and notes had made to the acquisition of knowledge about ARPA/RADAR Chinese seafarers were the most likely group to identify this as useful (55%). Many Filipinos also identified handover familiarisation and notes as useful in the acquisition of knowledge about ARPA/RADAR (49%) but this was less common for ASEAN seafarers (39%), Europeans (27%), and Indian seafarers (20%).

In summary, there appeared to be a significant division between nationality groups in terms of the general form that learning in relation to ARPA/RADAR had taken. Filipino (81%), Indian (77%), and European seafarers (72%) tended to have experienced more instructor-led

training than ASEAN (62%) and Chinese (45%) respondents. Filipino (66%) and Chinese seafarers (60%) were more likely to have benefited from colleague assistance than others (European 48%, ASEAN 46%, Indian 39%).

Senior officers (34%) were less likely than junior officers (52%) to identify cadet training as contributing to their knowledge of ARPA/RADAR. Similarly, those aged over 50 (16%) were much less likely than others to do so. A similar pattern was identified with regards to sea-time with seafarers with two hundred months of sea-time or more being least likely (16%) to identify cadet training as useful with regard to the acquisition of knowledge about ARPA/RADAR. It is likely that seniority and sea-time are proxies for age in this instance and that younger seafarers are significantly more likely than older seafarers to have benefitted from training about ARPA/RADAR in their cadet courses.

It seemed that respondents were more likely to have benefitted from training ashore relating to ARPA/RADAR (n=293) than they were relating to AIS (n=192) or GPS (n=175). Where they had benefitted from such training they were also likely to have experienced training ashore for a longer duration. Fifty-six percent of respondents who had benefitted from training ashore in relation to ARPA/RADAR had experienced more than five days training compared with just 20% in relation to AIS and 35% in relation to GPS.

Where seafarers reported that training ashore had contributed to their knowledge of ARPA/RADAR (n=184) the majority (59%) had been provided with such training after they had first used the equipment. This was also the case in relation to CBT (62%) and on board training provided by an installation technician/dedicated instructor (56%).

As with AIS and GPS there were some significant differences between nationality groups (Filipino and non-Filipino) in relation to duration of training, in some cases, and also whether or not such training took place before or after equipment was used.

Filipino seafarers were less likely than non-Filipinos to receive more than five days on shore training. Just over a third of Filipinos (37%) received more than five days on shore training on ARPA/RADAR compared with two thirds (67%) of non-Filipinos. Filipino seafarers also indicated that they were less likely to receive more than five days CBT training than others in relation to ARPA/RADAR. Seventeen percent of Filipinos had more than five days CBT relating to ARPA/RADAR compared with 58% of non-Filipinos.

Filipino seafarers were also much more likely to report that on shore training took place after they had first used ARPA/RADAR than other nationality groups. Eighty percent of Filipinos received on shore training after they used the equipment compared with 48% of non-Filipinos. This pattern was repeated in relation to CBT on ARPA/RADAR with 78% of Filipinos receiving this after they had used the equipment compared with fewer (49%) non-Filipinos.

The preference for training ashore and instructor-led training on board which has already been identified in relation to AIS and GPS was even more marked in relation to ARPA/RADAR. Fifty-six percent of respondents recommended training ashore in connection with ARPA/RADAR and 24% favoured on board instructor-led training. Learning from colleagues (10%), onboard CBT (8%), and self-learning (3%) were forms of training recommended forms by far fewer seafarers when it came to learning about ARPA/RADAR.

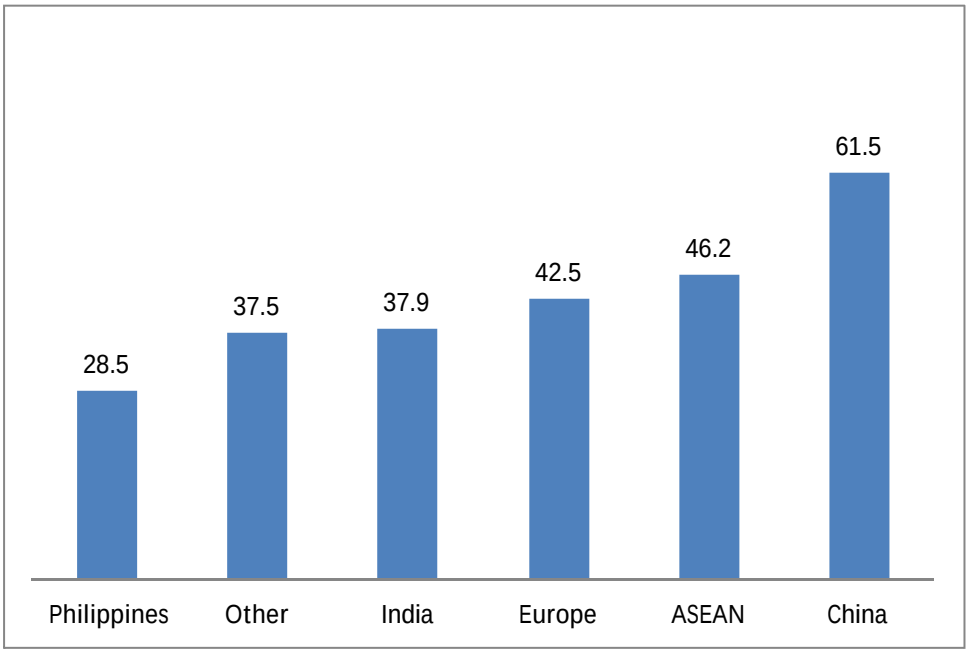
Global Maritime Distress and Safety System (GMDSS)

As reported previously seafarers (excluding cadets) were less confident about their skill levels relating to GMDSS than to the equipment discussed hitherto (AIS, GPS, ARPA/RADAR). Thirteen percent described their knowledge of GMDSS as 'basic'.

Whereas in relation to all the equipment discussed so far, respondents (excluding cadets) most frequently indicated that manuals had contributed to their knowledge, in terms of GMDSS, training ashore was nominated by most respondents (78%) as having contributed to their understanding. Consultation of manuals had contributed to the knowledge of 63% of respondents with fewer referencing the consultation of colleagues (39%), cadet training (38%), handover familiarisation and notes (30%), on board CBT (26%), and onboard training from an installation technician/dedicated trainer (22%).

In common with the equipment previously discussed, with regard to GMDSS, nationality was the variable of greatest significance in terms of the different forms of learning that seafarers indicated had contributed to their knowledge. Seafarers (excluding cadets) from China were the most likely to indicate that they had benefitted training on GMDSS as part of their cadet training programs (62%). Seafarers from the Philippines (29%) were the least likely group to identify GMDSS training as part of a cadet training program as having contributed to their knowledge (see Figure 19 for a more detailed picture).

Figure 19: Percentage of respondents identifying cadet training as contributing to their knowledge of GMDSS by nationality



In contrast when it came to on board computer-based training (CBT) it was Filipino seafarers who were the most likely to describe this as having contributed to their knowledge of GMDSS. Forty-two percent of Filipino seafarers described CBT as having contributed to their knowledge, followed in descending order by Indians (26%), ASEAN seafarers (23%), Chinese respondents (21%), and Europeans (10%).

Handover and familiarisation notes were identified most commonly by Filipino respondents as contributing to their understanding of GMDSS. Forty-seven percent of Filipinos indicated that handover familiarisation and notes were beneficial compared with 36% of Chinese seafarers, 22% of Europeans, 15% of ASEAN respondents, and just 11% of Indian seafarers.

Overall, significant differences were identified between nationalities when it came to forms of training that were 'instructor-led' (training ashore, on board training by an installation technician/dedicated trainer). Seafarers from India were the most likely to indicate that such training had contributed to their knowledge of GMDSS (91%). They were followed in descending order by Filipinos (85%), Europeans (82%), ASEAN respondents (77%), and Chinese seafarers (64%).

As with the other equipment discussed so far, rank significantly affected the responses of seafarers (excluding cadets) when it came to whether or not cadet training had contributed to their knowledge of GMDSS. Senior officers (22%) were much less likely than junior officers (51%) to indicate that it had. However as described earlier in this instance rank and sea-time may act as proxies for age as many older seafarers would have undertaken cadet training prior to the introduction of GMDSS. Sixty-seven percent of seafarers in the sample aged under thirty indicated that cadet training had contributed to their understanding of GMDSS compared with just five percent of seafarers aged over fifty. Similarly 67% of seafarers with less than fifty months of sea-time indicated they had benefitted from cadet training in relation to GMDSS, compared with just 5% of respondents with two hundred months or more at sea. These results tend to support the interpretation that differences in rank and sea-time can really be attributed to concurrent differences in age when it comes to interpreting the findings about cadet training programs having contributed to the equipment-related knowledge of qualified seafarers.

In the case of GMDSS, and in contrast to the findings relating to the equipment discussed hitherto, rank also affected the responses of seafarers in relation to on shore training. Senior officers (85%) were significantly more likely to indicate that training ashore had contributed to their knowledge of GMDSS than junior officers (72%).

Compared with the equipment discussed hitherto there was a marked difference in both the numbers of respondents who indicated that on shore training had contributed to their knowledge of GMDSS (n=346), and to the duration of that training. Seventy-four percent of the respondents who had benefitted from such training indicated that it had been of more than five days duration.

There were significant differences between Filipino and non-Filipino respondents when it came to the duration of on shore training. Fifty-five percent of Filipinos had received five days on shore training or more compared with 85% of non-Filipinos.

Where CBT had contributed to the acquisition of knowledge about GMDSS it had been of more than five days duration in 37% of cases and in relation to onboard training by an installation technician/dedicated instructor where this had taken place it was not usually of more than five days duration. It was of more than five days duration in just 31% of cases.

Filipinos once again reported shorter periods of CBT relating to GMDSS than other groups. Sixteen percent of Filipinos reported more than five days CBT concerning GMDSS compared with 57% of non-Filipinos.

Where seafarers indicated they had benefitted from training ashore (n=209) the majority (57%) had enjoyed such training after they had first been required to use GMDSS. Filipino respondents were more likely to have received training after they used GMDSS equipment (77%) than non-Filipinos (45%).

Generally, respondents had also received training after GMDSS was first used where CBT (n=84) had contributed to knowledge of GMDSS (63% benefitted from CBT after they had used the equipment) and where an installation technician/dedicated trainer (n=54) had contributed to their understanding (this took place after using equipment in 61% of cases).

Seafarers overwhelmingly recommended training ashore in relation to GMDSS. Sixty-one percent of respondents recommended training ashore compared with 24% who recommended onboard training from an installation technician/ dedicated trainer, six percent who recommended CBT and learning from colleagues respectively, and just four percent who recommended self-learning.

Electronic Chart Display and Information System (ECDIS)

Of the five pieces of equipment that deck officers (excluding cadets) were asked about the equipment that they were least confident about with regard to their skills was ECDIS. As reported earlier in this document, nine percent of respondents stated that they had 'zero' knowledge of ECDIS and a further 21% suggested that their knowledge was only basic.

Many seafarers indicated that training ashore (68%) and consulting manuals (64%) had contributed to their knowledge of ECDIS. Fewer indicated that consulting colleagues (40%), handover familiarisation and notes (33%), cadet training programs (27%) or CBT (27%) had assisted them in their learning about ECDIS.

There were some significant variations with regard to respondent nationality. Indian (81%) and Filipino (78%) seafarers were much more likely than others to indicate that training ashore had contributed to their knowledge of ECDIS. Only 59% of Europeans, 50% of ASEAN respondents and 42% of Chinese seafarers suggested that this was the case.

Similarly nationality affected the findings with regard to CBT. Filipinos (39%) were the most likely group to indicate that CBT had contributed to their knowledge of ECDIS. In contrast only 21% of Chinese, 18% of Indian, and 17% of European and ASEAN respondents respectively thought that this was the case.

Chinese (54%) and Filipino (50%) seafarers were the most likely to indicate that they found handover familiarisation and notes contributed to their knowledge of ECDIS. Other groups were much less likely to do so with only 24% of Europeans, 17% of ASEAN respondents and 8% of Indians suggesting that this was the case.

There was also a significant variation in the way that different ranks regarded cadet training in relation to their understanding of ECDIS. Senior officers were much less likely to regard cadet training as having contributed to their knowledge of ECDIS than junior officers. The proportion of junior officers who felt that cadet training had contributed to their knowledge of ECDIS was quite low (35%) but for senior officers this proportion was halved and stood at just 15%. Once again it seems that rank may be simply a proxy for age. Seafarers below the age of 30 were the most likely to regard cadet training as having contributed to their

knowledge of ECDIS (51%), followed by seafarers in their 30s (22%), Congruently, seafarers in their 40s and 50s were least likely to do so (9% and 6% respectively). With regard to sea-time, seafarers with less than 50 months of sea-time were most likely to report that cadet training contributed to their knowledge of ECDIS (46%). By contrast, 31 percent of seafarers with sea-time of 50-99 months and 13 percent of seafarers with sea-time of 100-149 months regarded cadet training as contributing to their knowledge of ECDIS, and none of the seafarers with sea-time 150 months or more did so. There was a significant affect of age on the extent to which seafarers identified handover familiarisation and notes as having contributed to their knowledge of ECDIS. Both older and younger seafarers were less likely to indicate that this was the case than seafarers in the middle age groups. Thus 21% of seafarers under 30 years old and 32% of seafarers aged 50 or older felt that handover familiarisation and notes contributed to their knowledge of ECDIS, whilst 41% of seafarers in their 30s and in their 40s respectively indicated that this was the case.

Whilst quite a few respondents had experienced training ashore relating to ECDIS (n=236), most of these had experienced five days training or less (73%). Similarly seafarers undertaking CBT on board (n=122) were most likely to indicate that this was for five days or less (76%) and this was also the case in relation to on board training by an installation technician/dedicated trainer (n=72) where 75% had experienced five days training or less.

In relation to training ashore, where this had taken place this had been after respondents had actually used ECDIS in the majority of cases (58%). This tendency was reported by Filipino respondents (74%) more commonly than non-Filipino respondents (47%). CBT and training onboard by an installation technician/dedicated instructor, where these had occurred, took place after ECDIS had been utilised by respondents in 60% of cases respectively.

The most recommended forms of training in relation to ECDIS were training ashore (48%) and on board training delivered by an installation technician/dedicated instructor (32%). On board CBT (8%), self-learning (7%), and learning from colleagues (5%) were recommended by fewer respondents.

Main Engine Manoeuvring and Control System (MEMCS)

Just as navigation officers were asked questions about learning in relation to specific equipment so too were engineers.

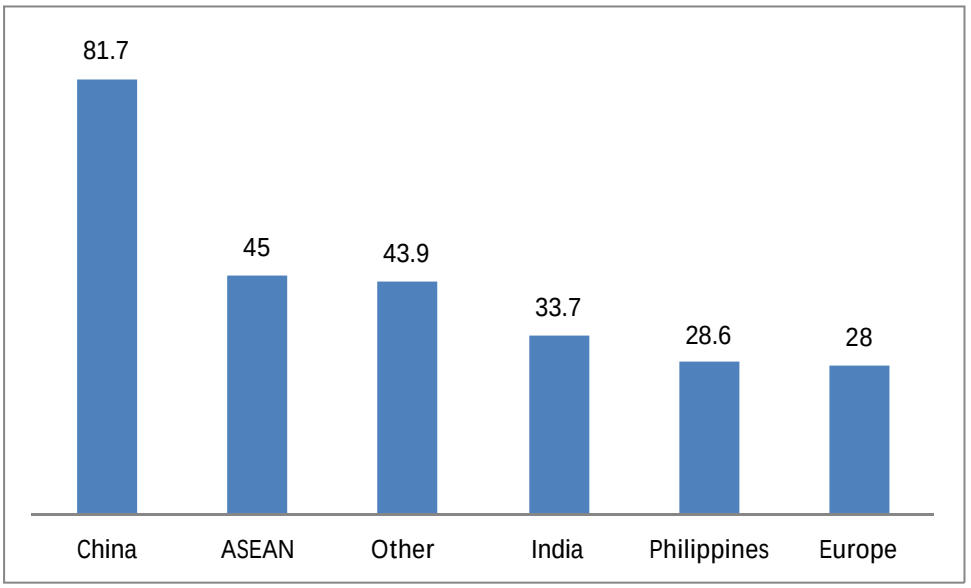
In relation to the Main Engine Manoeuvring and Control System (MEMCS) many (17%) suggested their knowledge was basic and only just over one in ten stated that their knowledge was 'excellent' as reported earlier.

Engineers overwhelmingly stated that consulting manuals had contributed to their learning about the MEMCS. Seventy-two percent of respondents had acquired knowledge in this way. They also consulted colleagues (in 39% of cases), had benefitted from cadet programs and onshore training (in 38% of cases respectively), acquired knowledge from handover familiarisation and notes (in 34% of cases), benefitted from on board training from an installation technician/dedicated trainer (in 28% of cases), and least frequently they had gained understanding from CBT relating to the MEMCS (in 24% of cases).

There were very significant nationality variations with regard to some forms of training relating to the MEMCS. Excluding cadets, for example, Chinese seafarers were much more

likely than other nationalities to state that they had acquired knowledge of the MEMCS from cadet programs. Eighty-two percent indicated that this was the case compared (in descending order) with 45% of ASEAN respondents, 34% of Indians, 29% of Filipinos, and just 28% of Europeans.

Figure 20: Percentage of respondents identifying cadet training as contributing to their knowledge of MEMCS by nationality



Nationality also had an effect on the responses of engineers when it came to the role of CBT in acquiring knowledge about the MEMCS. Like their compatriots on the deck side, Filipino engineers were most likely to say that CBT had contributed to their understanding of the MEMCS. Thirty-six percent of Filipino respondents suggested this compared with, 23% of Chinese engineers, 20% of Europeans, 15% of Indian engineers, and 10% of ASEAN respondents.

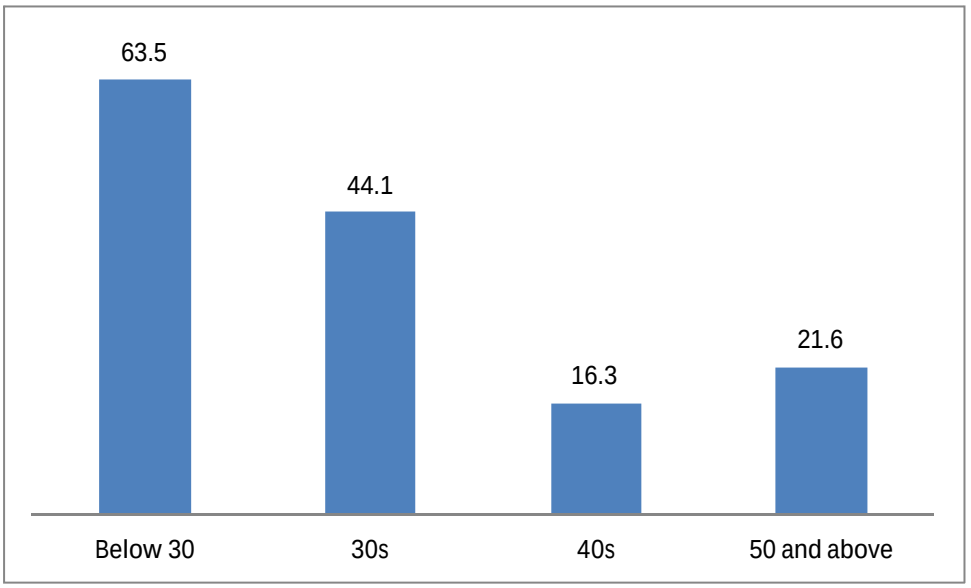
Handover familiarisation and notes were most frequently regarded as having contributed to knowledge of the MEMCS by Chinese engineers (48%). Europeans (39%) and Filipinos (39%) were also quite likely to suggest that handover familiarisation and notes had contributed to their knowledge of the MEMCS. This was less often the case amongst ASEAN (30%) and Indian (16%) engineers.

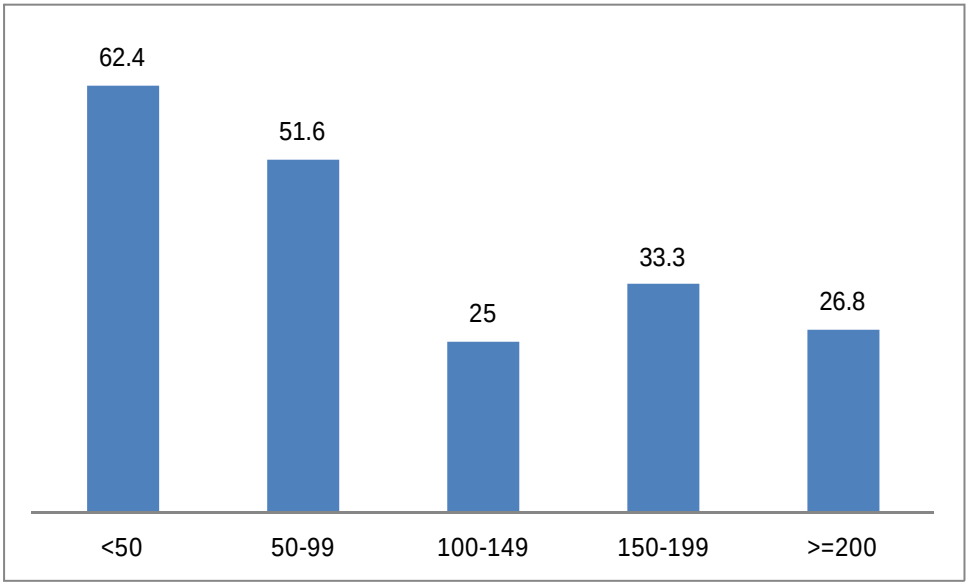
In relation to rank there were significant differences identified in terms of the role of manuals in the acquisition of knowledge about the MEMCS. Excluding cadets, senior officers were much more likely (81%) to identify manuals as contributing to their learning about the MEMCS than more junior respondents (65%). They were similarly more likely to identify handover familiarisation and notes as contributing to their understanding. Forty-three percent of senior officers and 27% of junior engineers stated that this was the case.

Younger engineers (excluding cadets) were more likely than older groups to indicate that cadet training had contributed to their understanding of the MEMCS. Those aged under forty were generally more likely (64%, 44%) than those aged over forty (16%, 22%) to state this to be the case. A similar pattern emerged in relation to sea-time with those who had less sea-

time being more likely to state that cadet programs had contributed to their understanding of the MEMCS than those with more sea-time (see Figure 21).

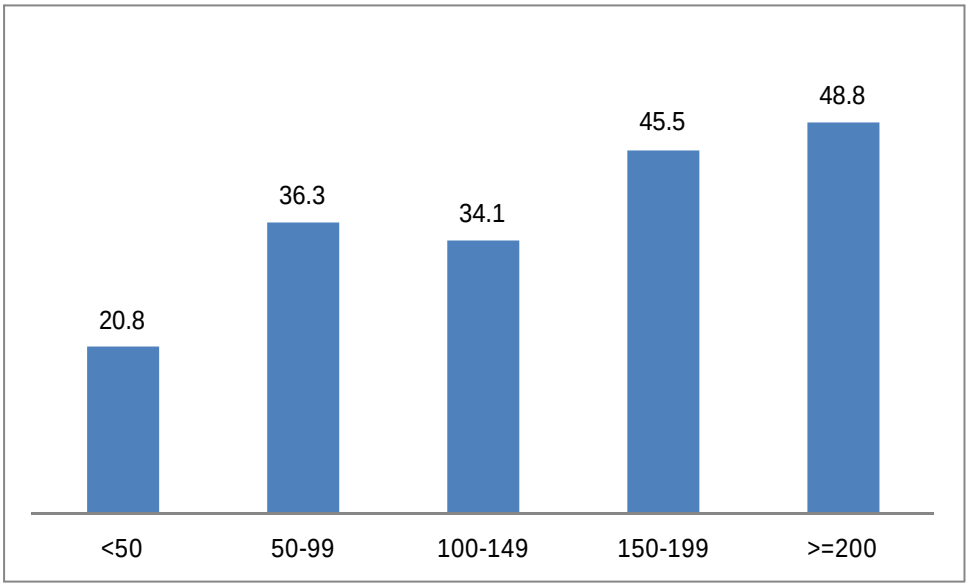
Figure 21: Percentage of respondents identifying cadet training as contributing to their knowledge of MEMCS by age and by sea-time





Less experienced seafarers (excluding cadets) were less likely than seafarers with more sea-time to identify handover familiarisation and notes as having played a part in the acquisition of knowledge about the MEMCS. Only 21% of seafarers with less than fifty months sea-time stated this was the case compared with 49% of those with two hundred months or more at sea (see Figure 22).

Figure 22: Percentage of respondents identifying handover familiarisation and notes as contributing to their knowledge of MEMCS by sea-time



Where engineers had benefitted from training ashore relating to the MEMCS (n=254) the majority (59%) had enjoyed more than five days training. Of those (n=182) who had undertaken CBT in relation to the MEMCS just over half (51%) had done so for more than five days. In relation to the less common experience of receiving training from an installation technician/dedicated trainer (n=150) less than half the engineers who had done so (37%) had experienced training of more than five days duration.

In relation to all three forms of training, where this had taken place it did so after engineers had first used the MEMCS. Seventy percent of training ashore took place after MEMCS was first used. Similarly, 75% of on board CBT and 79% of on board training by an installation technician/dedicated trainer took place after engineers first used the MEMCS.

As with their colleagues on the deck side we found that experience varied significantly with nationality in relation to both duration of on shore training and also its timing vis a vis operation of the MEMCS. Filipino seafarers were less likely to have received more than five days on shore training (47%) than their non-Filipino colleagues (67%). Filipino seafarers were also more likely to have received on shore training after they had operated the MEMCS. Eighty-eight percent of Filipino respondents stated that they had received training after operating the MEMCS compared with just 60% of non-Filipinos.

The significant variations between Filipinos and non-Filipinos were also found in relation to the timing, but not the duration, of other forms of training. Eighty-eight percent of Filipinos who had received CBT, received it after operating the MEMCS compared with 64% of non-Filipinos. Similarly 93% of Filipino respondents who had received on board training from a dedicated instructor received it after operating the MEMCS compared with 67% of non-Filipinos.

In relation to the training that engineers would recommend in connection with the MEMCS, most (35%) suggested that training ashore was the best option. The second most commonly recommended form of training relating to the MEMCS was on board instruction by an

installation technician/dedicated trainer (27%) and this was followed by the less favoured options of learning from colleagues (18%), on board CBT (11%), and self-learning (10%).

Oily Water Separators (OWS)

As previously reported, about one in ten engineers regarded their knowledge of Oily Water Separators (OWS) as basic or even 'zero'.

Given the importance of OWS for environmental management, it is perhaps surprising that formal training did not play a more significant part in contributing to the knowledge levels of engineers. In contrast it was manuals which were most referenced with regard to such a contribution with 77% of engineers indicating that these had been important. Consulting colleagues was highlighted by some engineers (39%) as was handover familiarisation and notes (36%) and similarly cadet training (36%). Less frequent mention was made of training ashore (30%), on board training from an installation technician/dedicated trainer (27%), and on board CBT (26%).

There were some variations in response according to nationality, age and sea-time. Chinese (77%) and ASEAN (55%) engineers were much more likely to identify cadet training as contributing to their understanding of OWS than other groups (Indians 36%, Filipinos 27%, Europeans 22%). Chinese respondents were also the most likely group (49%) to identify handover familiarisation and notes as contributing to their understanding of OWS. They were followed in descending order by Filipinos (41%), Europeans (39%), ASEAN (30%) and Indian (22%) engineers.

Figure 23: Percentage of respondents identifying cadet training as contributing to their knowledge of OWS by nationality

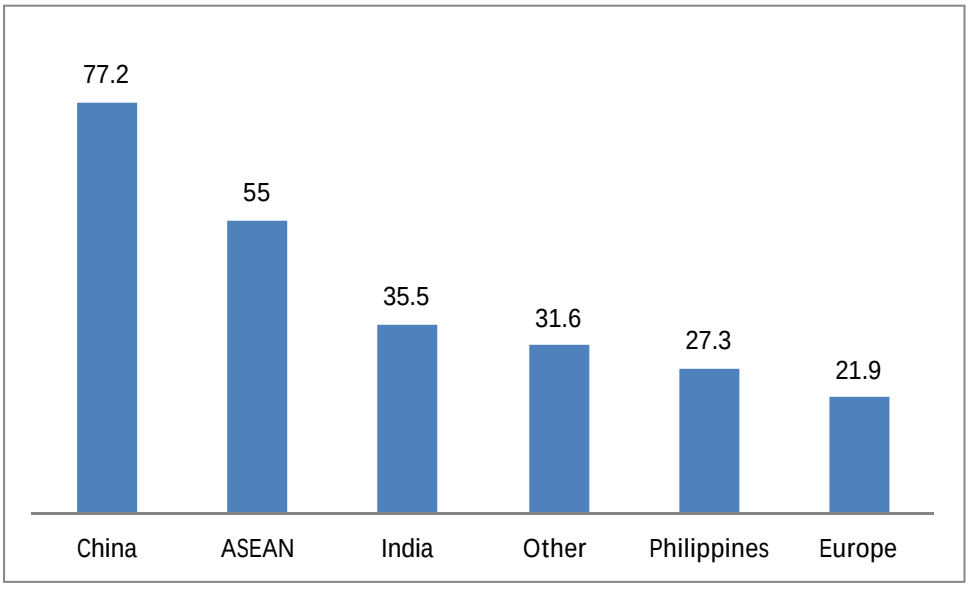
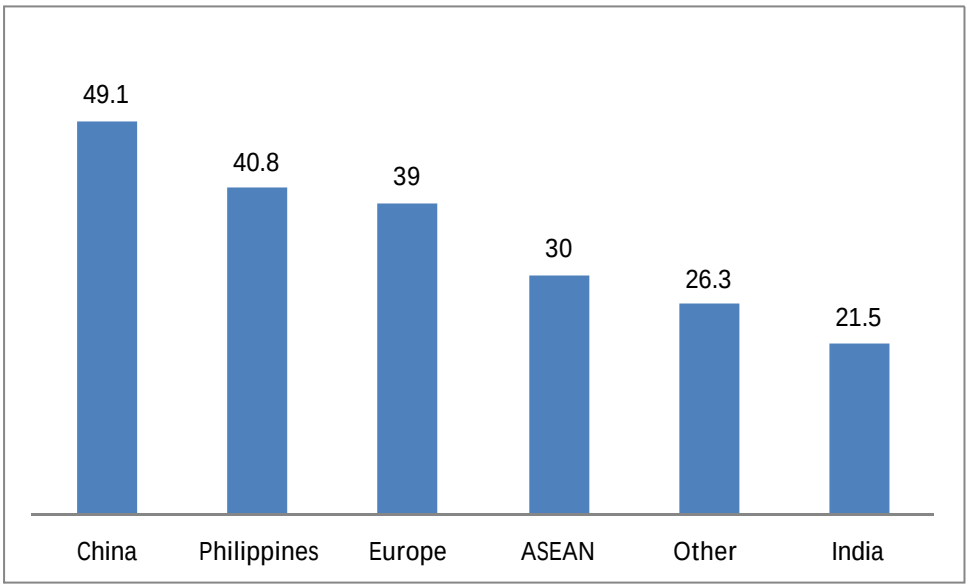


Figure 24: Percentage of respondents identifying handover familiarisation and notes as contributing to their knowledge of OWS by nationality



There was a significant variation identified in relation to rank and the consultation of manuals relating to OWS. Senior officers (84%) were much more likely to indicate that consulting manuals had contributed to their knowledge of OWS than junior officers (71%).

As has been common in relation to the equipment reported on so far, younger officers and those with less sea-time were the most likely groups to identify cadet training as contributing to their understanding of OWS. Whilst 60% of engineers aged under-thirty suggested this was the case only 18% of engineers aged fifty-plus did so. Similarly, 58% of engineers with less than fifty months sea-time referenced the importance of cadet training to their knowledge of OWS compared with 23% of those with two hundred months or more.

Age was also a relevant factor in relation to the importance of handover and familiarisation notes and consulting colleagues with knowledge of OWS. However from the pattern of responses a clear interpretation of the findings is not possible with regard to generally older and younger seafarers.

Where engineers had received training ashore relating to OWS (n=199) the majority (64%) had done so for five days or less. This was also the case when it came to CBT and on board training with an installation technician/dedicated trainer (n=145 and 140 respectively). In relation to CBT 74% had received five days training or less and in terms of the on board specialist training 70% indicated that training had been of a duration of five days or less.

In the majority of cases training took place after seafarers had first had experience of the OWS. In relation to training ashore 72% of engineers received this after using the equipment, in relation to CBT 77% indicated that they underwent this training after experience with OWS and training from installers/dedicated trainers also took place post-experience (of OWS) in 74% of cases. Nationality variations were, once again, apparent in relation to the timing of training concerning the OWS. Of the seafarers who had received on shore training

Filipino respondents (90%) were much more likely than non-Filipinos (58%) to have received training after working with the OWS. This was also the case with CBT where 90% of Filipinos who had received such training did so after working with the OWS compared with 64% of non-Filipinos.

The training which was most frequently recommended by engineers with regard to OWS, was on board training by a dedicated installation technician/trainer. Thirty-four percent of engineers recommended this form of training with training ashore being the next most recommended option (recommended by 23% of engineers). Learning from colleagues was recommended by 21% of seafarers, self-learning by 15% and on board CBT by just 7% of engineers in connection with learning about OWS.

High Voltage Equipment (HVE)

As reported earlier in this document seafarers lacked confidence in their skills relating to high voltage equipment (HVE) and 37% rated them as basic or 'zero'. In relation to what had contributed to their learning about high voltage equipment, 65% suggested they had learnt from manuals, 43% had learnt from training ashore, 41% from cadet training programs, and 39% had acquired knowledge from colleagues. Less frequently, engineers mentioned on board training from an installation technician/dedicated trainer (32%), handover familiarisation and notes (31%) and on board CBT (25%).

There were variations in response according to nationality when it came to acquiring knowledge from cadet training, from on board CBT and from handover familiarisation and notes.

Excluding cadets, Chinese engineers were the most likely (82%) to indicate that cadet training had played a part in the acquisition of knowledge about HVE. Other nationalities were less likely to indicate that cadet training contributed to their knowledge of HVE (ASEAN 44%, Indian 37%, European 34%, Filipino 32%).

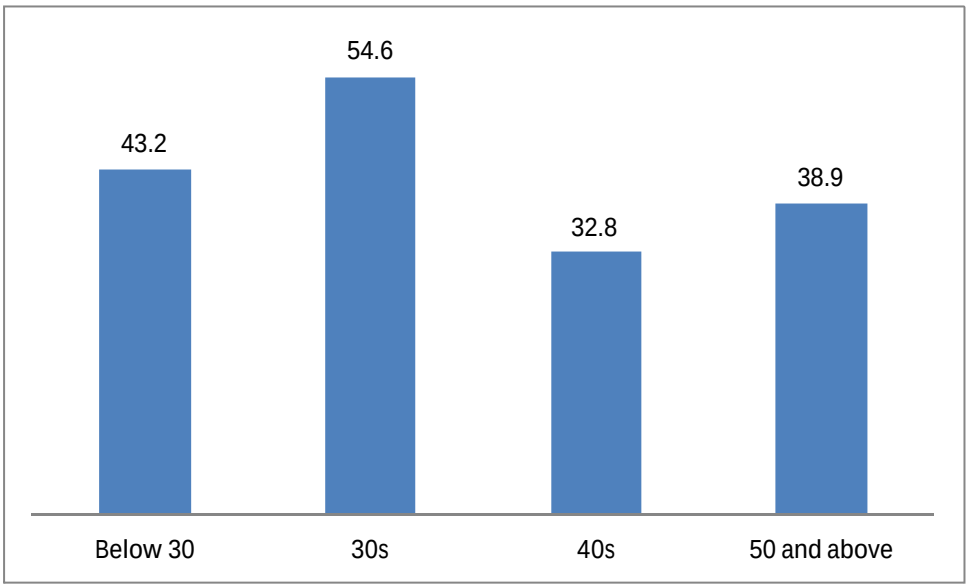
In common with the findings for other equipment, Filipino seafarers were the most likely nationality group to indicate that CBT had contributed to the acquisition of knowledge about HVE (36%). They were followed in descending order by Chinese seafarers 24%, ASEAN respondents 22%, Indians 19%, and Europeans 14%).

When it came to the contribution that had been made by handover familiarisation and notes Chinese seafarers (52%) were the most likely group to group to suggest that these were relevant. Fewer Filipinos (39%), Europeans (29%) ASEAN (22%) and Indian (14%) seafarers suggested that this was the case.

Age was once again a relevant factor in relation to the contribution cadet training had made to knowledge about HVE. Whilst 62% of the youngest age group (below 30) indicated that cadet training had been relevant to their acquisition of knowledge about HVE only 24% of those aged fifty or over suggested this had been the case. Similarly, whilst the pattern for sea-time was a little less clear it was generally the case that less experienced seafarers were more likely to indicate that cadet training had contributed to their knowledge of HVE than more experienced seafarers.

Age also appeared to affect the numbers of seafarers who had found that training ashore had contributed to their knowledge of HVE. Younger seafarers were generally more likely than older seafarers to indicate that this was the case (see Figure 25).

Figure 25: Percentage of respondents identifying onshore training as contributing to their knowledge of HVE by age



Where they had experienced training ashore in connection with the use of HVE (n=211), the majority of engineers (61%) had benefitted from more than five days training. This was not the case in relation to either on board CBT (n=128) or on board training with an installation technician or dedicated trainer (n=127). In these instances only 47% (CBT) and 45% (on board training with an installation technician) of engineers had enjoyed more than five days training.

There were nationality differences found in relation to the duration of on shore training with Filipinos reporting more than five days training less often (32%) than non-Filipino respondents (58%). In relation to all three forms of training the majority of respondents indicated that training had taken place after they had first used HVE. Sixty eight percent of respondents who had received training ashore had done so after they had first used HVE, 83% of respondents who had undertaken CBT had done so after they first used HVE and 78% of those who had received training on board from an installation technician or dedicated trainer had done so after first using HVE.

In terms of receipt of training on board ship with a dedicated trainer/technician, Filipinos who had received such training were more likely (92%) to have done so after utilising HVE than non-Filipino respondents (50%).

With regard to the form of training that respondents recommended in relation to HVE the most popular option was training ashore (47%). This was followed in descending order by on board training delivered by an installation technician or dedicated instructor (29%), learning from colleagues (13%), on board CBT (6%), and self-learning 4%).

Conclusion

This report has demonstrated that training is regarded as important by seafarers in relation to the acquisition of knowledge relating to new equipment and the on board application of new technology. Such training is not always optimal however and seafarers report that training is often provided after they have first been required to use equipment and that they are rarely involved in the identification of their own training needs. In almost half of the reported cases, seafarer officers were required to meet part, or all, of their own training costs, and over a quarter of them stated that they were **never** compensated for lost leave time when training. Such issues are likely to impact upon seafarer motivation and thereby upon the effectiveness of training.

Manuals were described frequently by respondents as having contributed to their knowledge of equipment. They were identified most commonly by respondents as contributing to knowledge of equipment with the exceptions of GMDSS and ECDIS. In the cases of GMDSS and ECDIS manuals were cited as important by the majority of respondents, however training ashore was cited by slightly more officers than manuals in both cases. This suggests an overwhelming dependence on manuals in relation to the acquisition of knowledge about, sometimes complex, equipment which is cause for some concern.

Experiences of training varied strongly with nationality and this may relate to patchy provision of training as well as national variations in training quality. Responses here are complex and preferences for one form of training amongst a particular group of seafarers cannot be easily interpreted. For example a preference for CBT may reflect a cultural bias relating to training methods or it could be indicative of the very poor quality of alternative methods of training previously experienced by respondents in this group. A strong emphasis on the importance of cadet training may indicate the high quality of such training or alternatively that this is the only training provided for many seafarers from a particular country. These findings therefore need to be interpreted with caution.

One of the most significant findings from the study relates to the timing of current training provision. In relation to every piece of equipment which deck officers and engineers were asked about, the majority stated that where training was provided, it was provided **after** officers had first used the related equipment. This may, in part, explain the reliance on manuals which has already been identified. However, in the context of an international workforce for whom manuals may not be available in 'mother-tongue', and given the established limitations of manuals, such reliance is problematic.

References

Bailey, N., Ellis, N., Sampson, H. (2008) 'Training and Technology Onboard Ship: How seafarers learned to use the shipboard Automatic Identification System (AIS)', SIRC Publication, July, ISBN: 1-900174-34-0.

Baldwin, T. T., Magjuka, R. J., and Loher, B. T. (1991) 'The perils of participation: Effects of choice of training on trainee motivation and learning', *Personnel Psychology***,** 44: 51-66.

Mathieu, J.E. and Martineau, J.W. (1997) 'Individual and Situational Influences in Training Motivation', in J.K. Ford, S.W. Kozlowski, K. Kraiger, E. Salas, and M.S. Teachout (eds) Improving Training Effectiveness in Work Organisations, pp223-246. Mahwah: Lawrence Erlbaum Associates, Inc., Publishers.

National Transportation Safety Board, 'Allision of Hong Kong Registered Containership M/V *Cosco Busan* with the Delta Tower of the San Francisco–Oakland Bay Bridge San Francisco, California November 7, 2007' Accident Report, http://www.ntsb.gov/doclib/reports/2009/MAR0901.pdf accessed March 15 2011.

Opposing Views (www.opposingviews.com), Pilot Who Crashed Ship Into Golden Gate Bridge Imprisoned, http://www.opposingviews.com/i/pilot-who-crashed-ship-into-golden-gate-bridge-imprisoned accessed March 16 2011.

Taylor, S.E. (1989) *Positive Illusions: Creative Self-Deception and the Healthy Mind*. New York: Basic Books.

Taylor, S.E. and Brown, J.D. (1988) 'Illusion and Well-Being: A Social Psychological Perspective on Mental Health'. *Psychology Bulletin*, 103(2): 193-210.

UK P&I Club, The Human Element, The cost of human error, http://www.ukpandi.com/loss-prevention/risk-management-advice/the-human-element/ accessed March 16 2011.

Appendix One: Sample by nationality

Country	Number of respondents	Percentage
Philippines	330	32.8
India	179	17.8
China	126	12.5
European countries together	**254**	**25.3**
Ukraine	42	4.2
Russia	34	3.4
United Kingdom	29	2.9
Poland	25	2.5
Germany	22	2.2
Netherlands	15	1.5
Croatia	14	1.4
Romania	12	1.2
Lithuania	11	1.1
Sweden	10	1
Denmark	8	0.8
Greece	7	0.7
Bulgaria	4	0.4
Italy	3	0.3
Latvia	3	0.3
Spain	3	0.3
Montenegro	3	0.3
Georgia	2	0.2
Norway	2	0.2
Albania	1	0.1
Finland	1	0.1
France	1	0.1
Ireland	1	0.1
Slovakia	1	0.1

ASEAN countries together	37	3.7
Burma/ Myanmar	18	1.8
Indonesia	9	0.9
Malaysia	9	0.9
Viet Nam	1	0.1
Other countries	79	7.9
Turkey	16	1.6
Sri Lanka	9	0.9
United States	8	0.8
Taiwan	7	0.7
Iran	6	0.6
Bangladesh	5	0.5
Israel	4	0.4
Japan	3	0.3
Panama	3	0.3
Syria	3	0.3
Australia	2	0.2
Montserrat	2	0.2
Pakistan	2	0.2
Korea, South	2	0.2
Canada	1	0.1
Cape Verde	1	0.1
Egypt	1	0.1
Faeroe Islands	1	0.1
Ghana	1	0.1
Peru	1	0.1
South Africa	1	0.1
Unspecified	2	0.2

Appendix Two: Sample by Rank

Rank	Frequency	Percent
Captain	84	8.3
Chief mate	99	9.8
Second mate	123	12.2
Third mate	126	12.5
Deck cadet	46	4.6
Chief engineer	109	10.8
Second engineer	113	11.2
Third engineer	106	10.5
Fourth engineer	77	7.6
Electrician	80	7.9
Engine cadet	39	3.9
Unspecified	5	0.5

Appendix Three

Duration of AIS onshore training by nationality

		AIS onshore training		
		5 days of less	More than 5 days	Total
Nationality group	Philippines	78	8	86
		90.7%	9.3%	100.0%
	India	20	6	26
		76.9%	23.1%	100.0%
	China	3	8	11
		27.3%	72.7%	100.0%
	Europe	39	11	50
		78.0%	22.0%	100.0%
	ASEAN	4	1	5
		80.0%	20.0%	100.0%
	Other	10	3	13
		76.9%	23.1%	100.0%
	Total	154	37	191
		80.6%	19.4%	100.0%

Duration of AIS onshore training by nationality (Filipino vs. non-Filipino)

		AIS onshore training		
		5 days of less	More than 5 days	Total
Filipino and non-Filipino	Filipino	78	8	86
		90.7%	9.3%	100.0%
	Non-Filipino	76	29	105
		72.4%	27.6%	100.0%
	Total	154	37	191
		80.6%	19.4%	100.0%

Duration of AIS Computer-Based training by nationality

		AIS CBT		
		5 days of less	More than 5 days	Total
Nationality group	Philippines	52	16	68
		76.5%	23.5%	100.0%
	India	14	3	17
		82.4%	17.6%	100.0%
	China	0	10	10
		.0%	100.0%	100.0%
	Europe	26	11	37
		70.3%	29.7%	100.0%
	ASEAN	2	1	3
		66.7%	33.3%	100.0%
	Other	5	3	8
		62.5%	37.5%	100.0%
	Total	99	44	143
		69.2%	30.8%	100.0%

AIS onshore training – when training took place (Filipino vs. Non-Filipino)

	AIS onshore training		
	Training before actual use	Training after actual use	Total
Filipino	11	44	55
	20.0%	80.0%	100.0%
Non-Filipino	36	30	66
	54.5%	45.5%	100.0%
Total	47	74	121
	38.8%	61.2%	100.0%

GPS onshore training – Duration of training (Filipino vs. Non-Filipino)

		GPS onshore training		
		5 days of less	More than 5 days	Total
Filipino and non-Filipino	Filipino	54	8	62
		87.1%	12.9%	100.0%
	Non-Filipino	60	52	112
		53.6%	46.4%	100.0%
	Total	114	60	174
		65.5%	34.5%	100.0%

GPS CBT – Duration of training (Filipino vs. Non-Filipino)

		GPS CBT		
		5 days of less	More than 5 days	Total
Filipino and non-Filipino	Filipino	49	8	57
		86.0%	14.0%	100.0%
	Non-Filipino	33	23	56
		58.9%	41.1%	100.0%
	Total	82	31	113
		72.6%	27.4%	100.0%

GPS onshore training – when training took place (Filipino vs. Non-Filipino)

		GPS onshore training		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	9	30	39
		23.1%	76.9%	100.0%
	Non-Filipino	46	30	76
		60.5%	39.5%	100.0%
	Total	55	60	115
		47.8%	52.2%	100.0%

GPS CBT – when training took place (Filipino vs. Non-Filipino)

		GPS CBT		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	8	22	30
		26.7%	73.3%	100.0%
	Non-Filipino	22	19	41
		53.7%	46.3%	100.0%
	Total	30	41	71
		42.3%	57.7%	100.0%

RADAR/ARPA onshore training – Duration of training (Filipino vs. Non-Filipino)

		ARPA onshore training		
		5 days of less	More than 5 days	Total
Filipino and non-Filipino	Filipino	67	40	107
		62.6%	37.4%	100.0%
	Non-Filipino	62	123	185
		33.5%	66.5%	100.0%
	Total	129	163	292
		44.2%	55.8%	100.0%

RADAR/ARPA CBT – Duration of training (Filipino vs. Non-Filipino)

		ARPA CBT		
		5 days of less	More than 5 days	Total
Filipino and non-Filipino	Filipino	50	10	60
		83.3%	16.7%	100.0%
	Non-Filipino	25	35	60
		41.7%	58.3%	100.0%
	Total	75	45	120
		62.5%	37.5%	100.0%

RADAR/ARPA onshore training – When training took place (Filipino vs. Non-Filipino)

		ARPA onshore training		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	12	49	61
		19.7%	80.3%	100.0%
	Non-Filipino	64	58	122
		52.5%	47.5%	100.0%
	Total	76	107	183
		41.5%	58.5%	100.0%

RADAR/ARPA CBT – When training took place (Filipino vs. Non-Filipino)

		ARPA CBT		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	8	28	36
		22.2%	77.8%	100.0%
	Non-Filipino	23	22	45
		51.1%	48.9%	100.0%
	Total	31	50	81
		38.3%	61.7%	100.0%

GMDSS onshore training – Duration of training (Filipino vs. Non-Filipino)

		GMDSS onshore training		
		5 days of less	More than 5 days	Total
Filipino and non-Filipino	Filipino	55	66	121
		45.5%	54.5%	100.0%
	Non-Filipino	34	190	224
		15.2%	84.8%	100.0%
	Total	89	256	345
		25.8%	74.2%	100.0%

GMDSS CBT – Duration of training (Filipino vs. Non-Filipino)

		GMDSS CBT		
		5 days of less	More than 5 days	Total
Filipino and non-Filipino	Filipino	52	11	63
		82.5%	17.5%	100.0%
	Non-Filipino	27	36	63
		42.9%	57.1%	100.0%
	Total	79	47	126
		62.7%	37.3%	100.0%

GMDSS onshore training – When training took place (Filipino vs. Non-Filipino)

		GMDSS onshore training		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	17	58	75
		22.7%	77.3%	100.0%
	Non-Filipino	73	60	133
		54.9%	45.1%	100.0%
	Total	90	118	208
		43.3%	56.7%	100.0%

GMDSS CBT – When training took place (Filipino vs. Non-Filipino)

		GMDSS CBT		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	10	31	41
		24.4%	75.6%	100.0%
	Non-Filipino	21	22	43
		48.8%	51.2%	100.0%
	Total	31	53	84
		36.9%	63.1%	100.0%

MEMCS onshore training – Duration of training (Filipino vs. Non-Filipino)

		MEMCS onshore training		
		5 days of less	More than 5 days	Total
Filipino and non-Filipino	Filipino	51	45	96
		53.1%	46.9%	100.0%
	Non-Filipino	53	105	158
		33.5%	66.5%	100.0%
	Total	104	150	254
		40.9%	59.1%	100.0%

MEMCS onshore training – When training took place (Filipino vs. Non-Filipino)

		MEMCS onshore training		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	8	57	65
		12.3%	87.7%	100.0%
	Non-Filipino	42	63	105
		40.0%	60.0%	100.0%
	Total	50	120	170
		29.4%	70.6%	100.0%

MEMCS CBT – When training took place (Filipino vs. Non-Filipino)

		MEMCS CBT		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	7	49	56
		12.5%	87.5%	100.0%
	Non-Filipino	25	45	70
		35.7%	64.3%	100.0%
	Total	32	94	126
		25.4%	74.6%	100.0%

MEMCS onboard trainer – When training took place (Filipino vs. Non-Filipino)

		MEMCS onboard trainer		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	3	40	43
		7.0%	93.0%	100.0%
	Non-Filipino	18	37	55
		32.7%	67.3%	100.0%
	Total	21	77	98
		21.4%	78.6%	100.0%

OWS onshore training – When training took place (Filipino vs. Non-Filipino)

		OWS onshore training		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	6	52	58
		10.3%	89.7%	100.0%
	Non-Filipino	32	44	76
		42.1%	57.9%	100.0%
	Total	38	96	134
		28.4%	71.6%	100.0%

OWS CBT – When training took place (Filipino vs. Non-Filipino)

		OWS CBT		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	5	47	52
		9.6%	90.4%	100.0%
	Non-Filipino	19	33	52
		36.5%	63.5%	100.0%
	Total	24	80	104
		23.1%	76.9%	100.0%

HVE onboard – Duration of training (Filipino vs. Non-Filipino)

		HVE onboard trainer		
		5 days of less	More than 5 days	Total
Filipino and non-Filipino	Filipino	44	21	65
		67.7%	32.3%	100.0%
	Non-Filipino	26	36	62
		41.9%	58.1%	100.0%
	Total	70	57	127
		55.1%	44.9%	100.0%

HVE onshore training – When training took place (Filipino vs. Non-Filipino)

		HVE onshore training		
		Training before actual use	Training after actual use	Total
Filipino and non-Filipino	Filipino	5	57	62
		8.1%	91.9%	100.0%
	Non-Filipino	41	41	82
		50.0%	50.0%	100.0%
	Total	46	98	144
		31.9%	68.1%	100.0%