

Crew Connectivity 2015 Survey Report

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Introduction

Communicating or Connected? The real opportunity for shipping

- K D Adamson

The message from the 2014 Crew Communications Survey, was that access to crew communications was an improving picture, but far from good enough. That's not a groundbreaking conclusion, but what was new was the extent to which the data was beginning to demonstrate that this state of affairs doesn't just disadvantage crew.

Crew want to speak to, or see their loved ones on video, as regularly and affordably as possible and the industry has the technology to make that a reality. But whilst the arguments made for access to crew communications have always centred around the basic right to be in contact with family, and a happier, more engaged workforce—and more recently, the provisions of the MLC 2006—there is another hugely significant dimension for operators. Put simply, it's no longer just a moral or regulatory imperative, but a commercial one.

For many years the prime driver for the uptake of IP satellite systems has been cited by ship operators as crew communications and welfare, and as this year's 2015 survey has confirmed once again, crew making decisions about who to work for consider comms provision a major factor. So the bot-

Crew have quite rightly been vocal about their desire for communications on board and, like any weary parent, ship operators have given in. But what they're beginning to see is that crew have done them—and the industry—a massive favour.

tom line is that you're looking for quality crew, and they're looking for quality onboard communications. But as some operators are beginning to understand, there is a value to them over and above a better chance of hiring better crew.

In another survey undertaken this year on behalf of network operator Intelsat, FutureNautics Research identified that for the first time since the data was first collected six years

ago, the prime driver for operators to fit IP satellite systems was not crew welfare, but operational efficiency. As a headline that makes it sound as though operators have hardened their hearts, but that is to misunderstand the shift that's taking place.


As the future of the maritime and shipping industry takes shape it is clear that the rate of change is increasing rapidly. That's due largely to the fact that shipping is becoming information-enabled, and as Moore's Law has taught us, any activity or industry that becomes information-enabled and starts operating digitally is likely to see the rate of change grow exponentially. Connectivity is the backbone of that change, and it needs to drive a far more holistic understanding of crew, not just as people who want to phone home once in a while, but as reservoirs of untapped value who can be better supported, better heeded and more deeply embedded into the organisation.

The industry is coming to the realisation that connecting crew to their families is only the beginning. That the proliferation of apps onboard like Whatsapp, which has stormed into the survey this year from nowhere last, shows new ways to deliver their services, support and engage crew.

In many respects this is a victory for pester-power. Crew have quite rightly been vocal about their desire for communications on board, and like any weary parent, ship operators have given in. But what they're beginning to see is that crew have done them, and the industry, a massive favour. Because having made the investment in these IP satellite systems, many of these enterprises are now discovering they have access to digital products and services, and methods of digital operation, that they wouldn't have had otherwise.

The difference between crew who communicate and those who are connected is a subtle but important one. It's also why



A large ship hull is shown under construction in a dry dock. The hull is painted white at the top and red at the bottom. The ship is positioned between two long, dark metal structures. To the right, a tall metal scaffolding structure is visible. The sky is filled with dramatic, colorful clouds in shades of blue, orange, and yellow, suggesting a sunset or sunrise. The lighting is warm and golden, casting long shadows on the ground.

"Cyber resilience is going to be one of the great struggles of this, and every other industry in the future. Rapid engagement, and acknowledgment that regulation could be coming faster than anyone yet realises, is essential. Ladies and gentlemen, it starts here."

this year the name of the survey became the Crew Connectivity Survey, rather than Crew Communications.

It's already been demonstrated in shore-based organisations that the data and knowledge being hidden in email strings and siloed department-specific databases hold insight that could transform the way leaders manage, operate and grow their companies.

To date our ships have been the biggest siloes in our organisations, but now we are beginning to unlock the data they're generating. Crew don't just need to communicate, they need to be able to connect with and interact with increasing amounts of data which is coming not just from the humans around them, but also increasingly the ship and even the cargo itself. Automation and digital interfaces are growing, as are new kinds of relationships with suppliers who may be monitoring equipment in real time from shore, or interacting directly with crew on procurement decisions on an e-procurement platform like ShipServ.

In forward-thinking ship operating companies a clear priority is evolving, and that is to capture the true value of their investment in IP connectivity. And that means connecting crew not just to family, but to absolutely everything they can.

The efficiencies and opportunities to create value and grow companies by connecting the organisation to employees and customers, and adopting new digital strategies aren't in question, or at least they shouldn't be. But there is one thing which should be raising an alarm. At the beginning of 2015 the World Economic Forum in Davos projected that the fear of cyber crime could act as a brake on technology-adoption, thereby costing the world economy more than \$3 trillion.

It's a problem for every industry, but anecdotal evidence to date has suggested that shipping is in more trouble than most. Seeking some hard, reliable data on cyber security and incidents, we decided to include a question set in this year's survey, and the results should be a wake-up call for the industry.

Only 12% of crew had received any form of cyber security training. In addition, only 43% of crew were aware of any cyber-safe policy or cyber hygiene guidelines provided by their company for personal web-browsing or the use of removable media (USB memory sticks etc.). Perhaps unsurprisingly, given the above statistics, fully 43% of crew reported that they had sailed on a vessel that had become infected with a virus or malware.

For an industry that sits at the heart of countless logistics and value chains, carries cargoes for governments and defence departments, and includes within it critical infrastructure such as ports, this is a situation which has to be addressed.

Cyber awareness and resilience is not an IT issue, it is a downside risk of the increased dependence upon technology that digital operation inevitably entails and it must be grasped and managed by boards accordingly.

It is essential that ship operators acknowledge the fact that cyber attacks now target users rather than infrastructure. The survey has demonstrated for another year that we have a highly IT-literate workforce and it's time to harness that capacity and leverage it to develop a real culture of cyber-awareness.

Training providers have to engage too, developing new, cyber focussed training and evaluation programmes in support. The impact of cyber extends across the piece, from virtually all insurance cover—aside from notable exceptions such as Marsh's Cyber Gap product—carrying a cyber loss exclusion clause, to crew themselves indicating this year that they are becoming concerned about the safety of their personal and financial data whilst using onboard networks.

Cyber resilience is going to be one of the great struggles of this, and every other industry in the future, and with moves already underway in the US to draw up maritime cyber security requirements for vessels, rapid engagement and an acknowledgment that regulation could be coming faster than anyone yet realises, is essential. Ladies and gentlemen, it starts here.

The 2014 survey has now been downloaded in excess of 20,000 times, and we continue to see the data referenced in presentations and articles, PhD theses, and sometimes even quoted back to us. That we're able to conduct a study of this depth and make it freely available to absolutely anyone who has an interest in it is as a result of the individuals and organisations like PTC, InterManager, BIMCO, ISWAN and CrewToo, who continue to collaborate with us. It's also down to the companies who continue to support the research and its objectives by advertising within the survey report, like Inmarsat, SingTel, KVH and Marlink.

Of course there's one set of stakeholders I haven't mentioned yet, and that's the crew themselves, over 3,000 of whom have taken the time and energy to complete the questionnaires either on paper, or online. Without the incredible level of engagement from those crew we wouldn't have such valuable data. I imagine they're making a very Millennial calculation, that the data they've offered freely will buy them a benefit down the road.

And I hope they're right. Not just for their sakes, but for the industry as a whole.

K D Adamson is a futurist specialising in the blue domain, and the founder and editor of Futureonautics

The Crew Connectivity Survey 2015

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Market value

Futurenautics estimates the market value for crew communications at sea in the major sectors at \$1.87bn USD per annum, an increase of nearly \$500m (*Table 1*).

This estimate is based on the expenditure by officers and ratings in each sector. With the exception of the Passenger and Offshore sectors it is based on 20 crew members per vessel with a split of 8 officers to 12 ratings. It also takes into account those that do not have access to any form of crew communications services, those that choose not to use them as well as those that are provided the services free of charge by the ship operator.

The increase in market size is accounted for primarily by increase in ships/crew numbers in the Passenger sector coupled with increased spend by ratings. The Bulk Carrier vessel numbers have also increased significantly in the last 12 months as has ratings spend on crew connectivity.

The Passenger and Tanker sectors remain the most significant markets for crew communications. The Passenger market is important because of the disproportionate number of crew in this sector in comparison to other commercial sectors.

Despite a large difference in rating and officer expenditure this is still the largest market by spend. The Tanker market (here we include crude, product and chemical tankers)

is the largest sector by vessel numbers, and expenditure by both ratings and officers is high. The Bulk Carrier sector is the third most valuable market growing significantly in importance in the last 12 months

Futurenautics estimates the shore based crew communications market at \$1.46bn per annum, an increase of \$0.24bn. (*Table 2*) This estimate is based on expenditure by officers and crew from each sector whilst ashore or in coastal waters where terrestrial (non-satellite) communications solutions are available. The estimate accounts for those crew members who do not go ashore during port calls.

The Bulk Carrier and Tanker sectors are the most significant markets, in terms of value, for the shore based crew communications markets.

Once again officers' expenditure was higher in all sectors apart from the Gas Carrier sector. Expenditure by officers in the other sectors was significantly higher than for ratings but the gap has substantially narrowed since last year. The Passenger sector, is now as significant a market as it is for crew communications services at sea.

Combined, the shore-based and sea-based crew communications market is worth in excess of \$3.3bn per annum an increase of \$0.6bn.



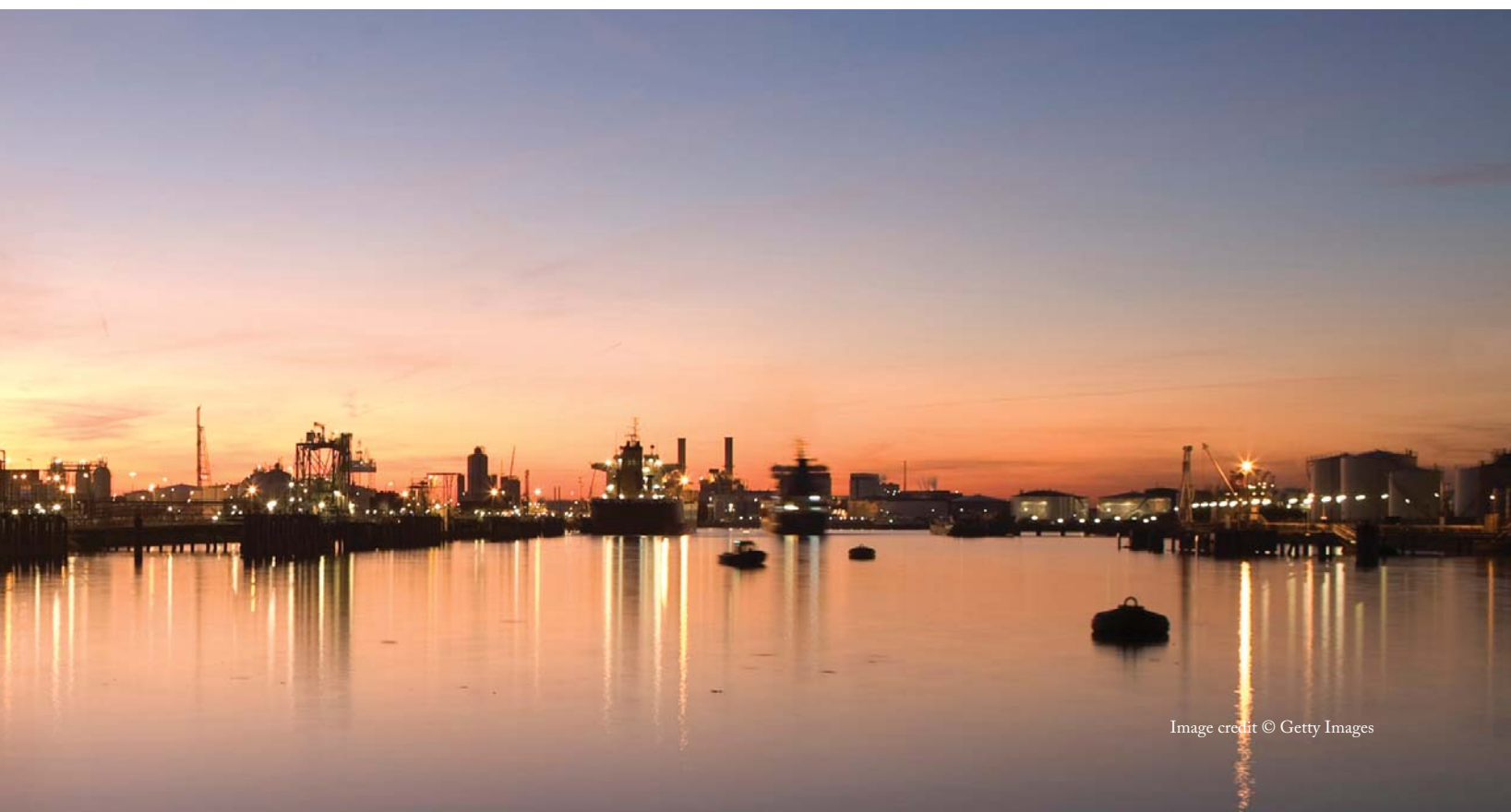
Table 1 | Expenditure at Sea

Sector	No. Vessels*	No. of Crew	Ratings	Officers	Market Value \$m
Tanker	16,686	333,720	\$126.52	\$190.00	\$475
Gas Carrier	1,736	34,720	\$152.50	\$84.30	\$41
Car Carrier	782	15,640	\$55.00	\$69.99	\$11
Bulk Carrier	13,152	263,040	\$183.01	\$112.59	\$374
General Cargo	4,899	97,980	\$122.92	\$163.10	\$122
Container	5,184	103,680	\$113.00	\$117.47	\$113
Offshore	7,162	85,944	\$47.17	\$95.24	\$53
Passenger	7,083	401,993	\$214.09	\$263.50	\$865
Other	6,786	135,720			
Total	63,470	1,472,437			\$1,869

* Clarksons Research

Table 2 | Expenditure Ashore

Sector	No. Vessels	No. of Crew	Ratings	Officers	Market Value \$m
Tanker	16,686	333,720	\$96.67	\$119.09	\$343
Gas Carrier	1,736	34,720	\$291.67	\$112.13	\$54
Car Carrier	782	15,640	\$50.00	\$56.50	\$9
Bulk Carrier	13,152	263,040	\$144.71	\$155.21	\$395
General Cargo	4,899	97,980	\$142.78	\$164.70	\$153
Container	5,184	103,680	\$97.41	\$125.94	\$107
Offshore	7,162	85,944	\$18.95	\$93.07	\$29
Passenger	7,083	401,993	\$82.27	\$109.51	\$367
Other	6,786	135,720			
Total	63,470	1,472,437			\$1,456



Crew Connectivity 2015

The 2015 Crew Connectivity Survey took place between April 2015 and August 2015. The survey was completed either digitally, online, or via a paper-based questionnaire. Responses were then collated, paper-based questionnaire data manually keyed, cleansed, and the results calculated and analysed.

As in previous years, we are indebted to a range of organisations for assisting in the dissemination of the survey link and paper questionnaires. Philippine Transmarine Carriers, a leader in the Philippine maritime industry deploying over 35,000 Filipino global maritime professionals on board close to 700 vessels, and offering an integrated value chain of services, continued their support in 2015 by making the survey available to all crew passing through their facilities.

Both InterManager, the international ship management organisation known as 'the voice of ship management', ISWAN—the International Seafarers Welfare and Assistance Network—and BIMCO were instrumental in lending their support to the survey and promoting the completion of surveys by the crews of their memberships. Crew social networking site Crewtoo, part of the KVH Media Group also offered invaluable assistance in creating awareness of the survey amongst their 100,000 strong—and growing—online community.

Respondents

Thanks to the efforts of all involved the total number of respondents was in excess of 3,057 representing over 30 different nationalities. The top ten nationalities represented were Filipino (31%), Indian (20%) and Ukrainian (9%) followed by Russian, Romanian, Pakistani, Bangladeshi, Polish and Sri Lankan. (Figure 1) The 'Other' category accounted for 13% of respondents and were predominantly from Western Europe (27%), other Eastern European countries (17%) and South America (16%).

Of the total respondent base, 59% were officers whilst 41% of respondents were ratings. The balance between officers and ratings does not correspond to the typical balance on an average commercial vessel, but does reflect the greater level of day-to-day access to communications that is enjoyed by officers. However, wherever meaningful the results are broken down by officers/ratings, to enable accurate reporting, analysis and conclusions to be drawn.

We asked all respondents to give us information about themselves including to which age group they belonged: 18-24 years; 25-34 years; 35-44 years; and 45 years or over. The youngest age group represented the smallest number of respondents at 342, the 25-34 year age group the largest at 1062 respondents, and the remaining 35-44 and 45+ age groups 792 and 789 respondents respectively.

The highest number of officers were represented in the 45+ age group at 70%. The lowest number of officers were

once again seen in the youngest age group, 18-24, at 39%.

Sectors

Of our respondents, 92% worked on vessels in the major sectors; namely, Tanker, Bulk, Gas, Car/Truck (PCTC), Off-shore, General Cargo, Container and Passenger. Although a further 12 sectors were represented—everything from coastal vessels and tugs to super yachts—analysis centres around the key sectors for the commercial maritime market. (Figure 2)

The proportion of respondents from each of these sectors corresponds approximately to the spread of vessel type across the world fleet. (Figure 3)

Sea Time

On average respondents spent 7.4 months per year at sea. Ratings spent 7.8 months at sea, slightly more than officers who spent 7.2 months per year at sea. When looking at this data in terms of age groups, those aged over 45 spent least time at sea at 6.9 months, and all other age groups were very similar in terms of sea time at 7.5 months. There was no evidence in this survey of less time being spent at sea by the youngest seafarers, meaning that it is not possible to draw any meaningful conclusion regarding Millennials' reluctance to spend prolonged time at sea.

Port Calls

When asked about port calls, respondents reported that 33% of port calls were greater than 24 hours duration. 28% of port calls were less than 12 hours in duration and 21% were 12-24 hrs in duration. 72% of respondents either never, or were rarely able to go ashore during these port calls, a slightly lower figure than last year by 4%. 22% said that they were able to go ashore on most port calls up—4%, and 6% said they were able to go ashore during every port call. A higher percentage of officers 'never' or 'rarely' were able to go ashore during port calls, whereas a higher percentage of ratings were able to go ashore during most of every port call, a statistic which reflects the demands placed on officers during port calls. (Figure 4)

The figures around time spent in port and the ability to go ashore could account for the fact that of the total respondent base only 28% of crew used crew welfare facilities whilst in port. However, there was no difference in the experience of officers and ratings in relation to their use of crew welfare facilities.

Of the 28% of respondents who reported using crew welfare facilities whilst in port, the most popular services according to crew were general unspecified facilities provided by the seaman missions (35%) very closely followed by Internet / WiFi services (34%). Other communications services

Fig. 1 | Top Ten Nationalities

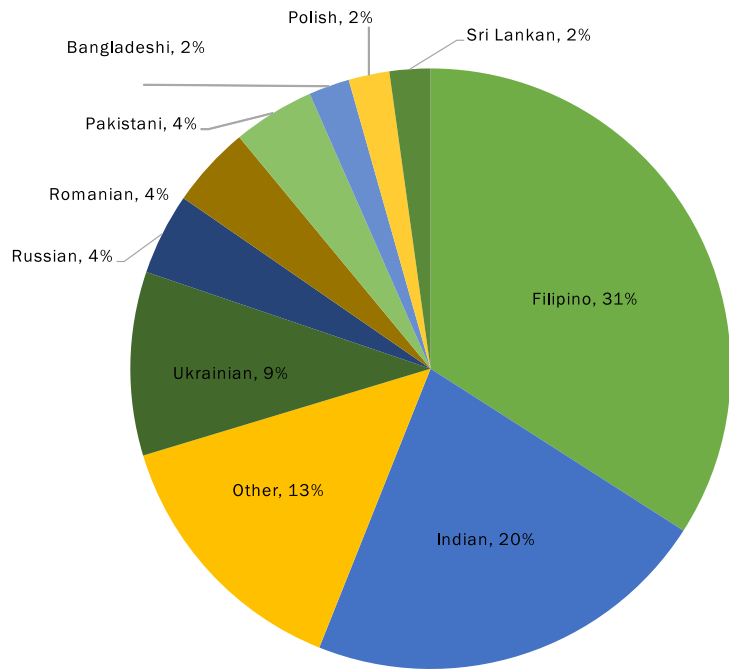


Fig. 2 | Vessel Type By Respondent

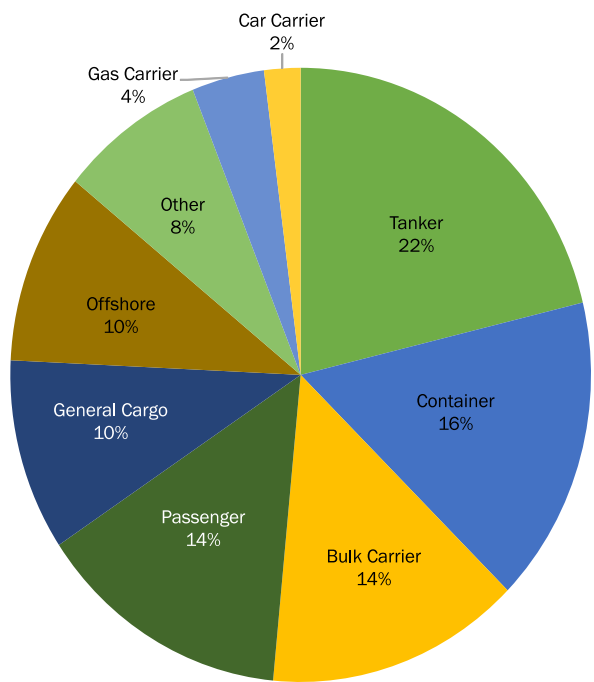


Fig. 3 | World Fleet By Vessel Type

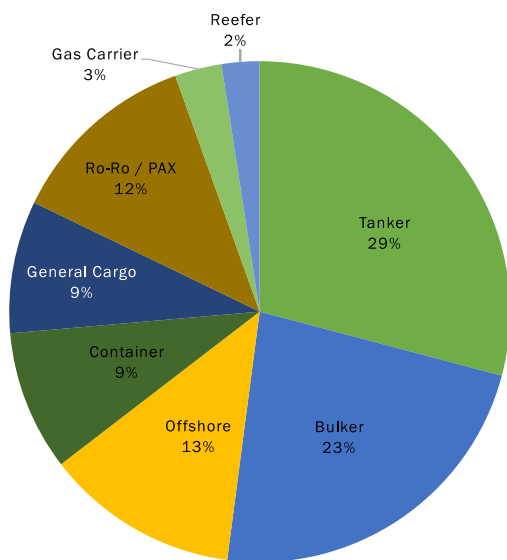
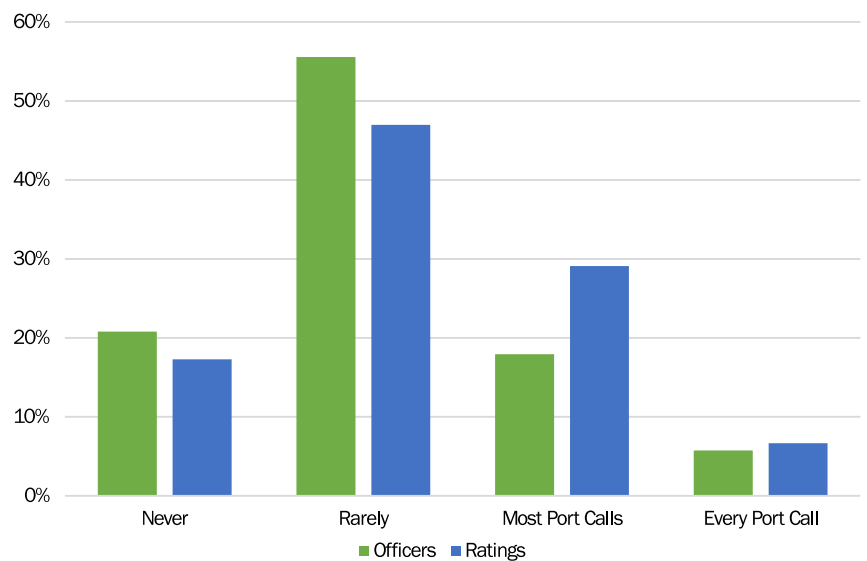


Fig. 4 | How Often Do You Go Ashore?



were also important services to seafarers including basic telephony (6%) and the ability to purchase local SIM cards. Other widely used services were transport, either to or from the welfare centre or the local town (10%) (Figure 5). When asked what additional services crew welfare centres could provide, respondents zoned in primarily on communications. 54% wanted Internet or WiFi services (the majority also prepared to pay for this access) 17% wanted better transport facilities to or from the port / local town or city and 7% wanted the centres to provide more shopping facilities (Figure 6).

IT Skills and Perception

With the continued increase in technology use both in the operation of vessels and in terms of personal devices, respondents were asked to rate their perception of their own IT skills and literacy.

7% of crew reported that they felt uncomfortable with technology and didn't really understand how it worked—a drop of 4% from last year's survey.

57% of respondents reported that they understood how the technology they used worked, and felt comfortable using it. Nearly 33% thought they were very knowledgeable and could help others onboard with technology. Taken together these two groups represent 90% of respondents, clearly demonstrating, once again, seafarers are a highly IT-literate workforce, used to using technology and comfortable with it. This is also reflected in the type and variety of personal devices these crew members brought aboard.

When the responses are considered by age group, we see that those in the Millennial generation age groups are most knowledgeable about IT matters. (Figure 7)

The over-45 year old age group is the most uncomfortable with technology, but not by a significant margin. In this year's survey we see that the 18-24 year group feels most comfortable and knowledgeable regarding technology as one might expect from that age group. They are also the

group that are most likely to help their colleagues with IT related matters.

The most significant differences between technology skills show up when comparing the officer and rating groups. Here the differences between officers and ratings is most noticeable in the 'very knowledgeable and help others' and 'use and understand how it works' categories. In both, officers are at least 20% ahead of ratings which represents a significant increase (+12%) on the prior year and a widening of the gap between officer and rating skills sets as they relate to IT competence.

Overall it is clear that shipping has a highly IT and technology literate workforce who do not perceive themselves to be struggling with increases in onboard technology and systems, but the widening gap between officers and ratings should be a warning especially in era of vastly increasing cyber risk.

Access to Crew Communications Services

When asked about their access to crew communications services 58% of respondents reported that they had access to some form of crew communications either 'always' or 'most' of the time a modest increase of 2% on last year. (Figure 8) Generally speaking officers enjoyed better access than crew, but this should be seen in the context of officers often having access within their cabins, and using communications systems for operational business as part of their duties.

Still of concern is that 35% of seafarers report having access to crew communications services only 'sometimes' although this is an improvement of 4%, but 7% report they never have access at all whilst onboard (+1%). Extrapolated to the global seafarer population, this would equate to 103,000 seafarers who regularly have no access to crew communications at all, an increase of 25,000 since the last survey. Not all of these seafarers will fall under the MLC 2006 mandate,

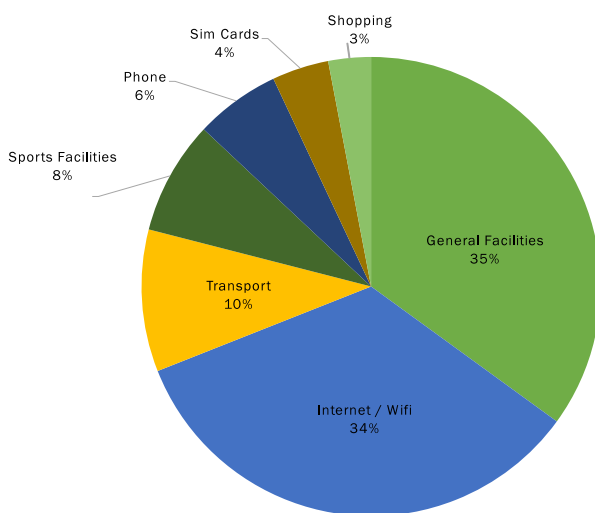


Fig. 5 | Crew Welfare Facilities Used In Port

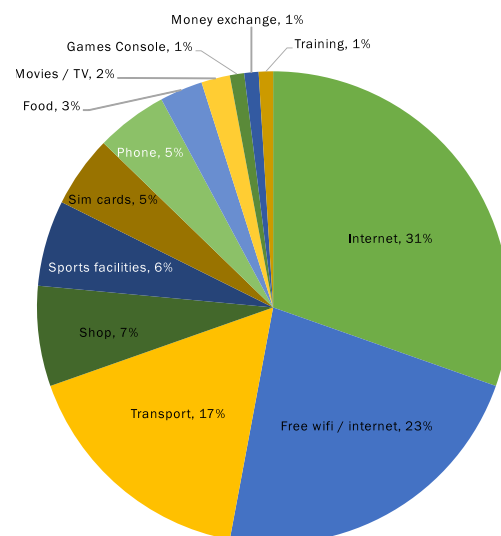


Fig. 6 | Additional Services Crew Welfare Could Provide

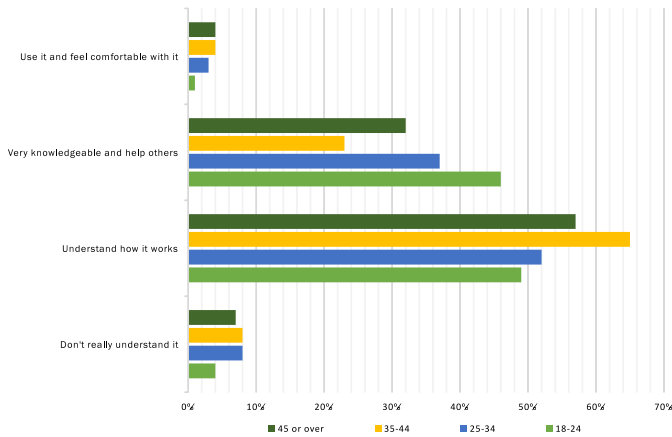


Fig. 7 | IT Skills By Age

but a significant proportion are likely to.

Given that the Maritime Labour Convention 2006 stipulates that ship operators should give crew reasonable access to communications at a reasonable cost, it seems clear that meeting this provision is proving challenging to operators.

For the first time, this year's survey asked crew whether they felt that there had been an improvement in the provision of communications since the introduction of the MLC. The majority of respondents believed that provision had improved. 22% said it had improved whilst 38% it had improved a little. However, the largest group (39%) believe that it had not improved since MLC was introduced. A further 3% actually believed provision had got worse since the introduction of the MLC.

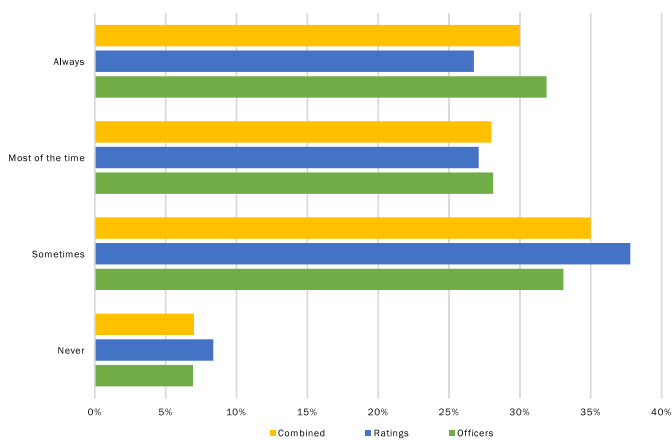


Fig. 8 | Access to Crew Communications

Access Within Different Sectors

Access to crew communications varied significantly between different sectors. This year the percentage of crew reporting never having access to communications had dropped to zero in the Car Carrier sector but was as high as 14% in the General Cargo sector. The Bulk and General Cargo sectors provide the lowest levels of access to crew communications in this year's survey. (Figure 9). The General Cargo and Bulk sectors remain the worst sectors for crew connectivity with 14% and 12% respectively never having access to communications.

There is an improvement in the 'Other' sector by over 10% despite many of these vessels not falling under the MLC 2006 mandate. This demonstrates continued increases in the level of GSM coverage and range within ports and coastal areas

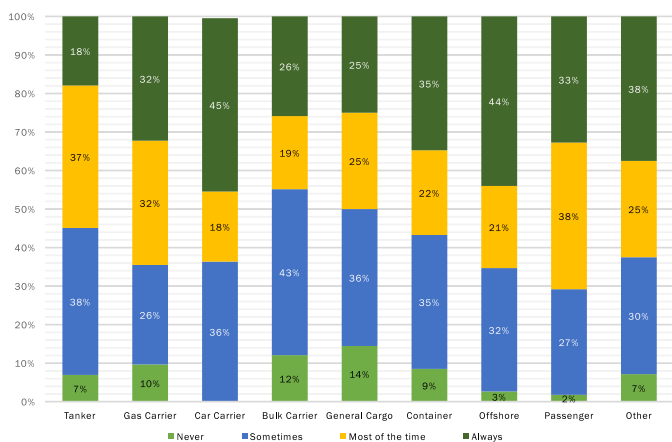


Fig. 9 | Access to Crew Communications by Sector

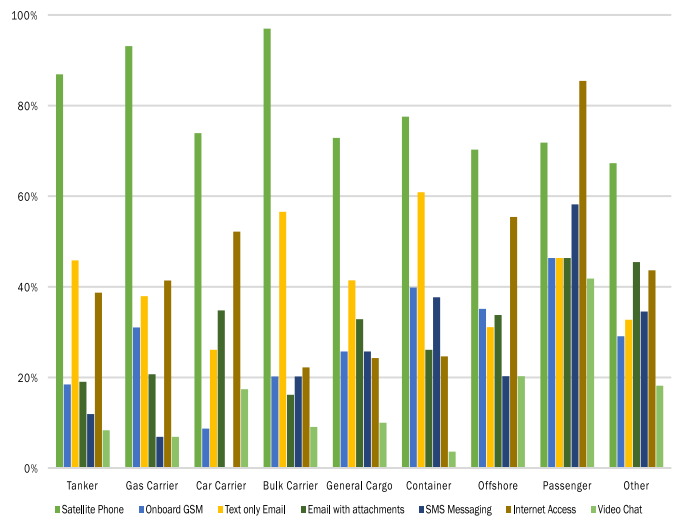


Fig. 10 | Crew Communications Services Provided Onboard

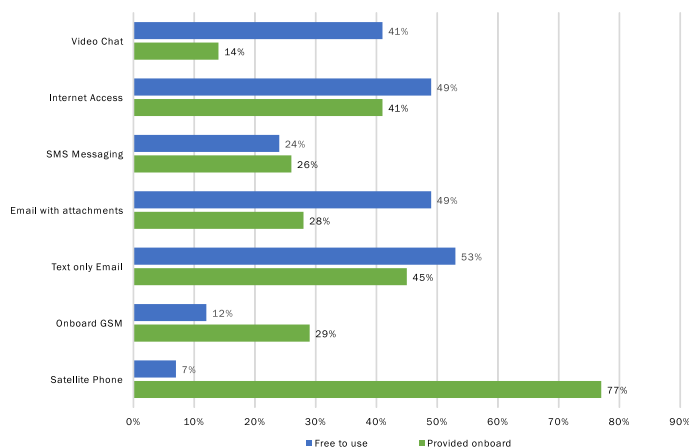


Fig. 11 | Provision of Free Services

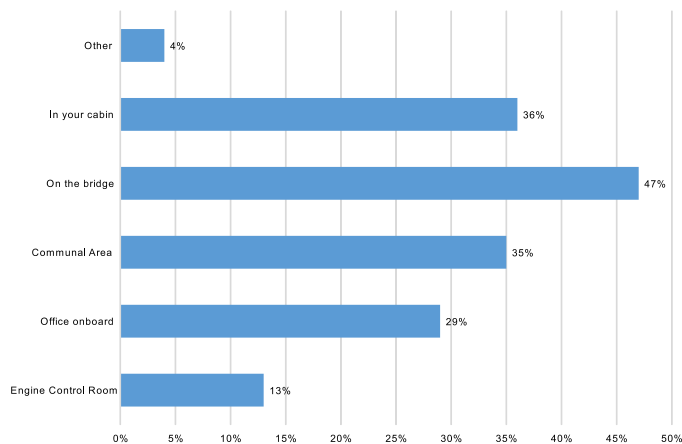


Fig. 12 | Where on board can services be accessed

where many of these vessels operate.

We asked those respondents who reported having access to crew communications to identify the communications services provided on board. (Figure 10)

Telephone - the most common form of communications to which seafarers have access across all sectors is voice calling, usually via satellite telephone. On average across all sectors 79% of seafarers with access to some form of crew communications have access to telephone calling—an increase of 3% on the prior year. However, this figure was as low as 70% in some sectors.

Onboard GSM – This could be either satellite or terrestrial GSM and on average is available to 28% of respondents to whom crew communications are provided onboard. Low levels of onboard GSM are seen in most commercial sectors apart from Container and Passenger. For the container sector operating a liner service, opportunities to use terrestrial GSM are at their highest and many passenger vessels (particularly in the cruise sector) now routinely provide satellite backhaul to their passengers via VSAT. However, there

are increasingly low bandwidth GSM solutions available that can now additionally connect via an L-band service such as Inmarsat's FleetBroadband.

Text only email – provided on average by 42% of vessels across sectors, text only email is still the most common form of non-Internet based crew communications, with very high levels seen once again in the Container sector at 61%.

Email with attachments – have increased by 5% since last year to 31% reflecting the increase in internet connectivity and the access to on-line email solutions this connectivity provides.

SMS Messaging – Generally provided via a PC except for the Passenger sector where routed via a distributed GSM solution. Static at 24% the level of provision is broadly low across most sectors with the exception of those with relatively high levels of GSM solutions (Passenger & Container).

Internet Access – With average availability of Internet access across all sectors 43%, access continues to be an improving picture up by 6% on last year's survey. Notably in the Passenger (85%) and Offshore (55%) sectors. Once again this relatively high level of provision in Passenger and Offshore reflects the correspondingly high VSAT penetration levels in those sectors.

At 43% on average across all sectors Internet access is now the second most common crew communication solution available today and demonstrates that ship operators have responded to crew demands for this service. However, this figure is distorted by the high levels seen in the passenger market and the underlying growth in the commercial sectors is closer to 2%.

The Container, Bulk and General Cargo sectors continue to lag behind the rest of the industry, with provision of Internet access at less than 25%.

Provision of Free Services

Respondents were asked to identify which of the services provided on board were available to use free of charge. (Figure 11) Text only email solutions are still the most commonly provided free crew communications service, but the most significant figures relate to Internet access. Over 40% of respondents now indicate that Internet access is provided on-board, and as per last year's survey half of those that had access to the Internet were given it free of charge.

These figures represent a further modest increase in Internet access per se, which can be explained by the increase in Internet-enabled platforms such as Inmarsat FleetBroadband and VSAT, and increased demand from crew for Internet access whilst at sea. Again with this year's survey although satellite telephones are widely available for crew to use, only a very small proportion of ship operators offer this free of charge (4%). When it comes to Internet access, that figure is five times as high.

The answer to this could lie in the fact that ship operators see the benefits to crew retention of free Internet access, or it could lie in the complexity and cost of implementing and administering pay-as-you-go or paid-for Internet services.

The low levels of free access to telephone calls explain the large percentage of expenditure amongst crew on voice calling (see Crew Communications Expenditure). It also indicates why crew are so keen on communications alternatives such as video chat/VOIP and also free port WiFi / Global roaming SIM cards, all of which leverage IP technology to

deliver live audio/visual contact.

In contrast to last year officers were provided with far more free access to communications services than ratings. Only when it came to satellite phone calls were ratings given higher access – and then only marginally. In areas such as email messaging and Internet access, officers were provided 15%-25% more free access.

Where is access provided?

The most common place for crew to access communications services is still on the ship's bridge, (Figure 12) although this figure has now fallen to under 50%. Access has risen in communal areas with many seafarers indicating that ship operators are setting aside spare cabins for crew to use these services in order to provide more privacy. Additionally, there has been a slight increase in access within the seafarer's own cabin.

As in last year's survey significant differences do exist between sectors, however, as expected, the Passenger sector has the highest levels of in-cabin communications services for crew along with those sectors with high levels of broadband (VSAT) installations such as the Gas Carrier and Off-shore sectors. But again, crew within the Bulk, Container and General Cargo sectors fared worst with high levels of access via the bridge and ships office—i.e. where there was little or no privacy.

Frequency of Service Use

There has been a significant shift in the frequency with which crew access the communications services provided to them. In last year's survey the majority of services were accessed by crew no more frequently than once a week. Now the majority of services are accessed on a daily basis with nearly 60% of those provided with Internet using it on a daily basis. The only exception is satellite phone usage where the majority only accessed this weekly or monthly (Figure 13).

Unsurprisingly only 17% of respondents never used the Internet. This figure was highest once again in the lowest age group 18-24 years, where 11% never used the Internet services provided, although this does represent a drop of 17% from the prior year, indicating generally better levels of access. Those respondents that never used the Internet were highest in the Bulk, General Cargo and Container sectors, which corresponds to the generally lower levels of VSAT connectivity these sectors demonstrate.

Ratings used the Internet on a daily or weekly basis more often than officers. 39% officers used the Internet on a daily or weekly basis compared to 56% of ratings, which shows a dramatic year on year reduction of 30% of officers accessing the Internet. It is difficult to understand why there should have been such a dramatic reduction in this group's use of the Internet.

The Internet was the crew communication service most commonly accessed daily by ratings, whilst email was the service most commonly accessed on a daily basis for officers.

Factors Limiting Crew use of Communications

The factor that most limits crew use of communications services provided—unsurprisingly—is the cost of those services. The number of crew that indicated this as the primary factor in limiting usage has increased by 10% on the prior year. (Figure 14) The issue of cost is confined to those ship

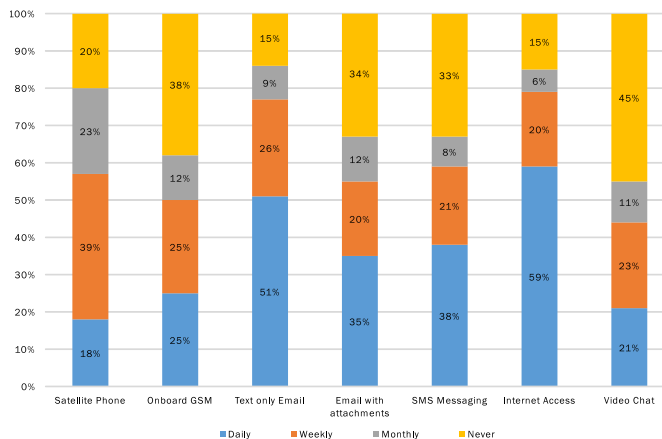


Fig. 13 | Frequency of Service Use

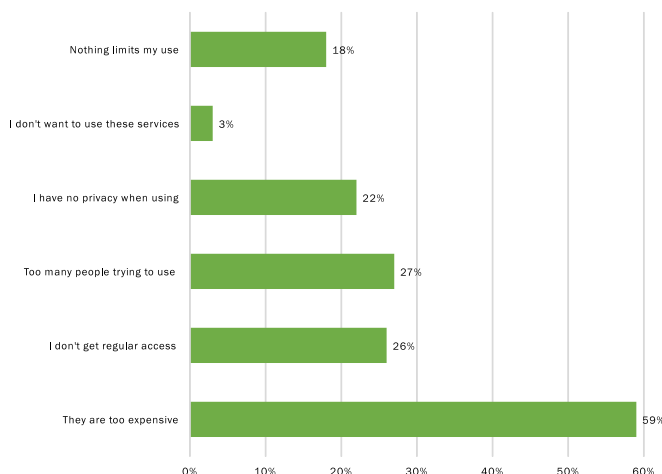


Fig. 14 | Factors Limiting Use

operators who provide crew connectivity through L-band demand assigned services, rather than always-on VSAT solutions. With the latter systems crew pay typically less than 30 cents per minute for satellite telephony. Those using L-band services are more typically paying approximately \$1.00 / minute for voice. The increase in legacy L-Band service charges and changes to charging plans for the most popular L-Band service (Inmarsat's Fleetbroadband) have produced uncertainty for ship operators and prevented them passing any cost savings onto their crew.

The other main issues limiting crew use of communications is that there are too many crew trying to access the services. This can be both a physical access as well as a quality of service issue as, for example, relatively low levels of bandwidth for Internet access is shared across multiple users.

The number of users reporting that nothing was limiting their use has remained static at 18%.

How do Crew want to access communications?

Crew's preferred device to access the majority of crew communications services is now a smartphone. This is a departure from previous surveys where a laptop via WiFi has

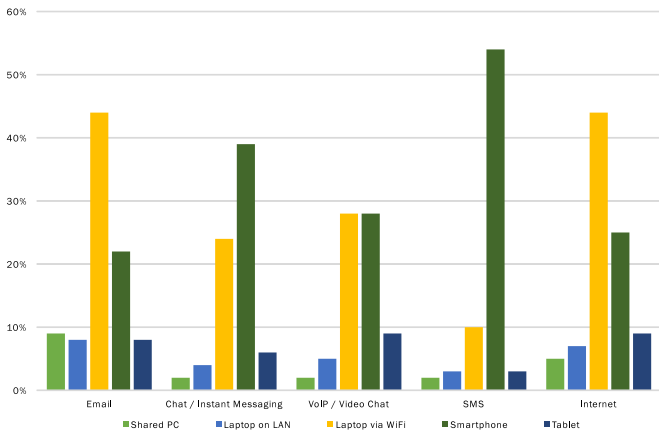


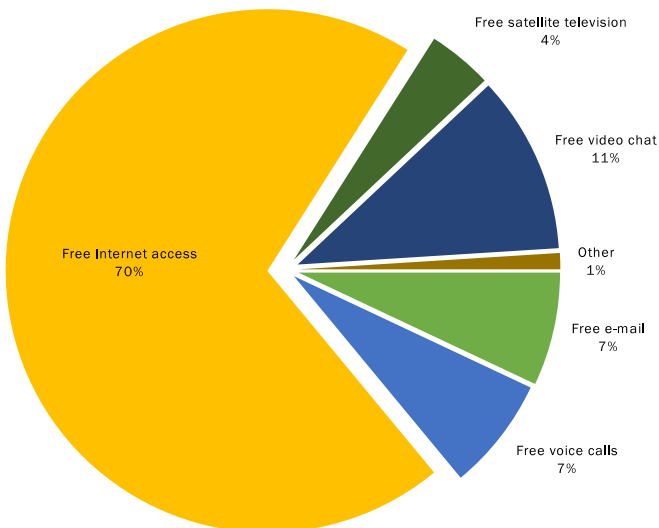
Fig. 15 | How Do Crew Want To Access Communications

been the preferred device. Only for email and Internet access did the smartphone come second (Figure 15).

This is borne out by the technology currently being taken on board, and the indications of new technology purchases within the next 12 months. These figures are all broadly in line with the BYOD (Bring Your Own Device) and ATAWAD (Any Time, Anywhere, Any Device) trends being seen in shipping and the wider population. The second most popular device to access services is the Smartphone of which 77% of crew now take on-board. The number of crew wanting to access services on a tablet PC remains very low – comparable with access via a shared PC – which again highlights that these devices are not being adopted by crew in the number that we have seen elsewhere.

Respondents were also asked which service they would most want if ship operators could provide just one free of charge service. (Figure 16) At 70% Internet access is still the most demanded service, with results consistent across all age groups and ranks. However, this figure has fallen by 7% in the last twelve months reflecting the increased levels of Internet access now available to crew. As Futureonautics posited last year, this demand for Internet access was masking an underlying desire by crew for access to VOIP and Video

Fig. 16 | If ship operators could provide one free service, what should it be?



Chat services to talk with friends and family. This is borne out in this year's survey, as video is now the second most desired service, having overtaking free voice calls.

The Influence of Crew Communications on Recruitment

There continues to be debate across the industry as to whether or not the provision of crew communications impacts recruitment and retention of seafarers. (Figure 17)

The survey questioned respondents as to whether the level of crew communications services provided on board vessels influenced their decisions about which shipping companies they worked for. The answer this year was even more unambiguous than last.

73% of respondents said that the level of crew communications services provided onboard did influence their decisions about which shipping company they worked for. This sentiment was echoed across nearly every sector except General Cargo where it dipped to a level below 60%.

We stated last year that clearly, the provision of crew communications services was just one of a range of factors which would influence the choice seafarers make about which ship operators they work for. This year we wanted to go further and understand just how important a factor it actually was. Of the 73% of crew that believed it was important

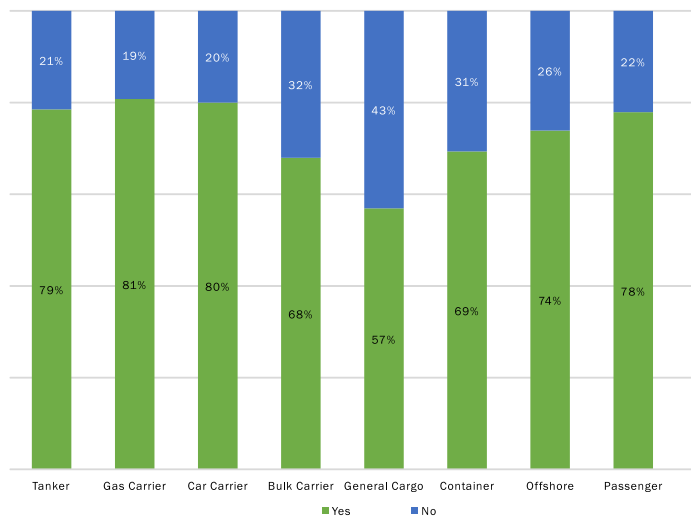


Fig. 17 | Influence of Crew Communications on Recruitment

78% said that it was a strong or very strong influence on which contract they decided to take.

For ship operators evaluating the importance of crew communications to their own overall recruitment and retention policies, it is clear that the level of provision of crew connectivity will have a major influence on which companies crew ultimately decide to work for. In a time where attracting and retaining quality, qualified crew is so important this should serve as a wake-up call to crewing and HR departments and further strengthens the need for them to work more closely with other departments within the organisation in order to ensure the package they provide attracts and retains the right crew.

The Impact of Crew Communications on Life and Operations at Sea

The increased levels of connectivity within the shipping industry as a whole and its impact upon life and operations at sea have been the subject of much speculation. This year, as last, we asked respondents a range of questions to establish how seafarers themselves believe improved communications had impacted their lives and jobs at sea.

40% of respondents believed that increased levels of, and access to, crew communications had reduced social interaction onboard—down by 6% on the prior year. This sentiment was consistent across most sectors. Again, this reduction in social interaction was most keenly felt by the oldest, least technology literate group of respondents.

Of particular interest was the impact of crew communications upon safe operations. Respondents were first questioned as to whether they felt that crew communications had had any affect upon safety at sea. This year only 16% of respondents felt that crew communications had affected safety onboard the vessel down from 22% last year.

Of this 16% the percentage that believed safety had been impacted in a 'positive' way had more than halved from 54% to 23%. This varied according to rank with those officers expressing an opinion believing that increases in connectivity almost always lead to a decrease in safety. For those respondents, now in the majority (77%), who believed access had led to a reduction in safety, this was due to:

-Increased levels of fatigue: in those who had been accessing crew communications services during their rest periods.

-Poor focus: caused by a lack of contact from family, or bad news which led to the crew member not giving the job in hand their full attention, and consequent mistakes and injuries.

-Distraction: was cited as a major issue. Safety was reportedly affected by crew members using communications services on watch on the bridge whilst at sea especially in cellular range in coastal waters. This coincided with typically high-traffic situations which required greater attention. Whilst in port the ability to make and receive calls via the crew member's mobile phone was also a cause of distraction during loading and discharge operations.

-Equipment risk: the risks of personal communications equipment on board was cited by some respondents who indicated that some personal communications devices were categorised by their company as NISE (Non Intrinsically Safe Equipment) and banned from the vessel.

-Breaches of data security: crucially for some crew, was the potential for their personal data to be accessed and browsing compromised using the onboard Internet services. Specific areas of concern indicated included access to personal email information and also online banking details.

Of the 23% of respondents that believed safety had been positively affected on board this stemmed from:

-Happier crew: better access to friends and family reduced stress amongst seafarers, which in turn led to improved, well-being, focus and ultimately fewer mistakes.

- Greater awareness and access to information: including home/family, company and world news. Seafarers felt that if the ship operator/company did not provide particular

information which they needed, there was now an alternative means of access to it. Respondents highlighted the ability to access additional medical information, piracy alerts and port welfare facilities.

Overall, the vast majority of seafarers do not believe that improved access to crew communications has had a negative impact upon safety onboard the ship. However, for officers and for ship operators there is an ongoing need for awareness as to how shipboard life is changing, and to develop and implement the necessary policies to manage any downside risk especially as it relates to cyber security.

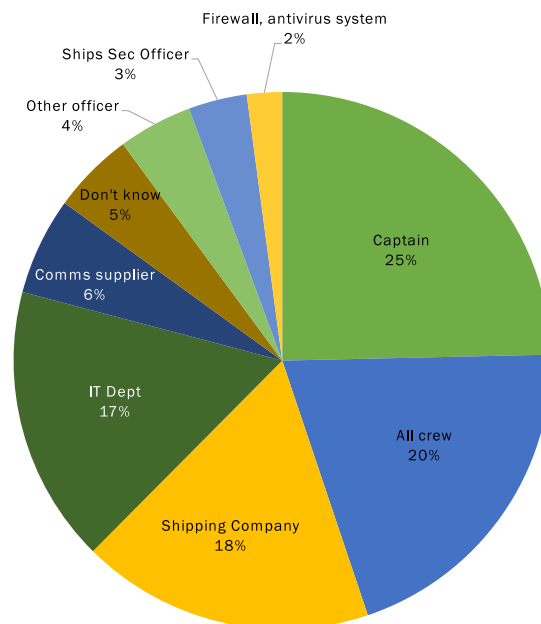
Cyber Threats

The maritime industry is being encouraged to operate digitally and with that comes the threat of cyber attack. While solutions such as virus software and firewalls are important, ship operators also need to look at other ways in which breaches can occur. Maritime solutions offering a BYOD platform and the proliferation of personal communication devices now taken onboard by crew mean the potential risk of a breach is increasing.

To substantially reduce the risk of such a breach—either malicious or unintentional—it is important that ship operators adopt cyber-safe policies and training for their crew. Given that various surveys have found that around 80% of cyber breaches are caused by employees, only 12% of crew had received any form of cyber security training. In addition, only 43% of crew were aware of any cyber-safe policy or cyber hygiene guidelines provided by their company for personal web-browsing or the use of removable media (USB memory sticks etc.). Perhaps unsurprisingly, given the above statistics, fully 43% of crew reported that they had sailed on a vessel that had become infected with a virus or malware.

Interestingly, when asked who was responsible for cyber security, the largest number of respondents thought that the captain of the vessel was responsible for cyber security, rather than the owner/management company (18%) or the IT Department 17%. A very encouraging sign was that 20% of crew

Fig. 18 | Who Is Responsible for Cyber Security



thought that it was the collective responsibility of everyone on-board (Figure 18).

In the light of increased concerns amongst flag states, authorities, not to mention suppliers and customers about the risks of cyber attack it seems clear that the industry has a very significant gap in competence where cyber security and resilience is concerned. It is essential that ship operators acknowledge the fact that cyber attacks now target users rather than infrastructure, and leverage the benefits of an IT-literate workforce to develop a culture of cyber-awareness, whilst training providers must engage to support them by developing new, cyber focussed training, evaluation and support. With moves already underway in the US to draw up maritime cyber security requirements for vessels, this is an area where operators must engage rapidly in order to meet the growing challenge.

Training and Other Services provided on board

At 72%, videos and DVDs are still the most commonly provided training service onboard—a drop of 7% over last year. Online training overtook Satellite TV as the second most widely available service at 30%—increasing 5% and likely replacing traditional videos and DVDs. E-books and publications was the fastest growing service—growing 11% from 14% to 25%. A significant percentage of seafarers, (15%), still have no access to these services.

Training

46% of respondents had undertaken some form of Computer Based Training (CBT) on their last vessel—an increase of 4%. (Figure 19) Once again this training typically related to either safety or security (54% of all respondents). The other CBT subjects undertaken by crew were fragmented between navigation (ECDIS / COLREGS), engineering, firefighting, ISM and pollution (MARPOL) with 7-9% of respondents undertaking training in these areas.

Fig. 19 | Computer Based Training onboard

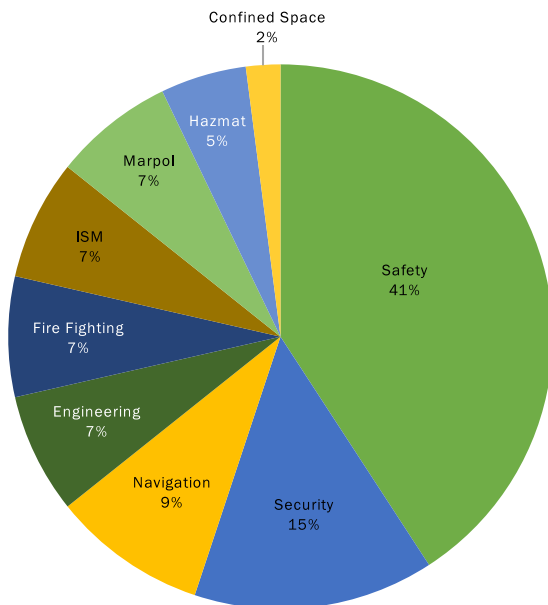
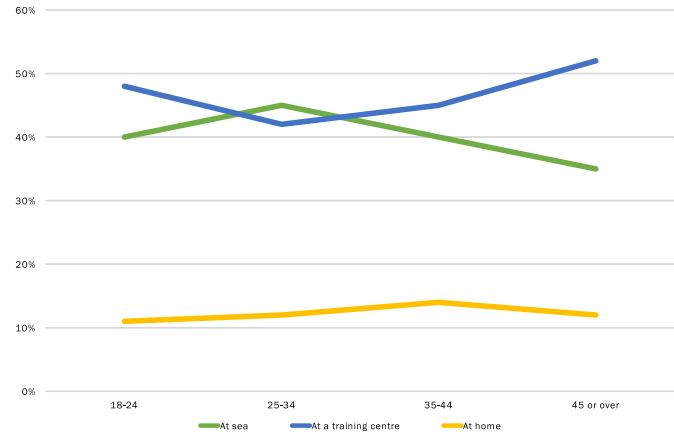


Fig. 20 | Where would you prefer to undertake training?



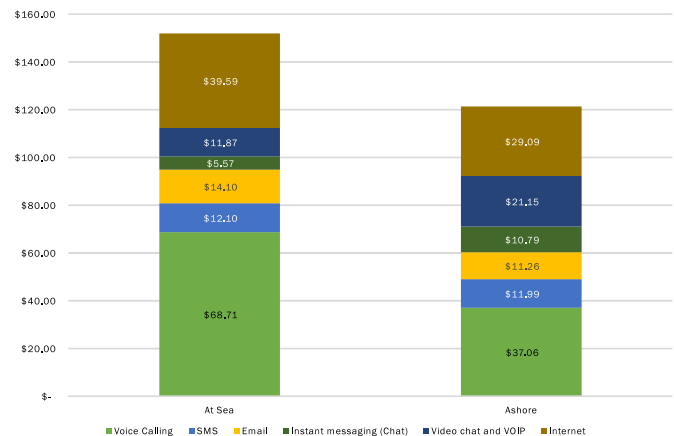
The majority of respondents (76%—and unchanged from last year) said that the ship was a good place to undertake training. Despite this, when given the choice the majority (46%) of respondents preferred to undertake training at a training centre ashore, although the gap between the two has halved over the last year, demonstrating a clear demand from crew for ‘on the job’ training. More officers than ratings would prefer to be trained ashore, but the most striking difference was by age group.

The 25-34 year olds are the only group that would prefer to be trained at sea rather than ashore. Although not as clear cut as the 2014 results, generally, as age increases so does the desire to be trained ashore, with the oldest group least amenable to being trained at sea. (Figure 20) This reinforces the observed trait of the Millennial generation as being more comfortable with online training or training on the job, but raises interesting questions about the gen-Z cohort and how best to train these seafarers.

Crew Communications Expenditure

On average respondents spend \$152/month on crew communications whilst at sea, an increase of nearly \$18 from last year, and spend \$121/month whilst ashore, a decrease of \$18. (Figure 21) The largest expenditure both at sea and ashore is still accounted for by voice communications and remains significantly higher at sea—growing by approximately 4% over the prior year. Voice expenditure whilst ashore or

Fig. 21 | Average monthly expenditure



in coastal waters has fallen by nearly \$10—from \$47/month to \$37/month. Expenditure on SMS has likewise reduced by 20% both at sea and in port, and email was comparable at sea and ashore. Expenditure on Internet based services—Internet access and VOIP / video chat is now comparable at sea and ashore. This levelling out of expenditure is accounted for by a 30% increase in expenditure on Internet access at sea as this service becomes more widely available. This year total expenditure at sea was higher than ashore.

The overall higher expenditure figure at sea is accounted for by the significantly higher spend of officers than ratings when at sea.

Comparison of expenditure by age group

Once again the youngest respondent group spent the least of any age group on crew communications, both at sea and ashore/coastal waters. (Figures 22 & 23)

This 18-24 age group spent approximately 40% less than other groups on voice communications both at sea and ashore. Once again, this is likely to be influenced by two main factors.

Firstly, junior crew are paid less and therefore have less disposable income. Secondly, however, these Millennial generation seafarers could be exhibiting behaviour typical of that generational cohort, more used to using social media and instant messaging rather than voice communications. Support for this interpretation comes from the fact that at sea, this group's Internet expenditure is equal to and, in some cases higher than, that of the other age groups.

The highest expenditure, by some margin, at sea is within the 35-44 year age group. Crew communication expenditure increases with age group peaking with the 35-44 age group before dropping in the over 45 year category. It is in the over 45 year category where we continue to see the least expenditure on Internet access and Internet-related services. Email is the only service where expenditure increases with every age group, suggesting that this is a technology with which older age groups are more familiar and comfortable.

Expenditure ashore follows a similar pattern to that at sea with expenditure increasing with age group and peaking with 35-44 group. Once again the youngest, 18-24 age group, also spent significantly less ashore than any other age group.

Expenditure by Rank

Expenditure by ratings was 6% higher than officers whilst at sea but approximately 10% lower when ashore/in coastal waters (Figure 24).

Both officer and rating's expenditure ashore is far more closely matched compared with expenditure at sea. Officers spent nearly double that of ratings on voice communications at sea whilst ratings spent more heavily on VOIP/Video chat, email and SMS messaging. Ratings once again spent a significantly higher percentage on internet based services – approximately 70% - whilst officers spent closer to 50% on these services.

For the first time, voice is no longer the highest expenditure item for ratings when ashore. Ratings are now spending more on Internet access than voice, and the proportion of expenditure between these two services at sea is also narrowing—down from 12% to 3%.

Ratings spent approximately 30% less ashore than when at sea. Officers spent 17% less whilst ashore or in coastal

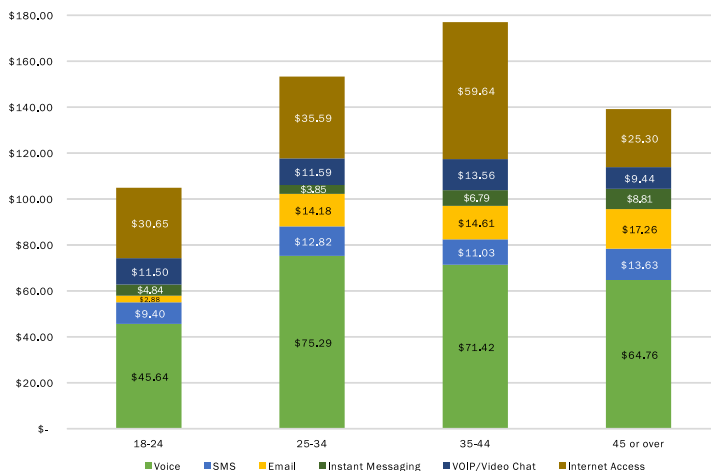


Fig. 22 | Expenditure at sea by age

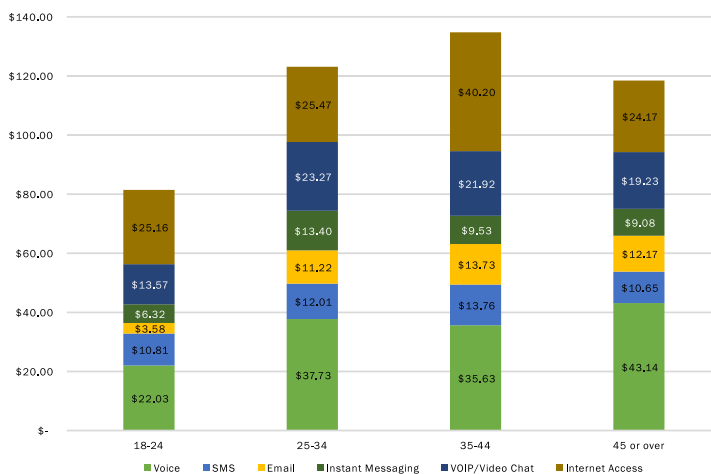


Fig. 23 | Expenditure ashore by age

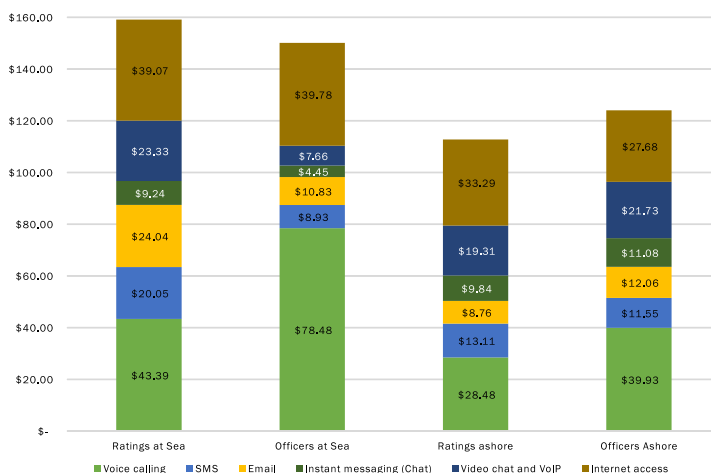


Fig. 24 | Expenditure by rank

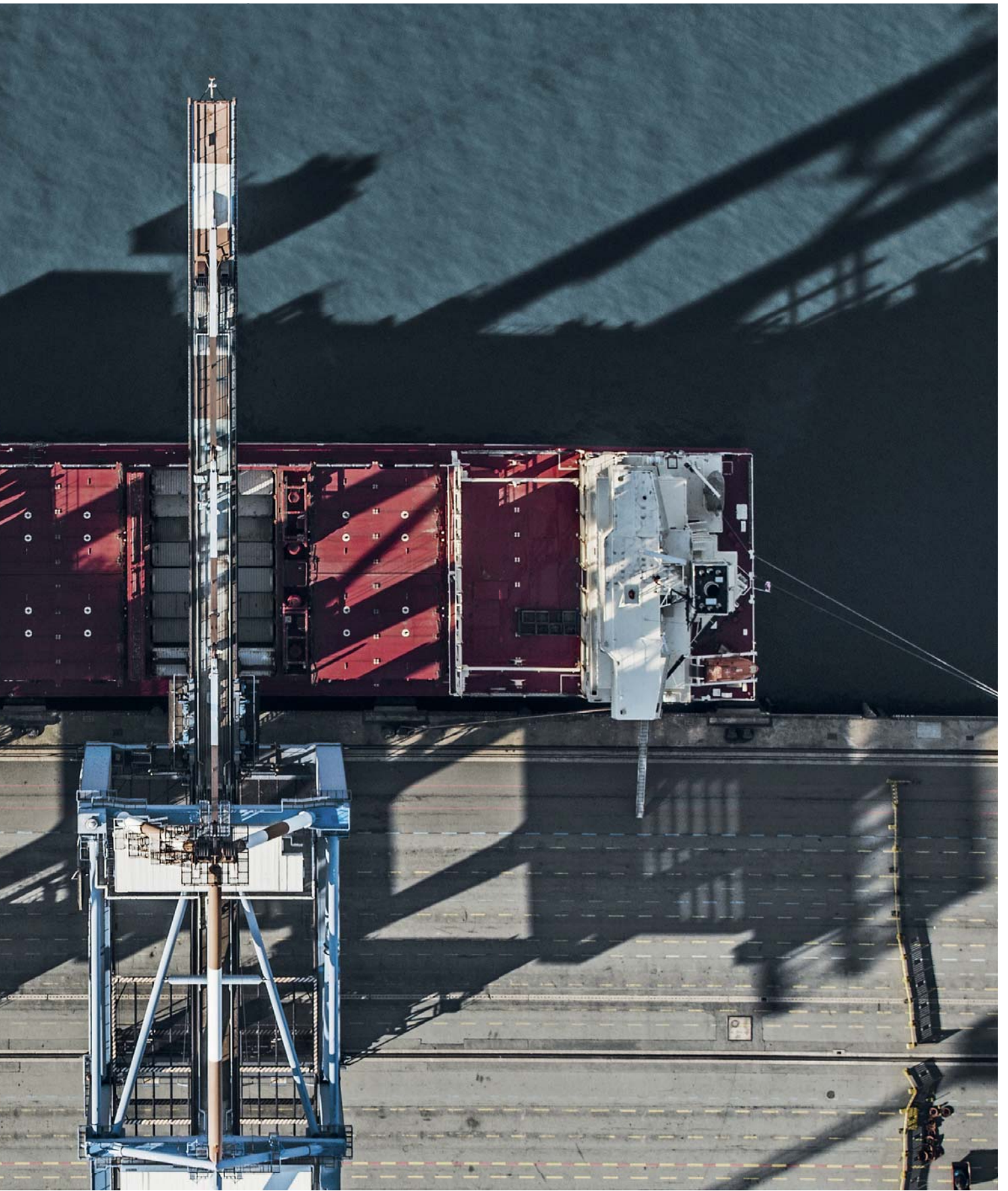


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waters, actually spending less ashore than at sea in contrast to last year. However, higher levels of overall expenditure ashore are still generated by officers not ratings.

Future Spend

When questioned about their likely expenditure on crew communications services over the next 12 months, 47% of respondents believed that their expenditure would remain the same.

However, despite continued concerns over the cost of these services, 41% thought their expenditure would increase—an increase of 5% over the prior year. In total 88% of crew believe that their expenditure will either stay the same or increase. Only 12% anticipate that they will cut their expenditure on crew communications in the next 12 months.

These results were consistent across both officers and ratings, and also largely across age range. It was the youngest age group 18-24 year olds, which had the largest percentage of respondents (42%) reporting an expectation that their expenditure would rise.

These figures are very close to those seen in last year's survey and reflect the rises witnessed in overall crew communications expenditure.

Payment Methods

In general, deduction from salary is still the dominant payment method used by seafarers at sea. Whilst the number of crew using cash has remained unchanged, the numbers using Internet banking has more than doubled in the last twelve months from 12% to 25%. Credit and crew payment card usage at sea remains low, but both have seen an increase of 5%. (Figure 25)

Payment Methods At Sea – Age Groups

Once again, when examined in terms of age groups the youngest two age groups show the highest levels of Internet banking, perhaps because these Millennial cohorts are both more used to using, and more trusting of such service delivery. (Figure 26) Internet banking is the fastest growing payment method used by seafarers whilst at sea, with an increase in 10% since the 2014 survey.

Although this age group has previously shown the highest levels of mobile payments and Paypal usage in the past, it is not possible to draw any firm conclusions from the cur-

rent data set as neither payment method has increased significantly and is highest in some of the older age groups. Therefore, it is not safe to conclude that this supports the emergence of a trend toward mobile / online payment.

Payment Methods Ashore - Age Groups

The dominant payment method ashore for crew members is cash with an average of 75% of crew using this as a primary payment method. (Figure 27)

However, the fastest growing payment method for seafarers ashore is Internet banking with a growth in usage of over 10% in last twelve months. The level of credit card use ashore has also risen—to an average of 36% across all age groups, but is still low when compared with the percentage of population that carry at least once credit card in developed economies. For example 71% of the population of the USA owned at least one credit card in 2014 (Experian). The ownership rates within the seafarer community is growing in each age group, and is now relatively consistent across all groups.

Mobile phone payment methods have also increased on average by 7% across all age groups—highlighting the trend toward online methods ashore.

Fig. 26 | Payment methods at sea by age

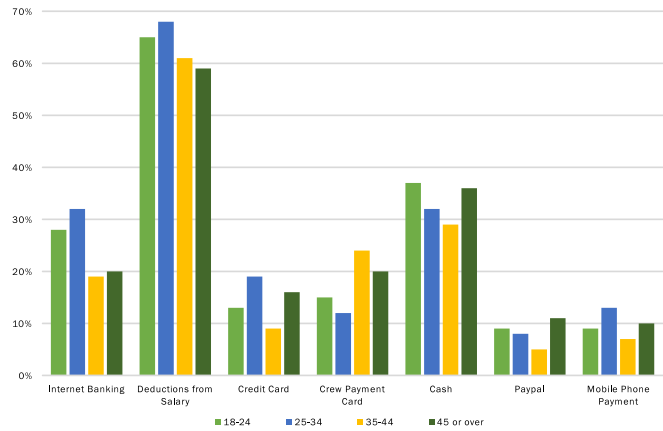


Fig. 27 | Payment methods ashore by age

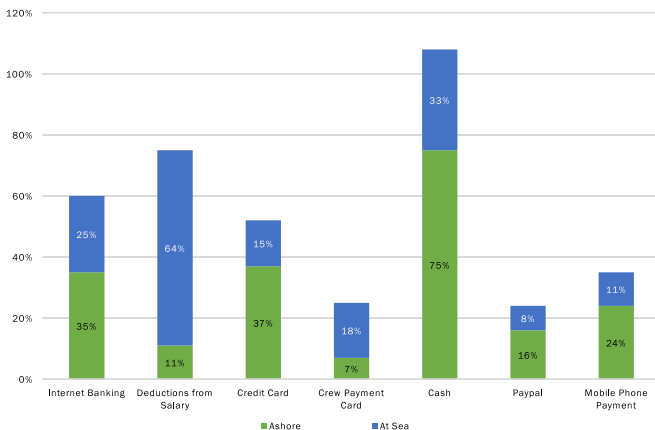
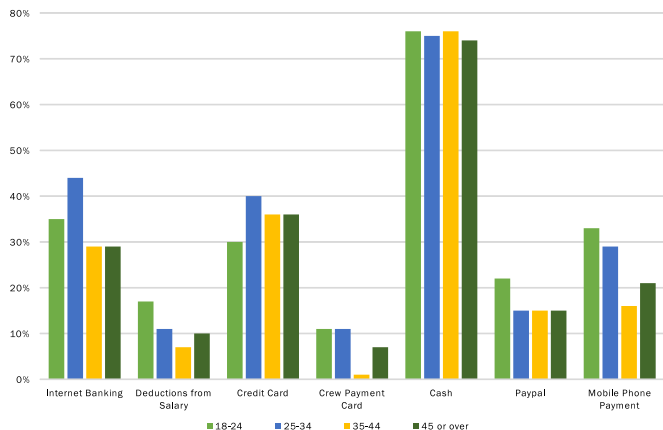


Fig. 25 | Payment methods at sea and ashore

Technology/Communications Devices Onboard

In this year's survey we once again asked crew about the technology/communications devices taken on board, to allow us to understand what affect this has on the services they use; what they wanted in future; and, how they would like to access these services. As with the 2014 survey the key finding is that seafarers take on average three personal technology/communications devices on board. This continues to reflect the broader commercial and consumer trends such as BYOD and ATAWAD, and demonstrates that shipping not only has a highly IT literate workforce, it also has a device-literate workforce.

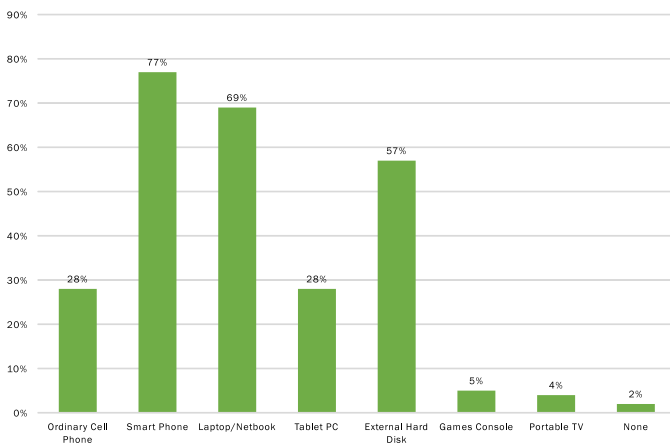
The smartphone has replaced the laptop as the most common device now taken onboard by crew members. There has been a 20% increase in the number of smartphones taken onboard since the last survey and now 77% of crew carry one. There has been a corresponding reduction in the number of crew taking an ordinary cell phone onboard—which now stands at 28%. The number of laptops taken onboard is still high but has dipped slightly from 75% in 2014 to 69% in 2015 (Figure 28).

The third most common device taken onboard by crew is an external hard disk, which is carried aboard by 57% of seafarers, largely as a means of storing more media content.

Although the number of tablet PCs taken onboard has increased by 8% these devices have not materialised in the number that might have been expected given that 40% of crew in last year's survey indicated that they would purchase one in the next 12 twelve months. This is likely down to two factors, namely the lack of WiFi connectivity on most vessels, and the limited storage capabilities of these devices

The number of respondents not taking any kind of technology onboard the vessel has halved in the last year to just 2%.

Fig. 28 | Communications/Entertainment Device taken onboard



Technology/Communications Devices By Sector

The Container and Gas Carrier sectors reported the highest levels of technology/communications devices (Figure 29). The Passenger sector had the lowest numbers of technology devices taken on board of any sector. The Passenger sector has also witnessed the highest fall in ordinary phones taken onboard—falling from 61% to 26% in the space of 12 months. Also of note is the fall in the number of crew taking a laptop onboard in this sector which has fallen from by 15% to 42%.

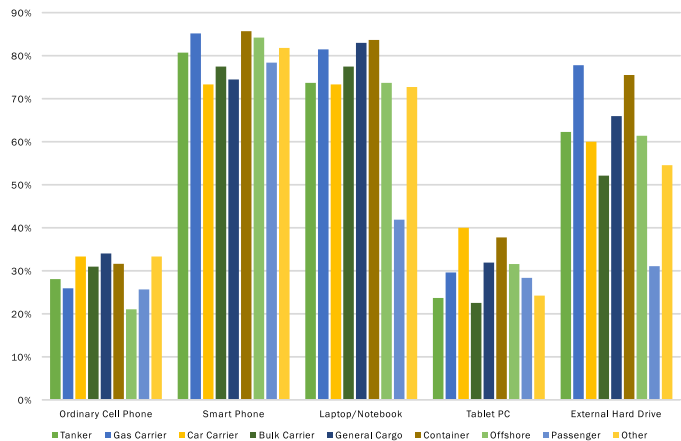


Fig. 29 | Technology/Communications Devices by sector

Planned Technology/Communications Device Purchases

In order to understand future BYOD/ATAWAD trends we asked respondents about their planned purchases over the next 12 months. As in last year's survey over 40% of respondents said that they planned to purchase a tablet PC for use onboard. (Figure 30). Again, exactly as with last year's survey, 34% of crew indicated that they would purchase a smartphone in the next twelve months.

Unlike tablet PC's the sentiment to buy smartphones translated into purchases, as smartphones are now the most common device taken onboard. It is not known whether crew members failed to purchase tablet PC's or whether they just choose not to take this technology onboard with them given the potential usage constraints outlined above.

The level of technology currently carried onboard, and that which is likely to be carried on board in the near future, provides significant opportunities for service providers and ship operators alike. With smartphones and laptops widely used, new ways to disseminate services, training and other information and content utilising wireless networks to personal devices are now possible.

Fig. 30 | Planned purchases of communications and entertainment devices

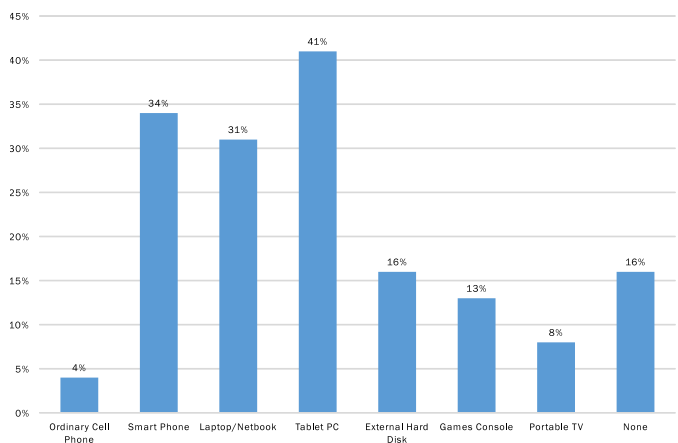




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Crew Communications Costs

To understand what crew paid for their communications we asked them to specify how much they paid for a minute of voice, an email, and a megabyte of Internet access.

According to the data, the average price paid by seafarers for telephone calls has fallen from \$1.42 per minute to \$0.91 per minute. This varied from users paying just a few cents per minute—most likely VSAT users—to those paying in excess of \$1.50 per minute. However, this data once again comes with a significant caveat, namely that of all the questions in the survey, those about costs and pricing clearly were difficult for crew to answer. It seems clear that the pricing information provided to crew can be inaccurate and misleading. It is therefore understandable that seafarers struggled to answer questions on prices.

However, although the figures provided by crew concerning what they actually spend should be approached with a degree of caution, their answers have highlighted some very important issues around how crew communications services are provided and charged to seafarers.

Most importantly, many seafarers once again clearly didn't understand what they were being charged for a minute of voice calling. Many respondents quantified the figure as monthly spend, indicating they knew how much they spent each month, but not how many minutes that equated to, or the price per minute. Considering that this is the service on which seafarers spend the most, their lack of familiarity with the charging structure and pricing of that service is a concern.

Crew generally had a better idea of what they were spending on email, although some answers again were clearly not accurate. The average price paid for an email was \$0.30, an increase of 10% on last year. Suppliers of email solutions for crew provide significantly more information to crew on the

cost of each message, SMS etc. This transparency appears still to be lacking in the market for voice calls except where dedicated crew calling solutions are in place.

When it came to Internet access, the average price paid for 1 megabyte of Internet access was \$0.44—roughly in line with the figure for last year. However, once again the spread of prices suggests that this pricing and cost data should be treated with caution. However, as it is closely in line with the data from last year's survey we can be more confident of its accuracy. It should be reiterated that respondents found this question very difficult to answer because:

—a number of those provided with Internet access were given a free daily/monthly data allowance and when they went over that allowance were charged for a block of data.

—those charged had paid for a block of megabytes or for a period of time, thus making it extremely difficult for them to understand what they were paying for a megabyte of data.

Ship operators are still not making the costs or the pricing structure clear enough for their crews and as we surmised last year this is largely to do with the complexity of the pricing models provided by the satellite connectivity suppliers. This makes provision of crew connectivity—particularly, for Internet access—difficult to make transparent and easy for crew to understand. Any additional administrative burden placed on ship owners or managers will result in the restriction of the provision of these services to crew.

The overall conclusion is that connectivity suppliers are offering overly-complex pricing structures which in some cases are preventing services being made available more widely to crew. Given that connectivity is now so important to crew when selecting which operator they work for (*see The Influence of Crew Communications on Recruitment*) it is important for ship operators and suppliers to work closely together to provide greater transparency in pricing information.

Crew's Favourite Websites

Respondents were asked to identify their favourite websites across a range of categories. The most popular single dedicated news site was CNN—cited by 20% of respondents, with the BBC the second at 14%, and followed by the Times of India at 8%. (Figure 31) Yahoo and Google news feeds are now important news sites for crew, taking a 16% share between them. The remaining results are fragmented as the news sites quoted were typically more nationally focussed and of relevance to individual nationalities. These included Ukr.net, which offers recent news from Ukraine and free email, and Yandex, ABS-CBN and GMA News Online which offer Philippines news. This explains the 'other' category being the largest cited in this group, and reflects the multiple nationalities represented within the survey.

The top ten most popular sports sites for crew were dominated by ESPN at 19% and the NBA at 9%. (Figure 32) Once again Yahoo sports scored highly with 8% citing it as a favourite sports site. The remaining sites included Star Sports, and live cricket streaming site, CricInfo, a cricket offshoot of ESPN. Other broader sports sites such as BBC Sports, Eurosport and CNN sport accounted for a further 8%. The 'other' category was the largest category in this group as well, reflecting again the diverse nationalities of crew taking part in the survey.

In terms of social networking sites, the top spot was once again dominated by Facebook with 79% of respondents citing it as their favourite social network. (Figure 33) Whatsapp is the second largest social media solution at 5%, but interestingly did not figure at all in last year's survey. Also important is that 8 out of the top ten social media sites are app based, reflecting the number of smartphones now taken onboard by crew.

Once again no shipping or maritime specific websites offering industry or international news were cited by any respondents. Also noteworthy is the high level of major portals, and smartphone based apps. It seems likely that there is a trend towards use of portals aggregating news and sports content rather than individual sites, particularly when useful services such as free email are offered.

Amazon has replaced eBay as the most popular shopping site amongst seafarers. Flipkart, an Indian online megastore, was the third most popular online shopping site, with a 16% share. (Figure 34)

Fig. 31 | Top 10 news sites

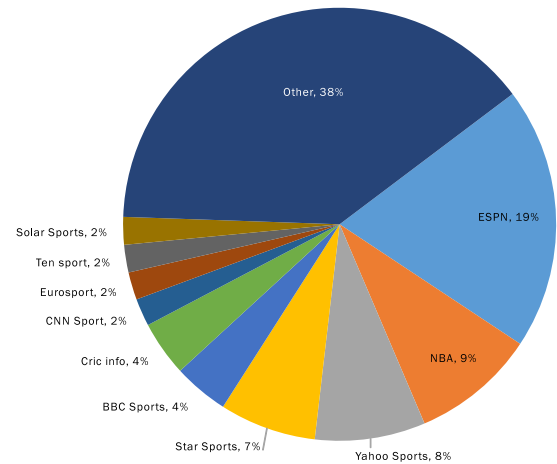
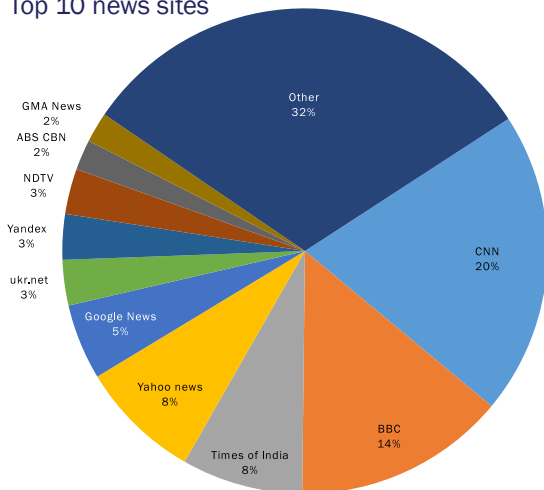


Fig. 32 | Top 10 Sports Sites

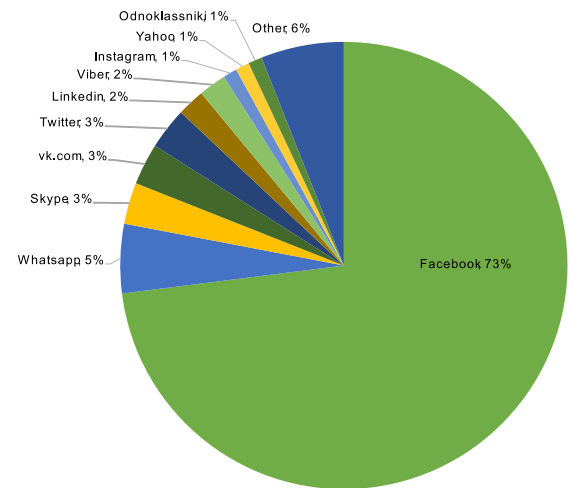


Fig. 33 | Top 10 Social Networking Sites

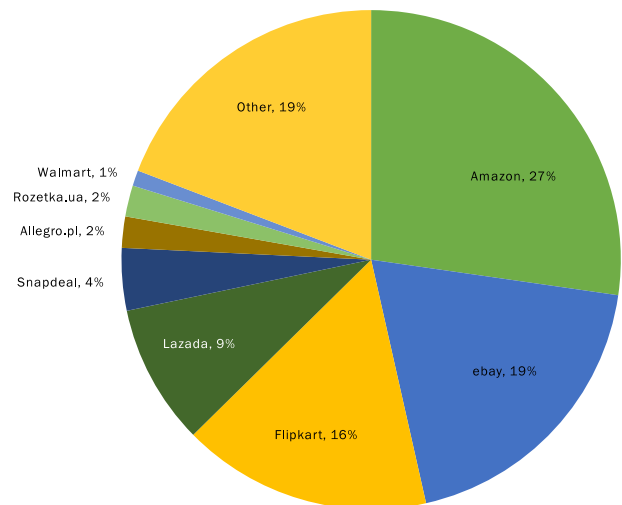


Fig. 34 | Top 10 Shopping Sites

Popular Maritime Websites

Respondents were asked to name their favourite maritime recruitment website (*Figure 35*). Of the top ten most popular maritime recruitment websites Jobships led with 15%, closely followed by Seajobs (12%). Crewtoo, the crew social media site, and which did not appear on last year's survey, was the third most popular maritime recruitment website. LinkedIn—also a new entrant—was the fourth most popular site. The only major maritime recruitment agency that appeared in this year's survey was Spinnaker, and it is the first agency to appear in the top 10.

The most popular website was MarineInsight with 13%, followed by Crewtoo at 10% and gCaptain 6%. The rest of the top ten, including the IMO, Nautical Institute and Nautilus had less than 5% shares, leaving a significant number of individual maritime websites to make up the remaining 44%. (*Figure 36*).

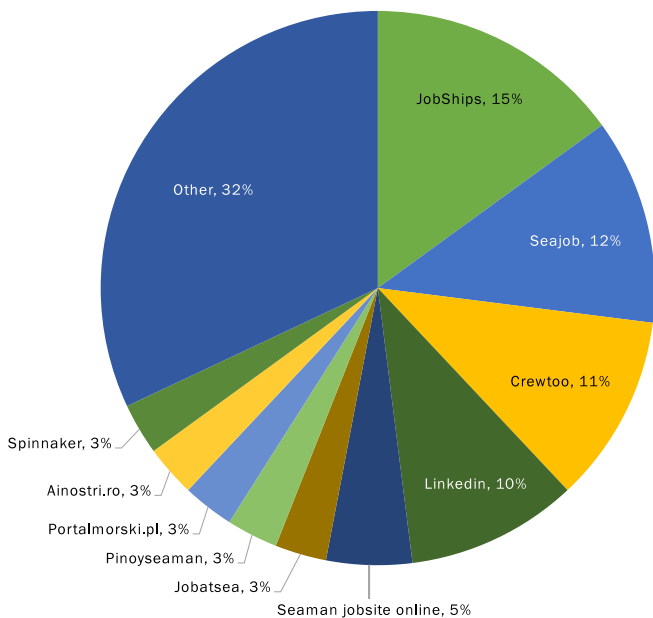


Fig. 35 | Top 10 Maritime Recruitment Sites

Has Access To Crew Communications Improved?

In this year's survey respondents were asked whether they thought access to crew communications had improved since the introduction of the Maritime Labour Convention (MLC 2006).

60% of respondents felt that access had improved since the introduction of MLC. 22% thought access had improved a lot and 38% thought it had improved a little. 36% of respondents thought the access had not improved and 3% actually thought access had got worse. (*Figure 37*) This shows an increase of 10% of those that felt access had improved since last year. It is difficult to ascertain exactly how much of the improvement is attributable to MLC—given the minimal coverage of connectivity within the regulation—and how much relates simply to improving levels of connectivity at sea. Nevertheless, it is an encouraging statistic, and should be good news to seafarers.

Fig. 36 | Top 10 Maritime Sites

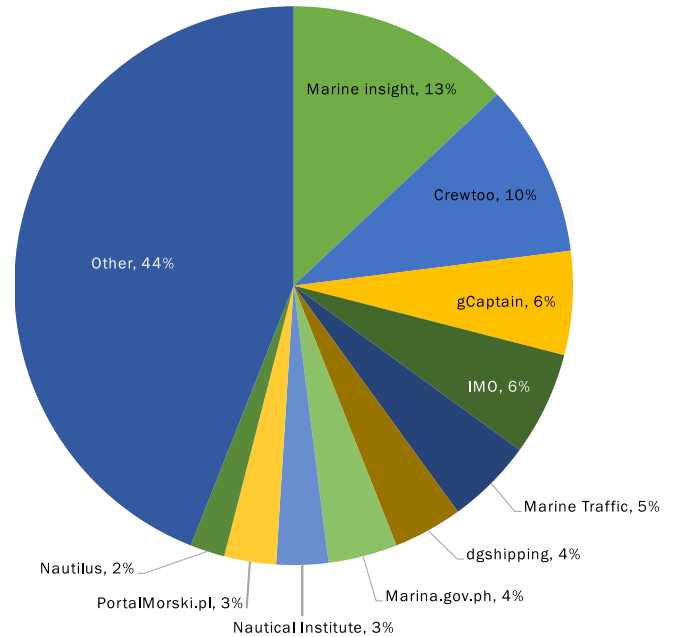
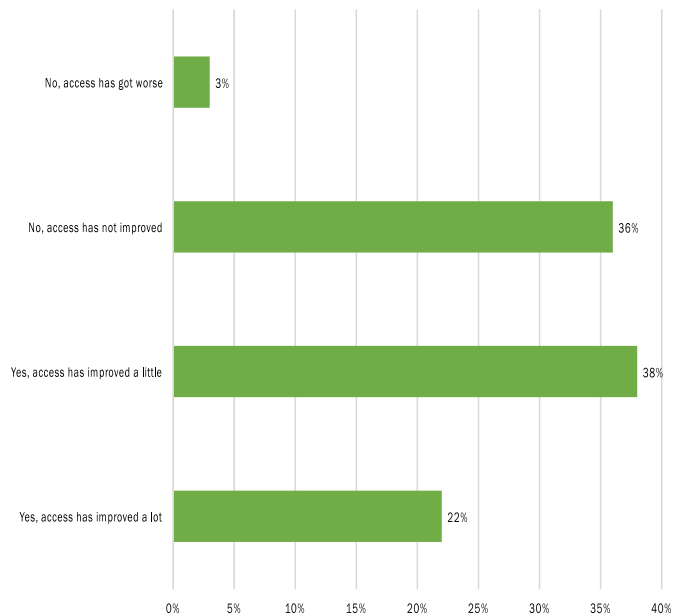


Fig. 37 | Has Access to Communications Improved?



Future Services

We asked respondents to consider a list of potential future services and asked them to choose the most important to them. (Figure 38)

When we consider the services seafarers want to see provided in the future there is further confirmation of relatively low levels of interest in content (on demand music, TV or film) services. This is reflected in the responses given by respondents when questioned as to what they would use the Internet for, were it provided to them.

Although levels of expenditure in port/coastal waters have declined this year they are still significant, and it is perhaps inevitable therefore that crew most want to see free WiFi access in port. The potential savings could be very significant for seafarers, since their Internet related expenditure ashore is on average approximately \$70 per month.

There continues to be a strong appetite for a low-cost global roaming SIM card that would allow low cost calls from any country. Currently seafarers find themselves purchasing SIM cards from port welfare facilities which, if not used, are worthless in another country.

Considering the wide availability of such global roaming SIMs and smartphone mobile apps, it continues to be a mystery why none of the terrestrial providers of such services have recognised the opportunity to market these SIMs to seafarers, or that maritime communications suppliers have not added them to their product portfolios. Perhaps it is down to the fact that these services will be short lived as mobile operators are soon to introduce true global roaming for a fixed fee. The continued interest in such SIMs would suggest that these cards represent the low hanging fruit of crew communications.

The other product which scored highly among seafarers was a low cost satphone for crew that would allow voice calls to be made in privacy.

Once again the clear message from crew is that they ac-

cept and understand that the costs of crew communications services at sea will be higher because satellite connectivity will always be higher in cost. However, they appear less happy with the amount of money they are expected to spend ashore, where terrestrial networks exist and telephony and Internet access should be correspondingly cheaper.

It remains clear that crew are not particularly looking for new and innovative service provision, but ways by which to reduce costs, which they see as unnecessarily high ashore.

One of the major findings of last year's survey remains true today—that Internet access, whilst utilising the latest IP technology, is actually being leveraged by crew to address the costs of the oldest and most traditional form of communications, and that upon which they are still spending the most, namely voice calling, and also, increasingly, video chat.

Access To Data

76% of seafarers are still happy to allow access to their data in exchange for free Internet access provision. (Figure 39)

This sentiment did not vary considerably between age groups, rank or IT competency and is a clear signal that re-designed service propositions and models based on the monetising of exhaust data from crews would have a good chance of widespread take-up. The implications of this finding are pertinent not just to deep-sea connectivity suppliers and ship operators, but to shore-based stakeholders including ports and those providing crew welfare facilities within them, or local to them.

However, crew were extremely aware of how important it was for companies/organisations to store their personal and employee data securely. 93% of respondents thought that it was either important or very important that companies store their data securely. Only 7% thought that it was not important for companies/employers to store their data securely.

Fig. 38 | What Future Services Would You Like To See Made Available?

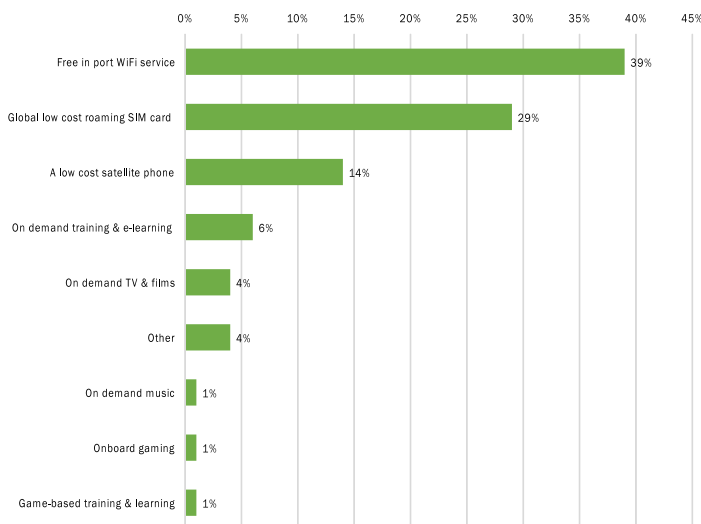
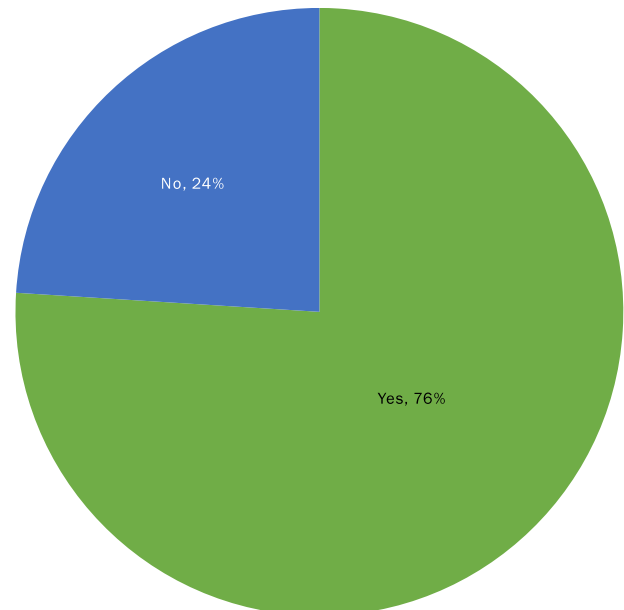


Fig. 39 | Would you be prepared to allow access to your online data in exchange for free Internet access?



Key Findings

- » On average respondents spent 7.4 months per year at sea, with ratings spending slightly more time at sea than officers, consistent with 2014. This survey showed no evidence that less time is being spent at sea by the youngest seafarers, meaning that it is not possible to draw any meaningful conclusion regarding Millennials' reluctance to spend prolonged time at sea.
- » 28% of port calls are reported as less than 12 hours in duration this year—a drop of 10%, whilst a slightly lower percentage of respondents reported they were either never, or rarely able to go ashore whilst in port at 72%. More officers than ratings never or rarely went ashore, once again reflecting the burden of management responsibility upon officers whilst in port.
- » Only 28% of the total respondent base used crew welfare facilities whilst in port, with the most popular services general, unspecified facilities provided by seaman's missions, very closely followed by Internet/WiFi services.
- » When asked what additional services they would like crew welfare centres to provide respondents primarily mentioned communications with 54% wanting Internet or Wifi services, and the majority prepared to pay for this kind of access.
- » 90% of respondents considered that they both understood how the technology they used at sea worked, and were comfortable using it, or were so knowledgeable that they helped others on board with technology. Those in the Millennial generation age groups are the most knowledgeable about IT matters, whilst the over-45 age group is the most uncomfortable with technology, although not by a significant margin.
- » At 58%, the percentage of respondents reporting that they had access to some form of crew communications either 'always' or 'most' of the time has increased very slightly year on year. The number of crew who report having access to communications only 'sometimes' has reduced to 35%, but those reporting never having access onboard has risen by 1% to 7%. Extrapolated to the global seafarer population that would equate to 103,000 seafarers who regularly have no access to crew communications—an increase of 25,000.
- » Respondents were asked whether there had been an improvement in the provision of communications since the introduction of the MLC. The majority of respondents believed that provision had improved. 22% said it had improved whilst 38% it had improved a little. However, the largest group 39% believe that it had not improved since MLC was introduced. A further 3% actually believed provision had got worse since the introduction of the MLC.
- » Access to crew communications varied significantly between different sectors. This year the percentage of crew reporting never having access to communications had dropped to zero in the Car Carrier sector but was as high as 14% in the General Cargo sector. The Bulk and General Cargo sectors provide the lowest levels of access to crew communications in this year's survey.
- » The most common form of communications to which seafarers have access across all sectors is voice calling, usually via satellite telephone. On average across all sectors 79% of seafarers with access to some form of crew communications have access to telephone calling—an increase of 3% on the prior year. However, this figure was as low as 70% in some sectors.
- » With average availability of Internet access across all sectors 43%, access continues to be an improving picture up by 6% on last year's survey. Notably in the Passenger (85%) and Offshore (55%) sectors. Once again this relatively high level of provision in Passenger and Offshore reflects the correspondingly high VSAT penetration levels in those sectors.
- » At 43% on average across all sectors Internet access is now the second most common crew communication solution available today and demonstrates that ship operators have responded to crew demands for this service. However, this figure is distorted by the high levels seen in the passenger market and the underlying growth in the commercial sectors is closer to 2%.
- » The Container, Bulk and General Cargo sectors continue to lag behind the rest of the industry, with provision of Internet access at less than 25%.
- » Over 40% of respondents now indicate that Internet access is provided on-board, and as per last year's survey half of those that had access to the Internet were given it free of charge. These figures represent a further modest increase in Internet access per se, which can be explained by the increase in Internet-enabled platforms such as Inmarsat Fleet-Broadband and VSAT, and increased demand from crew for Internet access whilst at sea.
- » The most common place for crew to access communications services is still on the ship's bridge, although that figure has now fallen to under 50%, and access has risen in communal areas with many seafarers indicating that operators are setting aside spare cabins for crew to use these services in more privacy. But again, crew within the Bulk, Container and General Cargo sectors fared worst with high levels of access via the bridge and ships office—i.e. where there was no privacy.
- » There has been a significant shift in the frequency with which crew access the communications services provided to them. In last year's survey the majority of services were accessed by crew no more frequently than once a week. Now the majority of services are accessed on a daily basis with nearly 60% of those provided with Internet using it



on a daily basis. The only exception is satellite phone usage where the majority only accessed this weekly or monthly

» The Internet was the crew communication service most commonly accessed daily by ratings, whilst email was the service most commonly accessed on a daily basis for officers.

» The factor that most limits the use of crew communications facilities provided is—unsurprisingly—the cost of those services. The number of crew that indicated this as the primary factor in limiting usage has increased by 10% over 2014. The issue of cost is confined to those ship operators who provide crew connectivity through L-band demand assigned services, rather than always-on VSAT solutions. With the latter systems crew pay typically less than 30 cents per minute for satellite telephony. Those using L-band services are more typically paying approximately \$1.00 / minute for voice.

» Crew's preferred device to access the majority of crew communications services is now a smartphone. This is a departure from previous surveys where a laptop via WiFi has been the preferred device. Only for email and Internet access did the smartphone come second. This is borne out by the range of technology currently being taken on board,

and the indications of new technology purchases within the next 12 months. These figures are all broadly in line with the BYOD (Bring Your Own Device) and ATAWAD (Any Time, Anywhere, Any Device) trends being seen in shipping and the wider population.

» If crew could choose one free service, it would be free Internet access, but at 70% that figure has fallen by 7% in the last 12 months, reflecting the increased levels of Internet access now available to crew.

» As Futureonautics posited last year, the demand for Internet access was masking an underlying desire by crew for access to VOIP and Video Chat services to talk with friends and family. This is borne out in this year's survey, as video is now the second most desired service, having overtaking free voice calls.

» The survey once again questioned respondents as to whether the level of crew communications services provided on board vessels influenced their decisions about which shipping companies they worked for. The answer this year was even more unambiguous than last. 73% of respondents said that the level of crew communications services provided onboard did influence their decisions about which shipping company they worked for. This sentiment was echoed across

nearly every sector except General Cargo where it dipped to a level below 60%. Of the 73% of crew that believed it was important 78% said that it was a strong or very strong influence on which contract they decided to take.

» For ship operators evaluating the importance of crew communications to their own overall recruitment and retention policies, it is clear that the level of provision of crew connectivity will have a major influence on which companies crew ultimately decide to work for. In a time where attracting and retaining quality, qualified crew is so important this should serve as a wake-up call to crewing and HR departments and further strengthens the need for them to work more closely with other departments within the organisation in order to ensure the package they provide attracts and retains the right crew.

» 40% of respondents believed that increased levels of, and access to, crew communications had reduced social interaction onboard—down by 6% on the prior year. This sentiment was consistent across most sectors. Again, this reduction in social interaction was most keenly felt by the oldest, least technology literate group of respondents.

» Of particular interest was the impact of crew communications upon safe operations. This year only 16% of respondents felt that crew communications had affected safety onboard the vessel—down from 22% last year. Of this 16% the percentage that believed safety had been impacted in a 'positive' way had more than halved from 54% to 23%. This varied according to rank with those officers expressing an opinion believing that increases in connectivity almost always lead to a decrease in safety.

» This year's survey asked a series of questions around cyber security, training and experiences. Only 12% of crew had received any form of cyber security training. In addition, only 43% of crew were aware of any cyber-safe policy or cyber hygiene guidelines provided by their company for personal web-browsing or the use of removable media (USB memory sticks etc.). Perhaps unsurprisingly, given the above statistics, fully 43% of crew reported that they had sailed on a vessel that had become infected with a virus or malware.

» When asked who was responsible for cyber security, the largest number of respondents thought that the Captain of the vessel was responsible for cyber security, rather than the owner/management company (18%) or the IT Department (17%). A very encouraging sign was that 20% of crew thought that it was the collective responsibility of everyone on-board.

» It seems clear that the industry has a very significant gap in competence where cyber security and resilience is concerned. It is essential that ship operators acknowledge the fact that cyber attacks now target users rather than infrastructure, and leverage the benefits of an IT-literate workforce to develop a culture of cyber-awareness, whilst training providers must engage to support them by developing new, cyber focussed training, evaluation and support. With moves already underway in the US to draw up maritime cyber security requirements for vessels, this is an area where operators must engage rapidly in order to meet the growing challenge.

» 46% of respondents had undertaken some form of Computer Based Training (CBT) on their last vessel—an increase of 4%. Once again this training typically related to either safety or security (54% of all respondents). The other CBT subjects undertaken by crew were fragmented between navigation (ECDIS / COLREGS), engineering, firefighting, ISM and pollution (MARPOL) with 7-9% of respondents undertaking training in these areas.

» The majority of respondents (76%—and unchanged from last year) said that the ship was a good place to undertake training. Despite this, when given the choice the majority (46%) of respondents preferred to undertake training at a training centre ashore, although the gap between the two has halved over the last year, demonstrating a clear demand from crew for 'on the job' training.

» The most striking difference in attitudes to training is that twelve months on, the 25-34 year olds are the only group that would prefer to be trained at sea rather than ashore. This reinforces the observed trait of the Millennial generation as being more comfortable with online training or training on the job, but raises interesting questions about the gen-Z cohort and how best to train these seafarers.

» On average respondents spend \$152/month on crew communications whilst at sea, an increase of nearly \$18 from last year, and spend \$121/month whilst ashore—a decrease of \$18. The largest expenditure both at sea and ashore is still accounted for by voice communications and remains significantly higher at sea—growing by approximately 4% over the prior year.

» Voice expenditure whilst ashore or in coastal waters has fallen by nearly \$10—from \$47/month to \$37/month. Expenditure on SMS has likewise reduced by 20% both at sea and in port, and email was comparable at sea and ashore. Expenditure on Internet based services—Internet access and VOIP / video chat is now comparable at sea and ashore. This levelling out of expenditure is accounted for by a 30% increase in expenditure on Internet access at sea as this service becomes more widely available. This year total expenditure at sea was higher than ashore.

» Once again the youngest respondent group spent the least of any age group on crew communications, both at sea and ashore/in coastal waters. This 18-24 age group spent approximately 40% less than other groups on voice communications both at sea and ashore. The highest expenditure by some margin at sea is within the 35-44 age group, whilst the over-45 age group has the least expenditure on Internet access and Internet-related services.

» Email is the only service where expenditure increases with every age group, suggesting that this is a technology with which older age groups are more familiar and comfortable.

» For the first time, voice is no longer the highest expenditure item for ratings when ashore. Ratings are now spending more on Internet access than voice, and the proportion of expenditure between these two services at sea is also narrowing—down from 12% to 3%.



Image credit © Getty Image

» Ratings spent approximately 30% less ashore than when at sea. Officers spent 17% less whilst ashore or in coastal waters, actually spending less ashore than at sea in contrast to last year. However, higher levels of overall expenditure ashore are still generated by officers not ratings.

» When questioned about their likely expenditure on crew communications services over the next 12 months, 47% of respondents believed that their expenditure would remain the same.

» However, despite continued concerns over the cost of these services, 41% thought their expenditure would increase—an increase of 5% over the prior year. In total 88% of crew believe that their expenditure will either stay the same or increase. Only 13% anticipate that they will cut their expenditure on crew communications in the next 12 months.

» In general, deduction from salary is still the dominant payment method used by seafarers at sea. Whilst the number of crew using cash has remained unchanged, the numbers using internet banking has more than doubled in the last twelve months from 12% to 25%. Credit and crew payment card usage at sea remains low, but both have seen an increase of 5%.

» Seafarers carry a lot of technology/communications devices on board, the majority taking multiple devices in line with broader BYOD and ATAWAD trends. The smartphone has replaced the laptop as the most common device now taken onboard by crew members. There has been a 20% increase in the number of smartphones taken onboard since the last survey and now 77% of crew carry one. There has been a corresponding reduction in the number of crew taking an ordinary cell phone onboard—which now stands at 28%.

» As with the 2014 survey the key finding is that seafarers take on average three personal technology/communications devices on board. This continues to reflect the broader commercial and consumer trends such as BYOD and ATAWAD, and demonstrates that shipping not only has a highly IT literate workforce, it also has a device-literate workforce.

» According to the data, the average price paid by seafarers for telephone calls has fallen from \$1.42 per minute to \$0.91 per minute. This varied from users paying just a few cents per minute—most likely VSAT users—to those paying in excess of \$1.50 per minute. However, this data once again comes with a significant caveat, namely that of all the questions in the survey, those about costs and pricing

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clearly were difficult for crew to answer. It seems clear that the pricing information provided to crew can be inaccurate and misleading, indicating the reason that seafarers struggled to answer questions on prices.

» Crew generally had a better idea of what they were spending on email, although some answers again were clearly not accurate. The average price paid for an email was \$0.30, an increase of 10% on last year. Suppliers of email solutions for crew provide significantly more information to crew on the cost of each message, SMS etc. This transparency appears still to be lacking in the market for voice calls except where dedicated crew calling solutions are in place.

» When it came to Internet access, the average price paid for 1 megabyte of Internet access was \$0.44—roughly in line with the figure for last year. However, once again the spread of prices suggests that this pricing and cost data should be treated with caution. However, as it is closely in line with the data from last year's survey we can be more confident of its accuracy.

» The overall conclusion is that connectivity suppliers are offering overly-complex pricing structures which in some cases are preventing services being made available more widely to crew. Given that connectivity is now so important to crew when selecting which operator they work for it is important for ship operators and suppliers to work closely together to provide greater transparency in pricing information.

» When identifying their favourite websites crew chose major news and sports sites including CNN, the BBC and ESPN. Amazon has replaced eBay as the most popular shopping site amongst seafarers, while Facebook remains the most popular social networking site with 79% of seafarers citing it as their favourite. However, Whatsapp is the second favourite social networking app which didn't figure at all in last year's survey. 8 of the top 10 social media sites are app based, reflecting the number of smartphones now taken on-board by crew.

» Asked to name their favourite maritime recruitment website, crew cited Jobships (15%), closely followed by Sea-jobs (12%). CrewToo, the crew social media site, which did not appear on last year's survey, was the third most popular maritime recruitment website, and LinkedIn—also a new entrant—was the fourth most popular site.

» The only major maritime recruitment agency that appeared in this year's survey was Spinnaker, and it is the first agency to appear in the top 10.

» The most popular maritime website was MarineInsight with 13%, followed by CrewToo at 10% and gCaptain at 6%. The rest of the top ten—including the IMO, Nautical Institute and Nautilus—had less than 5% shares, leaving a significant number of individual maritime websites to make up the remaining 44%.

» In terms of future services there is further confirmation of relatively low levels of interest in content (on demand music, TV or film) services. This is reflected in the responses given by respondents when questioned as to what they would use the Internet for, were it provided to them.

» There continues to be a strong appetite for a low-cost global roaming SIM card that would allow low cost calls from any country. Currently seafarers find themselves purchasing SIM cards from port welfare facilities which, if not used, are worthless in another country. Considering the wide availability of such global roaming SIMs and smartphone mobile apps, it continues to be a mystery why none of the terrestrial providers of such services have recognised the opportunity to market these SIMs to seafarers, or that maritime communications suppliers have not added them to their product portfolios.

The continued interest in such SIMs would suggest that these cards represent the low hanging fruit of crew communications.

» Once again the clear message from crew is that they accept and understand that the costs of crew communications services at sea will be higher because satellite connectivity will always be higher in cost. However, they appear less happy with the amount of money they are expected to spend ashore, where terrestrial networks exist and telephony and Internet access should be correspondingly cheaper.

» It remains clear that crew are not particularly looking for new and innovative service provision, but ways by which to reduce costs, which they see as unnecessarily high ashore.

» One of the major findings of last year's survey remains true today—that Internet access, whilst utilising the latest IP technology, is actually being leveraged by crew to address the costs of the oldest and most traditional form of communications, and that upon which they are still spending the most, namely voice calling, and also, increasingly, video chat.

» Again, perhaps one of the most important findings of the survey lies in respondents' attitudes towards their on-line usage data. 76% of seafarers are still happy to allow access to their data in exchange for free Internet access provision. This sentiment did not vary considerably between age groups, rank or IT competency and is a clear signal that redesigned service propositions and models based on the monetising of exhaust data from crews would have a good chance of widespread take-up.

The implications of this finding are pertinent not just to deep-sea connectivity suppliers and ship operators, but to shore-based stakeholders including ports and those providing crew welfare facilities within them, or local to them.

Supporting Organisations

Crewtoo

KVH Media group is the maritime industry's leading provider of rights-approved news, sports, music, and movies, including Walport maritime training films.

KVH is based in Middletown, RI, with facilities in Illinois, Denmark, Norway, the UK, Singapore, the Philippines, India, and Japan, and employs more than 500 people around the world. Home to popular maritime brands NEWSlink, MOVIElink, and TRAININGlink, KVH Media Group began the maritime social networking service Crewtoo for seafarers towards the end of 2011.

Crewtoo is the seafarer's community, aiming to let crew connect, share, learn and have a voice whether at sea or at home. Now with over 100,000 members, the service allows seafarers to create profiles, post comments and update their profiles from their ships, find colleagues with whom they may have lost touch, share opinions with the community, keep up to date with and comment on maritime news and also take part in Crewtoo polls and votes.

KVH Media Group is part of KVH Industries, a leading manufacturer of solutions that provide global high-speed Internet, television, and voice services via satellite to mobile users at sea, on land, and in the air, and is a leading producer of fiber optic gyros for guidance and stabilization.

In 2012, Euroconsult, NSR, and Comsys reported that KVH was the market share leader in global maritime VSAT.

PTC

Founded in 1979, PTC a one of the largest crew management and diversified maritime services companies in the Philippines. Its range of services include marine management, education and professional development, energy and logistics, healthcare, tourism, offshore processing, property development, microfinance and international professional placement.

Its pioneering initiative in crew management was the international deployment of a full-Filipino complement on three 50,000 DWT Ore Bulk Oil Carriers, a first in Philippine maritime history in 1984.

Today, PTC has grown beyond crew management. A leader in the Philippine maritime industry deploying over 45,000 Filipino global maritime professionals on board close to 1,100 vessels, PTC now offers an integrated value chain of services that spans Marine Management; Education and Professional Development; Energy and Logistics; Travel and Tourism; Healthcare; Offshore Processing; Property Development; Microfinance; Family Care Programs; International Professional Placement; and Information and Communications Technology.

Driven by a passion to make a difference and a commitment to longstanding partnerships with Principals who are themselves leaders in Europe, Asia and North America, the PTC Group continues to embrace its vision for a Filipino Global Maritime Professional to be on every vessel, in every sea, Moving the World.



www.crewtoo.com/



www.ptc.com.ph/

InterManager

InterManager is the international trade association for the shipmanagement industry. Its members are in-house or third party ship managers, crew managers or related organisations and businesses from throughout the shipping industry.

Collectively InterManager members are involved in the management of almost 5,000 ships and responsible for some 250,000 seafarers. InterManager is the only organisation exclusively dedicated to representing the shipmanagement industry. It is a recognised and well-respected organisation which represents its members at international level, lobbying on their behalf to ensure their views and needs are taken into account within the world-wide maritime industry.

In addition, InterManager is committed to improving transparency and governance in the shipping world and ensuring high standards are maintained throughout the shipmanagement sector.

The directors and senior staff of InterManager member companies hold a number of external positions. Posts include advisers to governments, technical institutes, maritime academies and maritime courts on maritime affairs, as well as senior elected positions in environmental and business promotion organisations, representation on ICS, ISF, Intertanko, BIMCO and national shipowners' association boards or committees and official positions in local branches of The Nautical Institute. InterManager is the voice of shipmanagement.



InterManager

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BIMCO

Bimco has continuously advocated for the economic well-being of shipping, whilst promoting safety and environmental protection, and always acting in the best interests of its members. Bimco has existed through an era of immense change in transportation and economic growth, and has built its strength upon its ability to move with the times and adapt to economic and political realities.


Bimco's mission is to provide a first class service to its membership representing all segments of the shipping industry by Facilitating state-of-the-art access to quality information and advice, Developing standard contracts and clauses, Promoting fair business practices, free trade and open access to markets, Enhancing the proficiency and qualifications within the industry through its educational programmes, Pro-actively participating in all developments which serve to enhance harmonisation and help to maintain a level playing field within the international shipping industry.

Bimco also offers a broad range of practical knowledge and services, complemented by voluntary reporting and input from the membership. BIMCO's website – www.bimco.org, is possibly the largest single compilation of contemporary and practical shipping information, with more than 175,000 pages on all aspects of vessel operations including port and cargo databases and an array of other shipping-related data.



BIMCO

www.bimco.org/



"43% of crew reported that they had sailed on a vessel that had become infected with a virus or malware."

ISWAN

The International Seafarers Welfare and Assistance Network promotes seafarers welfare worldwide and directly serves seafarers by providing a 24 hour helpline. ISWAN is the result of a merger between the International Committee on Seafarers' Welfare (ICSW) and the International Seafarers Assistance Network (ISAN). ISWAN is a membership organisation with the International Shipping Federation, The International Transport Workers Federation and the International Christian Maritime Association as the core members.

ISWAN provides direct welfare services to seafarers. The 24 hour multilingual helpline, seafarershelp, runs every day of the year and is free for seafarers to call from anywhere in the world. ISWAN also runs an emergency welfare fund for seafarers in dire need, produces health information for seafarers, and provides information on the location of seafarer centres.

ISWAN works to support the welfare of seafarers all over the world. It works in support of organisations and bodies that provide direct welfare services to seafarers. It works to enable the establishment of welfare facilities and services in port and on ships. ISWAN brings together and supports its members to share learning and experiences to improve seafarers' welfare both onboard and ashore. In particular, ISWAN works for the implementation of the ILO Maritime Labour Convention 2006. ISWAN works with companies, unions, governments, welfare organisations (secular and faith based), and ports for the benefit of seafarers' welfare.

ISWAN is funded by membership subscriptions, grants from foundations, sponsorship, and earned income.



www.seafarerswelfare.org/



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