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The future of manpower supply sustainability for shipping industry

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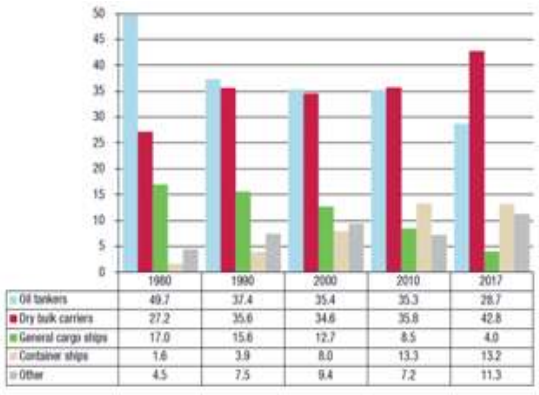
Abstract

Our global society is supported by an international economy – and that economy is simply sustained by the shipping industry which could not function without ships. Shipping is truly the lynchpin of the international economy; without shipping, intercontinental trade, the bulk transport of raw materials and the import/export of affordable food and manufactured goods would simply not be possible1. It is generally accepted that more than 90 percent of global trade is carried by sea and we believe that shipping is depending upon manpower. The standard protocol regarding traditional seafarers training was based first on theoretical teachings in the classrooms, followed by practical training onboard the ships . Due to economical and practical reasons; reduction of crew size, improvement of technology the lack of these experiences causes seafarer to not be fully prepared for the real problems that may arise on board ship. This can be considered uncomplicated by means of obtaining proper qualifications through IMO, so that when partnered with the simulator, the training will prove to be effective. Only through integration of these measures can effective and efficient training of the seafarer be achieved in line with the training objectives of the STCW Convention. However, what about if we face a shortage of manpower? This article examines if there is a manpower shortage and why quality manpower supply is the most important factor driving sustainability in maritime transport

1. Introduction

As a shipping industry we need to know the likely availability of our most important asset both in the short term and longer term and Due to the training and development lag, we must be looking at least ten years ahead. But without sound information and an awareness of what initiatives are taking place globally we do not know whether we are in a positive position as an industry or not. And with the anticipated future growth of the world merchant fleet over the next ten years what is the possible impacts on the global manpower situation. Consequently, for the fifth year in a row, world fleet growth has been decelerating. The commercial shipping fleet grew by 3.15 per cent in the past 12 months to 1 January 2017 compared with 3.5 per cent in 2015 and by 3.15 per cent in 2016. Despite this further decline in the annual growth rate, the supply increased faster than demand, at 2.6 per cent, leading to a continued situation of global overcapacity and downward pressure on freight rates. In terms of vessel numbers, the growth rate was 2.47 per cent – lower than tonnage – reflecting a further increase in average vessel sizes. In total, the world commercial fleet on 1 January 2017 consisted of 93,161 vessels, with a combined tonnage of 1.86 billion dwt



	1980	1990	2000	2010	2017
Oil tankers	49.7	37.4	35.4	35.3	28.7
Dry bulk carriers	27.2	35.6	34.6	35.8	42.8
General cargo ships	17.0	15.6	12.7	8.5	4.0
Container ships	1.6	3.9	8.0	13.3	13.2
Other	4.5	7.5	9.4	7.2	11.3

But the current shortage of officer corps seafarers is forecast to worsen and risks impacting carrier profitability, according to Drewry's recently published Manning 2014 Annual Report3.

A shortage of competent seafarers, particularly officers, to operate the increasingly sophisticated vessels is a challenge for the industry; high-quality engineering officers will be particularly in demand as tighter emission regulations require ships to burn lighter fuels in sophisticated new engine designs4.

The highest priority of the international shipping industry remains the safety of life at sea. It is anticipated that the sustainable development goals developed by IMO also address issues such as seafarer training, further improvements to

navigational safety and the promotion of an effective safety culture5.

It is also common knowledge that 75-96% of marine casualties are caused by some form of human error. Therefore, there is a direct cause and effect relationship between the competence of seafarers through quality of maritime economic trade (MET) and successful and environmentally responsible Globalization6.

Many dangerous shipping practices originate from substandard MET, which results in substandard skill levels of Officers and Crew. Consequently, such Human Factor issues are highly correlated to conditions of industry Safety, Security and Environment Protection levels7.

It is also reasonable to take into account that Globalization stimulates growth in the international trade and that increased International Shipping itself is one of the major factors in this process.

The building of newer and more technically sophisticated ships and port systems to meet this increased demand for seaborne trade, along with new IMO requirements for regulating safety, security, protection of environment, will demand, more than ever, well trained and educated personnel both on board and ashore. Viewed in this light, it is easy to see why sustainable development needs a sustainable maritime transportation system and why sustainable shipping needs sustainable and quality manpower supply. It is recognized that human resources and human element are of utmost importance for development of the sustainable maritime transportation system. It is also understood that such industry challenges as reduced ship manning, crew fatigue, crew overload, overregulation, administrative burden, and the attraction of young people to the industry are tightly related to quality of human resources. Taking into account the IMO Secretary-General's statement at the 2015 International MET Symposium at WMU, "Effective standards of training remain the bedrock of a safe and secure shipping industry, which needs to preserve the quality, practical skills and competence of qualified human resources8", in addition the International Association of Maritime Universities (IAMU) proposes the «Sustainable and Quality Manpower Supply for Shipping Industry: System Approach» for IMO 2018- 2023 Strategic Direction:.

2-Narrative of the trends and developments (global supply and demand for seafarers)

Practically all manpower surveys carried out in the 21st century are still predicting the shortages of properly qualified seafarers; this is something the stakeholders cannot afford to ignore, we narrate as example:

2.1 Projections of UK Seafarers from 2011-2031

It is a simple model of officer entry and exit rates is combined with the detailed age profile information generated by the ministry of corporate affairs (MCA) safety data sheet (SDS) on UK certificated officer ages. This permits the simulation of the trend in total numbers of UK certificated officers. These can be projected using different assumptions about officer loss rates and retirement ages, together with trainee completion rates.

Cadet entry numbers have been assumed to be 800 per year, a little lower than the actual entry figures in the last few years. This is a key assumption, in terms of its effect on the results.

It is assumed that new trainees leave training prior to completion at an average rate of 8 per cent per year. This figure has been employed in previous modeling work, and is de-rived from the analysis of GAFT data the (Generalized Accelerated Failure Time (GAFT) model)

The age profile of new entrants has been modeled using detailed provided by merchant navy training board (MNTB) data, to construct an estimated age profile of trainees. This profile has been employed to derive an aggregated probability distribution to apply to the ages of new entrants. This means that the generated age profile of certificated officers for 10 or 20 years in the future

The second key assumption is in the maintained 'wastage rate' of officers. This has been set at 6 per cent for the age range 20 – 50 years, and 1 per cent thereafter, until the age of retirement. These assumptions are 'consensus' estimates that are consistent with Cardiff University's study of seafarer numbers using 'back casting techniques

The final element in the projection model is the assumed age of retirement. Using data provided by the Merchant Navy Officers' Pension Fund (MNOPF) for retirees over the period 2000-2007,

Table shows the impact on the forecast numbers of varying each of the main input assumptions (individually) by 25 per cent. For example, a 25 per cent increase in the assumed officer wastage rate reduces the forecast numbers in 2020 by about 9%.

The table shows that the two most significant assumptions are the cadet entry numbers and the officer wastage rates prior to retirement. Variations in cadet wastage rates have less impact.

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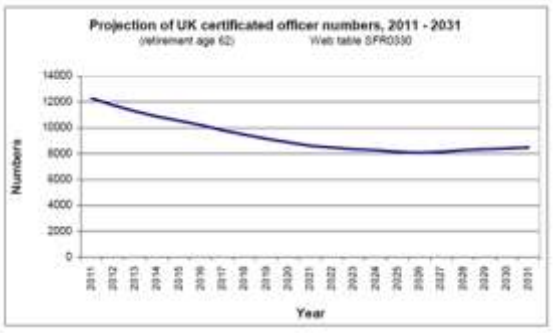


Table SFR0310 Projection of UK certificated officers for 2011-2031

Age 62	Year	2011	2016	2021	2026	2031
Total	Numbers	12,240	10,172	8,630	8,099	8,491
Deck	0.51	6,234	5,180	4,395	4,125	4,324
Engineer	0.49	6,006	4,992	4,235	3,974	4,166
Age 65	**Year**	**2011**	**2016**	**2021**	**2026**	**2031**
Total	Numbers	13,191	10,946	9,248	8,420	8,588
Deck	0.55	7,265	5,979	5,052	4,599	4,691
Engineer	0.45	5,986	4,967	4,197	3,821	3,897

Input Assumptions

Cadet Entry Rates		Wastage Rates	
Input	800	At ages 20 < 30	0.06
Wastage	0.08	At ages 30 < 50	0.06
Output	573	At age 50 plus	0.01

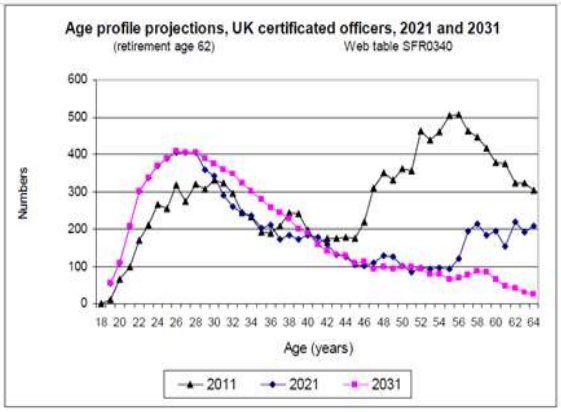


Table SFR0320: Forecast Sensitivity: Effect of a 25 per cent change in modelling assumptions on 2021 forecast

	Sensitivity testing			% change in 2021 forecast		
Model assumption	Low	Base	High	Low	High	Elasticity
Cadet entry numbers	600	800	1,000	-12.8	12.8	0.51
Cadet wastage rate	0.060	0.080	0.100	4.6	-4.3	-0.18
Officer wastage rate	0.045	0.060	0.075	9.8	-8.8	-0.37
Base case scenario forecast for 2021 (officer numbers)						8,630

2.2 BIMCO/ISF AND ICS MANPOWER REPORTS 2005 AND 2015-2025

In accordance with Baltic and International Maritime Council/importer security filing and international chamber of shipping (BIMCO / ISF) and ICS MANPOWER REPORTS 2005 and 2015-2025, the Supply / Demand Balance in 2000 estimated a worldwide shortfall of 16,000 officers or 4 % of the total workforce9. In 2005 the estimates indicated a modest theoretical worldwide shortfall of 10,000 officers or 2 % of the total workforce10. The results in 2010 suggest that the situation is one of approximate balance between demand and supply for ratings with a modest overall shortage of officers (about 2%); the implication being there is currently not a serious shortage problem for officers in aggregate. This does not, of course, mean that individual shipping companies are not experiencing serious recruitment problems, but simply that overall supply and demand are currently more or less in balance. This is perhaps not surprising given the sharp contraction in the demand for sea transport in 2009 combined with significant growth in total seafarer numbers.11

In 7 September 2016, ICS and BIMCO launched the results of their latest five year Manpower Report on the global supply and demand for seafarers. This was a major project conducted with assistance from Dalian Maritime Consulting and Dalian Maritime University, overseen by a steering committee of industry representatives.

According to the ICS and BIMCO Report, the global supply of seafarers in 2015 was estimated at 1,647,500 of which about 774,000 are officers and 873,500 are ratings. Encouragingly, the worldwide supply of officers is estimated to have increased by 24% since 2010, with the supply of ratings increasing too. Significantly, China is thought to have overtaken the Philippines as the largest single source of seafarers qualified for international trade (although the Philippines is still the largest source of ratings). However, data from international shipping companies suggests that the extent to which these Chinese seafarers are available for service on foreign-owned ships may be limited, with the Philippines and Russia seen as equally important sources of officers, followed closely by Ukraine and India.

Summary of the estimated global supply of seafarers 2005-2015

RANK	2005	2010	2015
Officers	466,000	624,000	774,000
Ratings	721,000	747,000	873,500
Total	1,187,000	1,371,000	1,647,500

- The global supply of seafarers has increased over the past five years, with both numbers of qualified officers and ratings available to the internationally trading world merchant fleet continuing to increase. The number of officers was reported to have increased by 34% between 2005 and 2010, and is now estimated to have increased by 24% in the past five years. The following figure provides a summary of how the estimated global supply of seafarers has increased since 2005.
- The world merchant fleet for the purposes of the 2015 report was defined as 68,723 ships. The largest category was general cargo ships

with 31% of the total ships by number, followed by bulk carriers with 16% and offshore supply vessels with 10%. The 2015 report has included information on the tanker industry and various types of offshore vessels to obtain an indication of the demand for seafarers by these sectors. The global demand for seafarers in 2015 is estimated at 1,545,000, with the industry estimated to need approximately 790,500 officers and 754,500 ratings. As a result of the substantial growth in the number of ships in the world fleet since 2010, the estimated demand for officers has increased by around 24% in 2015, although the demand for ratings has increased by only 1%. The figures therefore suggest a current global shortage of about 16,500 officers (2.1%) but a surplus of about 119,000 ratings (15.8%).

The estimated demand for officers has increased by around 24.1% since 2010, while the demand for ratings has increased by around 1.0%. The estimated demand for officers and ratings in 2015 compared to the estimates of demand reported in previous reports is shown

Estimated global demand for seafarers 2005-2015

RANK	2005	2010	2015
Officers	476,000	637,000	790,500
Ratings	586,000	747,000	754,500
Total	1,062,000	1,384,000	1,545,000

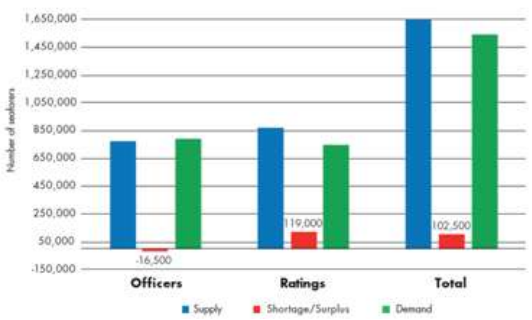
- Whereas the estimated demand for officers and ratings increased between 2005 and 2010 by 33.8% and

27.5% respectively, the trend of the demand for officers has continued whilst only a small increase in demand for ratings has appeared since 2010. The report suggests that the industry has made good progress in the past five years with respect to increasing recruitment and training levels, and reducing officer wastage (i.e. retaining qualified officers and increasing the number of years which they serve at sea).

The estimates prepared for the 2015 report indicate that the current global supply of seafarers is around 1,647,500 seafarers, of which approximately 774,000 are officers and 873,500 are ratings, and that the current global demand for seafarers is around 1,545,000 seafarers, with the industry requiring approximately 790,500 officers and 754,500 ratings

	OFFICERS	RATINGS	TOTAL
Supply	774,000	873,500	1,647,500
Demand	790,500	754,500	1,545,000
Shortage/Surplus	-16,500	119,000	102,500
%	2.1%	15.8%	6.6%

Current estimated global supply and demand of seafarers

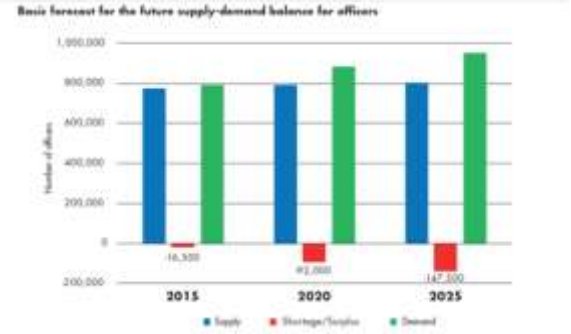


- Recruitment and training levels are estimated to have increased over the past five years and wastage rates appear to have reduced below those identified in previous reports

A basic forecast for the future supply-demand balance is calculated based on the information and data obtained for the 2015 report. The report also presents nine other possible future scenarios (some demand-side and some supply-side) that may affect the future maritime manpower situation, specifically the global supply and demand for officers. The basic forecast is that the global supply of officers will increase steadily, but be outpaced by increasing demand for officers.

	ESTIMATED SUPPLY-DEMAND BALANCE FOR OFFICERS		
	2015	2020	2025
Supply	774,000	789,500	805,000
Demand	790,500	881,500	952,500
Shortage/Surplus	-16,500	-92,000	-147,500
%	2.1%	11.7%	18.3%

Basic forecast for the future supply-demand balance for officers



But using the 2015 report indicates that the forecast growth in the world merchant fleet over the next ten years, and its anticipated demand for seafarers, will likely continue the trend of an overall shortage in the supply of officers. This is despite improved recruitment and training levels and reductions in officer wastage rates over the past five years.

Without continuing efforts to promote careers at sea and improve levels of recruitment and retention, it cannot be guaranteed that there will be an abundant supply of qualified and competent seafarers in the future.

2.3 Drewry annual review and report 2008-2018

Drewry indicates that for approximately the same period of time there is, however, an expanding gap between the supply and demand of properly educated and trained seafarers. In 2008, Drewry also predicted officer shortfall at 34,000 against 498,000 total, rising to 83,900 by 2012 assuming current supply levels and fleet growth.

Further, Drewry estimates the current officer supply to be 610,000, representing a shortfall of 19,000 personnel. This shortfall is forecast to rise to 21,700 by 2018 given that there will be a requirement for an additional 38,500 officers by this time. The shortage of officers remains, especially among senior engineering ranks and for specialist ships such as LNG carriers13.
Regardless of the accuracy of these estimates, and bearing in mind the current market volatility, it is likely that there will be a continuing worldwide shortage of officers and a surplus of ratings for the foreseeable future.

2- Supporting data (reasons)

The following extracts from indicated sources demonstrate supporting evidence for the proposal:

- The labor shortage is attributed to factors such as an ageing workforce in the throes of retirement, and the difficulty in recruiting seafarers with sufficient experience and qualifications18.
- Touching upon maritime casualties, in 2014, the total number of maritime accidents increased by 10% in comparison with the previous year, according to the statistics provided. The IMO Secretariat recorded 799 lives lost or missing last year. If you look at the statistics over the last decade from 2004-2014, 4,784 lives were lost on passenger transport by sea. Obviously the human element must have played a part in those accidents19.
- As it was reported by “Maritime Today” (October 30, 2015, the future operating costs of ships will increase exponentially due to innumerable new regulations (overregulation), the low competence of seafarers, the high bargaining power of the oil majors, stricter rules regarding maintenance and repairs carried out in ports, the advent of more
- Sophisticated onboard machinery and increasing consolidation in the marine equipment and services sector, resulting in more bargaining power for fewer, larger companies20.
- The low competence of seafarers relates also to the trend of moving the centre of crewing into cheaper (developing) countries, while overregulation substantially undermines the sustainability of quality manpower supply of industry in future.
- The loss of prestige of marine professions in traditional maritime countries and the shortage of qualified teaching staff in many countries will threaten the ability of the world to provide truly competent seafarers. The loss of such a critical mass of skilled and experienced Human Resources, therefore, poses a threat for the World Shipping Industry and the ocean environment in general12.
- The shortfall of seafarers has negative impacts on the shipping industry as a whole; whereas both the on-board and on-shore maritime related work posts face manning problems that may directly threaten the existence of shipping activity and the sustenance of maritime know- how14.
- Retention of seafarers is estimated to have improved with annual wastage rates estimated at around 2.3% to 2.4% for deck and engineer officers.
-

3- Qualification challenges and sustainability

- It is clearly recognized by the industry that the world needs more competent personnel at sea and ashore than ever before. The mandatory implementation of STCW provisions by a national authority increases barriers to entry for sub-standard maritime education providers that lack the necessary resources. Even in cases where monetary resources are adequate for a shore-based physical plant, other constraints persist. One such major challenge that many maritime institutions experience, regardless of location, is their inability to attract appropriately qualified instructors. The typical pool of applicants for license-track faculty openings is relatively small. The turnover among faculty, especially those with experience on board specialized risky vessels such as tankers and LNG ships, is exceptionally high. Furthermore, while many mariners who pursue the teaching option may have the professional skills, they rarely possess formal preparation in pedagogy and instruction, and hence, may have a lengthy learning curve towards becoming effective educators. This has a major impact on the effectiveness of the instruction provided

which for deck students is about one-half of the total four-year academic credits required for graduation, and close to 60% for engineers.

- Although all world class maritime institutions invest routinely in expensive simulator technology for effective education and training, there is no real alternative to the experiential learning that takes place on board a ship and is a requirement for any approved MET program. However, very few countries today have sufficient on board training (OBT) facilities of their own and this is presently emerging as a serious global concern15.
- It is obvious that the STCW Code requires all seafarers to be properly qualified for the position that they hold on board, and the ISM Code requires the company to assess and document the position of responsibility and individual competency of each crew member. Instructors, supervisors and assessors themselves are also required to be appropriately qualified. However, while it is recognized that the current STCW Code's levels of competencies are minimum levels to assure safe and environmentally responsible shipping, these minimum levels are not sufficient to cope with the increasing size and complex nature of many of today's ships17.
- Women seafarers may represent approximately 1% of the estimated global supply of qualified seafarers
- Recruitment and training levels are estimated to have improved to 1 officer trainees per 7.6 qualified officers (1:10 in 2010).
-

4- Safety, regulation challenges and sustainability

The following outcomes from the IAMU research project submitted to HTW 2 directly or indirectly link safety, regulation challenges and sustainability of shipping in general and quality manpower supply24:

- "Overregulation" is catastrophic for a ship (company) when there is a "shortage of crew", especially if they both exist together with "low crew qualifications". It is accompanied by an enormous "overload". When "overregulation, unskilled seafarers" and "overload" combine, they create a vicious circle of "continuous raising of overregulation levels";
- Even in conditions of stiff competition, "overregulation" in the shipping industry can be avoided or its negative impact can be reduced by educating and training highly qualified seafarers, company shore-based staff and ship inspectors;
- Decreasing of seafarer's qualification is equal to increasing his/her "workload". It entails increasing the fatigue level and reducing the level of safety, security and the attractiveness of shipping industry;
- One of the causes of "overregulation" in the shipping industry is cheap and poorly-qualified crews;
- Future demands for seafarers will be driven by a number of factors. They are:

  (1) The future growth of world trade, and hence the growth of the world fleet;

  (2) The future growth of ship productivity, which will be determined by the technology embodied in new ships;

  (3) The changing vintage of the fleet, which will alter the crew levels required for safe and quality manning;

  (4) Changes in the required levels of manning to comply with national and international conventions as and when they alter;

  (5) Changes in the flag composition of the world fleet, because this affects overall manning totals;

  (6) Changes in the proportions of non-national crews used by ship owners and ship management companies, as this affects the ‘typical manning levels’25;

  (7) changes in securing qualified instructors in MET institutions taking into account the situation gap between seafarer supplying and demanding countries; and

  (8) Significant changes in methodology of MET initiated by ICT (Information and Communication Technology).

5-Conclusion

- The continued growth in world trade [and possible supply / demand imbalance in number and quality of seafarers], has placed intense pressure on capacity building and the sustainability of Maritime Transportation System. The challenge for IMO is to support, encourage and render assistance to administrations and the shipping industry to expand their capacity and responsibility in order to successfully handle the increased demand for sustainable and quality manpower supply; – otherwise there is a risk of losing safety and efficiency in the industry. When the available capacity does not meet the incoming demand, serious problems can ensue26.

- From a global perspective, capacity and the responsible expansion of administrations and industry can be achieved not only by capital investment into manpower supply. Similar capacity increases can also be achieved by improving the international standards or implementation efficiency of existing standards and systems through systematic analysis and tight collaboration of global networks within administrations, industry and MET institutions.
- The current updated data of the labor market highlights that the shipping industry is likely to face a challenging future for crewing. There are many uncertainties, for instance where the next generation of seafarers comes from, but the results indicate that the industry will - - Most probably face a continuing tight labor market, with recurrent shortages for some officers, particularly if shipping markets recover.
- Unless measures are taken to ensure a continued rapid growth in the number of qualified seafarers, especially for officers, and/or to reduce wastage from the shipping industry, existing shortages are likely to intensify over the next decade. Supply appears likely to increase in many countries, but the positive trend that has been established for training and recruitment over the past few years must continue to ensure a suitable future pool of qualified seafarers. It is important to stress that the shipping industry requires well qualified and high caliber seafarers capable of adapting to change and handling the wide range of tasks now required of them. Any training program provided must ensure quality is not compromised in the quest for increasing quantity27.

6-Recommendation

- The current maritime manpower situation and future outlook indicate that the industry and relevant stakeholders should not expect there to be an abundant supply of qualified and competent seafarers in the future without concerted efforts and measures to address key manpower issues. It is crucial to promote careers at sea, enhance maritime education and training worldwide, address the retention of seafarers, and to continue monitoring the global supply and demand for seafarers on a regular basis.
- Currently, more than 1.5 million people are employed as seafarers. If the global economy continues to grow, more highly trained and qualified seafarers will be needed. Related activities such as shipbuilding, ship repair and ship recycling will also have growing requirements for manpower resources.
- If the global fleet increases in size by 70% between now and 2030 (as has been widely predicted, based on the growth trend of the last five decades), the current number of 500,000 officers needs to be increased to 850,000. If half the existing officers retire by 2030, that means 600,000 new officers will need to be recruited and trained from now. This equates to an annual requirement for officers in the order of some 40,000. This is a real challenge. Clearly, further effort must be made to bring new generations into seafaring as a profession. Seafaring must be seen to appeal to new generations as a rewarding and fulfilling career.
- At the same time, a number of factors are combining to make ships themselves more complex and sophisticated than ever before. Environmental pressures, the need to operate at optimum efficiency in difficult economic times and the quest for sustainable development, are all factors that raise the bar with respect to the skill levels of seagoing personnel16.
- High quality maritime education and training are the bedrock of a safe and secure shipping industry. Quality is a key aspect of this to ensure seafarers are competent in their onboard roles and prepared for career advancement. This should be a universally accepted requirement from shipping, but the best method for training crew is not yet agreed upon.
- Interpreting the economic principle of Pareto optimality28, a final conclusion can be drawn as follows: it is impossible to maintain the safety, efficiency and therefore the sustainability of the shipping industry while not keeping or reducing the resources for quality manpower supply, or raising in a timely manner the resources for safety and protection of the environment by additional regulations.
- In this context it is absolutely clear that to maintain sustainable development of the industry, MET systems need a stable supply of qualified instructors 21 while also creating and continually maintaining [Global] Maritime Academic and Instructors Resource Database, which contains qualifications, experiences and specialization of each teaching staff members at MET institutions22.
- It has also become prudent to create, keep and update information on MET teaching materials by building a special e-Platform for these purposes23.

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