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A future for maritime professionals

Patrick Carnie MIoD, MRINA, FIES, FRSA

Strategy Director, E&MT, Babcock International Group

Abstract

The future for maritime professionals could be, and should be, very positive. The paper reviews Scotland's maritime industries, suggesting that people within our sector are relatively competitive, but will face increasingly co-ordinated competition from around the world. This paper considers and interprets a personal view of the consequences for Scotland's maritime industries and professional engineers. A recent report by Lloyd's Register, Strathclyde University and QinetiQ, "Global Marine Trends 2030" sets the scene for the global sector across merchant, naval and offshore energy, showing that all three are set for growth. The paper then poses some questions about what the audience would like the future to be, and how that could be achieved – not just a question of "more work please", but how do we make ourselves more attractive to the international buyer of maritime services, and how do we make that sustainable? It poses questions about whether co-ordinated strategy would provide the best opportunities for all.

Introduction

Why should we study the future – isn't it all too difficult and unreliable? It probably is. But it's also really important. The pace of change is increasing, and we face global competition for our jobs and resources. The good news is that there are various past trends, aspects of human nature, and physical laws which do make the future somewhat predictable. At least we can say that parts of the future may be likely. Historians generate part of their value to society by examining what lessons can be learned from the past, for the future. Military and business leaders, stock market players and gamblers, try to understand how the future might work out, so that they can gain a financial or competitive lead.

Having considered what the future might hold, one might then consider what to do about it – making and enacting a strategy. Strategic planning has been developing for centuries, but it has turned into more of a science in the last century.

I say "more of a science", because, rather like naval architecture, it involves judicious decision making about information points which come with a range of certainty. For a naval architect, key input measures to a design might include:

- specific: seawater density and kinematic viscosity – which are reliably about 1.025 tonnes per cubic metre and 1.83×10^{-6} square metres per second
- range: dynamic forces due to wind and waves that will hit your ship – which are not specific, but quantifiable in terms of minima, maxima, frequency, etc.
- unknown: prices of fuel and steel – which will be based on the international commodity prices, in turn affected by a massively complex set of factors, not least geo-politics, so its not reliably predictable at all, and you have to use an opinion based estimate.

Despite the range of confidence we have in these factors (from accurate to probabilistic to qualitative), we design ships taking account of all of them, and most ships perform pretty efficiently, achieving their goals in terms of function, profit, safety and environment.

Likewise, in business strategy, we are certain that shareholders expect us to achieve net profits over the next five years of at least five to fifteen percent (or they will move their capital to new investments). However, the business environment in which we will be working can only be characterised by somewhat qualitative trends, with a wide range of possibilities, and an uncertain outcome. Again, however, it is practiced by many large companies, because they understand that “failing to plan is planning to fail”, and that at least if you have a strategy, it can be adapted as the environment changes. Thus companies, often, manage to grow, return profits, and employ large numbers of people.

“Strategy is the direction and scope of an organisation over the long term, which achieves advantage in a changing environment through its configuration of resources and competences with the aim of fulfilling stockholder expectations” Johnson et al (2008)¹

Strategic planning is not feasible for everyone, because it is complex and takes a lot of effort. This paper therefore seeks to help professionals, who may be working in isolation or in small organisations, address the question of what the future looks like, what the impacts might be. *“Most small businesses have a strategy in the form of a business plan; this is usually a standard document generated to convince either an advisor or a bank they have a good idea and have thought about it.”* This may help us to consider what we would like to do about it – if anything. It is aimed at helping us to understand whether the time and effort we invest in our careers, studies, professional development, colleagues, and businesses, is worthwhile.

Key elements of successful strategy include information, analysis, vision, plan, organisation, authority (earned or imposed), means and resources. Since strategy has to be delivered by a lot of people, a reasonably representative group of people have to contribute to its development, even if some individual contributions are modest.

Scope

Before I offer my understanding of a future for maritime professionals in Scotland, let me first describe who I am including in that group.

“Professionals” are people assessed to have achieved a high level of competence, and are committed to a high level of practice and ethical behaviour. The UK Inter Professional Group definition of a Profession [reference A] is *‘an occupation in which an individual uses an intellectual skill based on an established body of knowledge and practice to provide a specialised service in a defined area, exercising independent judgement in accordance with a code of ethics and in the public interest.’*

Among professionals, I would categorise the following as Maritime professionals, assuming we can accept that “marine” and “maritime” are interchangeable. You may think of others.

- Naval Architects and Marine Engineers
- Deck and engineering officers engaged in Merchant, Naval and fishing sectors
- Ship managers, brokers, owners, shipping and logistics professionals
- Port operators and coastal/subsea civil engineers
- Marine Scientists and those engaged in aquaculture and blue-biology
- Offshore energy professionals inc. Petroleum engineers, Systems engineers, Asset Managers
- Directors, project managers, lawyers, managers, accountants, and even strategists, in the same companies - all of whom are increasingly professional.

For the purposes of this paper, I include maritime professionals based in Scotland, or living here but working outside Scotland, or working for Scottish headquartered companies. Of course many of us work internationally.

So, is there a bright or dull future for maritime professionals in Scotland? Will we have more confidence in our work and our professions if we understand what it could be? Can we influence it? If so, what goal would we set and how would we organise to achieve it?

The local context

In strategy, we usually look at the situation around us to determine answers to these important questions, and to help us with decisions we may have to make.

Marine Scotland [B] describes our situation as follows, not all of which is unique: *“Scotland is a maritime nation with a history that is linked to the seas. Over many centuries, the seas have been a major source of food for the Scottish population, through the consumption of wild fish and shellfish, and they have been important for trade, the movement of people and the early political and governance structure of Scotland. Industrialisation of Scotland’s seas began in earnest with the herring fisheries in the 19th Century. This has gathered pace with increasingly technology-led fishing practices and with the exploitation of offshore oil and gas reserves, mainly in the North Sea, over the last 30-40 years. At the same time, the sheltered sea loch environments, typical of the west coast of Scotland and Shetland, have provided opportunities for the development of aquaculture. This process of industrialisation of Scotland’s seas will continue through the development of offshore renewable energy and the exploitation of oil and gas reserves in deeper water towards the edge of the continental shelf. Furthermore, there is likely to be increased tourism and recreational marine activity.”* Norway, Ireland, the Netherlands and other countries might be described similarly.

A more useful starting point, and one that we can cover in a single paper, is the SWOT analysis. This considers the current Strengths and Weaknesses internal to the group under review, and the external Opportunities and Threats it sees now and in the future. I will consider the SWOT for maritime professionals in Scotland. Some of these factors will also apply elsewhere, and are not exclusive to this group. The Opportunities and Threats are external. The latter are important because we are inextricably bound to the global maritime sector.

Strengths

It is easiest and most satisfying to start with our current Strengths.

Although not many people are aware of it, the fact is that more than 90% of the UK’s physical trade is by sea. We are seeing increasing maritime leisure interests and growing world trade; and a broad range of supporting maritime activities are also increasing. The UK has had a significant maritime history and, despite disappearing from national attention, today, only the Netherlands handles more goods through its ports than the UK [ref. C]. *“Firms in the marine and maritime sector are estimated to have made a £18.9 billion gross value added contribution to GDP in 2011/12 {and employ 367,000 people} ... {ie} 1.2% of the UK’s economic output {and of total employment}”* [ref. D]. The UK maritime industry is bigger than the UK aerospace and aviation sector, whether measured by value added to the economy or number of employees [ref. D].

Around 1 in every 4 of people (or 41,600 people) employed by the maritime services sector (shipping, ports & business services) in the UK were based in Scotland in 2011 [ref. E]. This is nearly twice as many as employed in the South East, the second largest region in terms of maritime services employment. The sector generated significant levels of Gross Value Added (GVA) in Scotland (£2.2 billion), accounting for approximately 3.5% of the devolved country’s GDP in 2011 [ref. E]. It thus makes a significant contribution to our economy and society.

A few more unique strengths I can identify include the following, and you may have others in mind:

- Our skill base in the maritime professions.
- History of maritime leadership, connections and iconic ships, as well as innovation in fisheries, ship management and design [ref. G]. This dates back to dugout canoes, via the Viking era and culminates in the zenith of Clyde shipbuilding around 1910. Sadly, the value of our historic reputation has diminished significantly.
- Calvinist admiration for “the respectable arts” (to quote Professor Tom Devine [ref. H])

- Proximity to the coast – everyone in Scotland lives within 45 miles of tidal waters. Scotland's coast (ca. 6214 miles) is approximately 29% of the whole European coastline (excluding Norway).
- Scottish basing and operations of the Royal Navy, RNLI and Coastguard, all of which actively stimulate positive media coverage.
- Current research at our universities, and their business relationships through spin-outs and jointly funded "Catapult" Innovation Centres (eg Advanced Manufacturing and Offshore Renewable Energy Catapults headquartered at Strathclyde University)
- Competitive approach to business, especially the offshore oil business in Aberdeen
- International outlook, and connections through our diaspora (again, Tom Devine made the point that (unlike the English), "the Scots have always had to travel" to learn and work.)
- Scottish branches of UK based professional institutions, and of course IESIS itself. The UK based institutions have made great efforts in recent years to expand their international footprint, which can help with exporting our services.
- UK marine and maritime trade associations, which are working with Government to develop industrial strategies and policies [such as ref. G], achieving modest progress.

The sectors which appear to be most active in Scotland are the Oil & Gas sector, Naval, and Merchant shipping. The Naval sector is dominated by the Clyde Naval Base at Faslane and the Rosyth dockyard. The Oil & gas sector is served mostly in the North East, with the obvious hub at Aberdeen, and growing capacity around Shetland, Orkney, Montrose, Dundee and Rosyth. Our Merchant shipping sector encompasses ship management and crewing agencies, mainly centred in Glasgow, and ship operation around the coasts. We are beginning to see the emergence of the Offshore renewable energy sector, including offshore wind, wave and tidal, and there is a significant number of professionals associated with this sector working in central and northern Scotland, to create economically viable technology and development projects. We still have some fisheries, although this has shrunk from the high numbers of registered vessels a century ago. That development is reflected around the world. Aquaculture is set to overtake fishing but in a holding pattern with fishing unlikely to grow at all between 2000 and 2020 [I].

In addition, I would note that our academic institutions host many very bright professionals, with the most obvious examples being the Universities of Edinburgh, Heriot-Watt, Robert Gordon and Strathclyde. We produce some fantastic ideas in these institutions, which register higher on the global scale than would be suggested by the small size of our country. There are more research professionals per capita in Scotland than in the rest of the UK, with around 32,000 in Scotland (1.3% of all employment in Scotland, vs (1.1% for rest of UK), and Scotland's share of the world's top 1% most cited publications is rising (from 1.4% 1996-2000 to 1.7% 2006-2010). Further, Scotland is the most successful region of the UK in creating university spin-outs, attracting 21% of UK investment in such companies (Edinburgh and Strathclyde ranked 4th and 5th among UK universities) [J]. The universities are an important breeding ground for future professionals, and a positive influence on the wide diaspora of international students. As part of the UK, our academic reputation is strong - the World Economic Forum ranks UK among the top 5 nations for university-business R&D collaboration, which it considers a notable competitive advantage for the UK. In addition, the Global Innovation Index 2013 showed the UK moving up from 5th to 3rd in the world rankings (and now ahead of US) out of 142 economies. [J].

Be cautious – strengths are usually easy to define, and we could be suffering optimism or hubris.

Weaknesses

If we turn a grave Calvinist face to the mirror, and consider our current failings, only those suffering from severe hubris would say they are few.

We are lucky to have had a significant history and reputation, but sometimes rely on this too much without considering how or why that reputation was won (and lost). We don't always recognise that change is constant, and planning must adapt. The collapse of British Shipbuilders and the departure of UK shipping companies are part of the reason we have relatively small sector today, compared to other countries. The world's best known maritime professional firms (with the possible exception of ship managers and crewing agencies) are no longer Scottish. As a sector, we are not leading maritime thinking in most areas (with the possible exception of some universities). This suggests we are not as assiduous at pursuing opportunities, or we offer weaker value for money, than our predecessors and our competitors. In that mix of weaker offerings, there is a balance (which we may be making unconsciously) of:

- local rivalry vs local co-operation (when facing global markets)
- innovation vs risk and experience
- complexity vs time available and
- cost base vs living standard and travel costs to reach customer

This partly seems, to me, a question of the increasing specialisation of technologies, and the difficulty of maintaining (in a relatively small sector) enough overhead time to explore all the opportunities. I also wonder whether we are organised for, and effective at:

- monetising our own inventions (turning them into commercial products and services, and marketing them effectively)
- listening carefully to our customers, and
- expressing our value propositions

At any significant scale, our physical maritime infrastructure is aging, and our current experience of ship design and build is only for the Royal Navy, which has very different demands from merchant ship owners.

I wonder whether our many UK maritime trade associations and other institutions are strong enough for their jobs. We have collectively made only modest progress with Westminster policy makers, and have insignificant collective consciousness of why or how that could be better. It has surprised some people in other countries that the UK as an island nation has left maritime policy and strategy substantially off its agenda.

Consider whether those weaknesses apply in your experience, and what others may be pertinent.

Threats

We have considered the current strengths and weaknesses internal to maritime professionals in Scotland. Clearly, internal aspects are easiest (even if "easy" is a relative term) for us to change. The future is up to us to choose, and I will come back to that.

Having considered the internal aspects, we must also look outward at the current and future Opportunities and Threats facing us from the global maritime and other sectors. Since I have a shorter list of the latter, and they fit better with the sober reflection on our weaknesses above, I will examine the Threats first. Again, you may have your own list, but here are a few to consider.

Competition from European – and increasingly global - maritime professionals, operating in volume and at a lower cost base: UK engineering staff salaries are significantly higher than other equivalent salaries, so we need to offer some additional value to be competitive against international engineers. For example, in Romania, equivalent marine engineer salaries would be about one third of UK salaries. Education & skill levels are reasonably high there, with plenty of opportunities to obtain engineering degrees, Masters, and even PhDs. One ship design firm domiciled in the British Isles bases its business model on this fact, and a Scandinavian firm is thought to have diluted its salary bill by around 25% through offshoring its detail design work to Croatia & China. Very large numbers of maritime professionals are also now emerging in China, and of course Korea has produced a huge number in recent years as it established the world's biggest shipbuilding industry.

Competing industrial strategies: Starting in the Netherlands some years ago, maritime industrial strategies have been established in places as diverse as San Diego, Singapore, Norway, France, Germany and Malta. The European Commission itself has an Integrated Maritime policy and Blue Growth agenda [refs. K, L & M]. These are enabling faster development of national maritime capabilities, through investment in skills, innovation, marketing, etc., and focussing Government resource on positioning (eg tax advantages). The UK was one of the last to get it going, and although somewhat successful, it has not led to the rise in media coverage or political interest received in this country by the automotive, aerospace, defence or biotechnology sectors. Those sectors appear to me to have received better support because their top leaders invested money, time and attention to the possibilities of collaboration, and concentrated this effort through a single leading trade association. In the UK we have many maritime related trade associations, no single one having a complete maritime constituency.

Competition from celebrity culture and the inadequate value placed by society and the media on the important, interesting and worthwhile work of professionals. Every year, the UK faces a shortfall of 81,000 people with engineering skills [N], and initiatives over decades (most recently the Perkins Review [O]) have not resolved this. Although the cause of this shortage is complex, I believe that there are two structural weaknesses behind it. First I agree with Shell UK's Chairman that our effort at bringing school students into engineering is "fragmented and uncoordinated" [N]. This leaves our case weakened, and exposes young people to the second element - popular media maximising their advertising income by exciting young base instincts. I quote a worried American mother "*celebrity culture seems to turn everything on its head: what is essential for a happy life is not valued, while the less important things – such as wealth, fame and beauty – are touted as the only way to happiness. ... STEM – science, technology, engineering, and mathematics – subjects are central to everything from long-term earning potential to innovation to national security. If you're playing the odds, having great ability in these areas is your best shot to avoid unemployment, earn good wages, have good opportunities for advancement, etc.*" The threat we face is that celebration of superficiality combines with an inefficient marketing effort, making it difficult to attract and recruit serious minded people, willing to go through the challenges and rigours of a professional education and development.

I could also have mentioned demographics, cognitive agents, our current political situation, or communications. I don't see these aspects as being particularly strong threats or opportunities to the relative competitive position of our maritime professionals. I could have added that we don't socialise with our peers as often as our predecessors did; that higher specialisation makes it harder to scan a range of topics [ref. D]; global influences such as regulation and oil prices; or the effort required to overcome our professional aversion to the pace of change. These issues are very broadly equivalent to our peers in the UK, many other developed countries, and (increasingly) anywhere else in the world.

Opportunities

What of the opportunities? The world is frankly awash with opportunities for maritime professionals. Attempts to measure the scale of the global maritime sectors lose count in the trillions of dollars of annual activity. Commercial marine activity is a very large part of the world's total economic activity, to the extent that it is considered an indicator of the global economy in its own right. The Baltic Dry Index (provided by a British institution) has been almost as useful a measure as global interest rates (although as shipping enables trade in physical goods, the growing trade in services will gradually decouple this link). Rather than look simply at the current market, I would like to set it in context of the long term trends.

The future maritime world

Humanity tends towards improving their lot, as shown comprehensively by Professor Ian Morris of Stanford University [ref P], in his Social Development Index. This measures energy capture, social organisation, war-making capacity and information technology. On this index, every century has

provided better social conditions than the previous one, all the way back to the very first known civilised settlements, established in the hills of Eastern Turkey about 10,000 years ago. This long term development has outlasted any geo-political unrest, recessions and instability.

Focussing in on maritime transport, the European Commission sees a complex future. *“Maritime transport (composed of shipping and ports) facilitates over 90% of all global trade, thus we shouldn’t underestimate how the drivers underpinning the future evolution of the business environment such as investment flows, resource availability and consumption patterns may affect this area. These may directly change the ways in which maritime transport is structured, what forms of business model it will choose to operate by and what capacity is required to meet forecast traffic and demand levels. Issues such as geo-economics (the effects of emerging economies and the shift of economic activity from West to East) as well as more traditional geo-politics may also act as key points of influence on security considerations and the ways in which the sector will be governed across multiple jurisdictions. Technology is also likely to play a further significant role, both in terms of driving the productivity ‘step-changes’ already seen historically in the industry (for example, the introduction of containerisation) as well as tackling longer-term social issues such as climate change (by the introduction of low-carbon shipping) and safety (navigation, automated operations and enhanced risk management). Lastly, a range of ICT trends are beginning to be seen as likely to have impact in this sector including the Internet of Things (M2M¹), Big Data, satellite and space technologies and real time analytics.”* [ref. Q]

In recent years, there has been a huge increase in shipping, a trend that I expect will continue. A recent study quantifying global ship traffic shows that maritime traffic on the world’s oceans has increased four-fold over the past 20 years. Shipping traffic grew even faster during the second decade of the study, peaking at an increase of 10% in 2011. Traffic went up in every ocean during the 20 years of the study. In the Indian Ocean, where the world’s busiest shipping lanes are located, ship traffic grew by more than 300 percent over the 20-year period. [R]

I would like to focus on the next couple of decades, with a look at “Global Marine Trends 2030” [S], or “GMT2030” as we have come to call it. Produced by Lloyd’s Register, QinetiQ, and the University of Strathclyde in 2013, this provides a rational, numerical analysis of possible futures for the global maritime industries. Like any intelligent review of possible futures, of course it has a disclaimer, and you should not rely on it (or anything else I say). However, using scenarios, it paints a picture of likely changes in commercial shipping, naval and offshore energy sectors. Given these possible, or likely, futures, we can consider some of the implications, and our responses to them.

GMT2030: What did we find?

Expectations for significant change between the end of the twentieth, and the start of the twenty-first, were limited: Apart from the “millennium bug”, most people seem to have expected business as usual. The reality has been very different, and the pace of change only seems to have increased. Events in the financial world, the Middle East and emerging countries have surprised many of us. There has been a dramatic interplay between geopolitics, international security, world trade and business. More people recognise that the business environment is becoming more complex, global and multi-polar. Some of the driving factors behind this are easily discernible, and others are more subtle. One of the principal driving forces is the aspiration of people in developing nations. This has prompted massive dislocations and upheavals in the Middle East, the BRIC countries (Brazil, Russia, India, China), and elsewhere around the globe.

We are seeing a new, multi-polar, world economic configuration emerging (in terms of resource demand and allocation, trade and consumption patterns and a shift in the centre of economic activities from west to east). This poses many challenges but also opens many new opportunities for maritime professionals. It will have profound impacts on commercial shipping requirements and

¹ M2M: Machine to Machine

natural resource exploitation; an emerging shift of geopolitical configurations, where future competitions and conflicts between nations are more likely to involve future competition at sea. In turn, this potential threatens peace and stability, generating business opportunities for naval suppliers.

Understanding the possibilities requires us to consider the actual drivers, and the scenarios in which they could operate.

GMT2030: Scenarios & Drivers

Our approach started with asking the central question: “What are the possible outcomes, based on what major drivers, influencing the next two decades in the global marine industry?”.

We moved on to the first part of the question: What are the drivers or influences on our maritime world? We found that these driving forces are primarily: Population, Economy and Resources. There are other influence: we considered Technology (such as autonomy and 3D printing), but found that it is more of an enabler; we assumed Environment would drive our study, but the International Panel on Climate Change showed that the only marine trend which is near having a global effect in 2030 will be polar warming, with other trends taking much longer to have an impact. We also considered Politics - the process by which people make collective decisions. This is a key differentiator, so we used it to define our scenarios. It can be hard to predict, and yet sets the context for all of our futures.

Given these drivers, we built scenario frameworks including the forcing models, which we validated against data for the last few decades. Finally, we developed scenario stories, and it is these we plan to describe today.

GMT2030: Core scenarios

By bringing together trends and their interactions, industry-specific insights, and simple problem-solving techniques, we created three possible outcomes in a quantitative, actionable and unbiased way: “Status Quo”, “Competing Nations” and “Global Commons” scenarios. These mainly separate international political options.

Status Quo scenario

In the “Status Quo” scenario, we expect business as usual, clear economic growth, with no single trade power dominant. Reactive and short-term solutions are used to address trade issues, in turn affecting shipping. Lack of market solutions to security issues, change, etc. leads to checks and controls, encouraging short-term portfolio optimisation and vertical integration, creating risk to the shipping world. A collection of powers will try to support current world orders to advance their interests, but all recognise that protectionism is detrimental. Maximum flexibility is called for in the shipping community. Naval power continues to grow around the world. Energy demands increase offshore investment.

Global Commons

In the “Global Commons” scenario, we see increased co-operation, a bit more growth, and accelerated globalisation. Cross-border integration (e.g. non-custom trading) and virtual value chains are encouraged by built-in security and compliance certification, regulatory harmonisation, and mutual recognition. Networking skills and superior reputation management are essential. We envision international trade, climate and environmental agreements. We see accelerated globalisation with strong international institutions. This is a win-win world for all and shipping will expand in-line with rising living standards and an expanding world economy. Although we see less need for naval power, investment will continue as economies grow. Offshore energy demand will increase more rapidly.

Competing Nations

The “Competing Nations” scenario is characterised by weaker global institutions, a bit less growth, and a rise in protectionism. Dogmatic approaches, regulatory fragmentation, national preference and conflicts over values and religion give insiders an advantage and put a brake on globalisation. Gate communities (e.g. trade blocks), patronage and national standards exacerbate fragmentation and call for careful country-risk management. Shipping suffers, globalisation is rolled back and protectionism rises. Local presence for shipping is necessary and competing demands from national interests make life complicated. The naval sector will see greater demand, but suffer from lower economic growth.

GMT2030: Disruptive scenarios

Around these three scenarios, there will be disruptive events that would introduce step changes at almost any time. The OECD calls this sort of event “future global shocks” [T]. We whittled down our long list to a few examples that would affect the maritime world, and would stimulate thinking:

- Russia joins NATO, caused by, and causing, changes in regional co-operation and tension.
- Dollar loses its reserve currency status, changing everything, including the prices for all products and services; location of manufacturing and research; and the distribution of economic and political power.
- A major pollution accident in the Arctic could accelerate decisions about Arctic Governance, increasing reliability of shipping and assuring a short route from Europe to China, avoiding choke points and canals
- The Rise of an economic bloc based around Islamic values in the Middle East, which we have called the Green Crescent, would impact trade routes, regional naval power, and potentially enable a large scale sustainable solar energy industry.
- Technology - such as the rise of robotics and autonomous systems, or synthetic fuels - changes everything. For example, you may know that robotics control ship-building processes already, and that emerging robotics and autonomy are being considered to enable autonomous ship control. *“The autonomous ship and the data and connectivity ... will allow the ship itself to support the Master and crew. It will also allow shore-based staff, authorities, other vessels and a huge number of maritime stakeholders to have the same information the Master has at exactly the same time, and in an emergency situation, the potential to intervene if necessary. ... Autonomous ship systems offer the industry a chance to attack the root causes of accidents and therefore bring down accident rates, [which] would justify a far larger investment in R&D.”* [ref. U] Such integrated systems technologies are in the prototype stage now, with serious consideration being given to the regulatory and classification issues in a number of countries. This and other technologies could take us into completely new and unknown territory with massive consequences for all manner of human activities, whether in peace or war.
- Finally, we have to take into account the extreme “Global collapse” scenario first postulated by Meadows et al in “Limits to Growth”, 1972. This would be very bleak, with every country left on its own to fight for self-interest and survival. The world economy contracts, global trade collapses and military build-up intensifies. Civilisation itself is in retreat. We hope human nature can help us avoid this, although recent reviews suggest it is a continuing threat.

We don’t know whether these scenarios or disruptive events will prevail, but the trends we have identified should help you to challenge conventional wisdom, identify opportunities, and innovate.

GMT2030: Global Drivers

Our **population** model is based on the United Nations’ demographic predictions. The population may reach 8 billion by 2030, with 96% of growth coming from developing countries. India will have just overtaken China, with the largest population and the largest labour force in the world. No other country will come close.

Our **economic** model was validated against other long term models. It can’t predict next month’s interest rates, but validated well on long term trends. In every scenario, countries and regions will continue to grow, the world economy potentially tripling between 2010 and 2030. In all three scenarios, the top three economies are China, USA and India, and they will all be a long way ahead of any other country (or even the EU). These economic powers will shift the rebalance of the world. China, alone, will contribute about 20% of global GDP. Brazil will arrive in the top 5. Globally, GDP

per capita will rise faster than in the last 20 years. The world's middle class is likely to grow 40-50%, with China and India contributing nearly two-thirds of this growth.

The growth means there will be significant increases in global trade, the vast majority of which is moved by sea, and arrives in ports. An important finding is that the most important cities in the world (by population or by economic contribution) will almost all be ports.

As the population, economy and prosperity increase so will the demand for **resources**. China will overtake North America to become the largest oil consumer. While the USA will remain the biggest natural gas consumer, China will see massive growth to nearly match the USA. Meanwhile, China and India will be the two giant coal consumers. Around 60% of coal consumption will come from China in 2030. Massive demand in the construction sector will mean India sees the largest growth in steel consumption, at 5 times current levels, but China will remain the biggest consumer of steel.

GMT2030: Maritime markets

The outcome of these drivers is that all branches of merchant shipping, naval power and offshore energy are likely to grow in the next couple of decades. Some key examples are the growth in intra-regional trade, which nearly doubles by 2030; continued growth in seaborne trade flows of all commodities; consequent development of fleet sizes and shipbuilding; likely supporting increases in naval power (although this will be predominantly in the on-board systems, rather than the number of ships), and the rapid growth of renewable energy sources offshore (assuming the investment case is made).

In 2030, we could be living in a world where China owns a quarter of the merchant fleet; the size of the tanker fleet is expanding (though slower than all other major ship types); and the number of containerships with capacities that exceed 7,600 TEU is growing three times faster than those below that threshold. Despite the volatile nature of commercial shipping, the broad trends indicate opportunity and growth.

The oil trade will have increased, but it will not be on the routes we would have expected in recent decades. The US shale revolution will have put paid to that. The oil trade will be primarily on the routes between the Middle East and South/South East Asia (especially China).

Seaborne gas trade (principally LNG) will have grown, with a number of new streams coming on line, such as Oceania. Exports from Africa, CIS and others will have increased, and imports to South/South East Asia (especially China).

Coal exports from Australia and Indonesia, into China, Japan, and other Asian countries, will increase. Likewise, iron ore exports from Australia and Brazil, and imports to India and China. Perhaps the most dramatic increase is the container trade, on all routes, but massively so on the equatorial routes – China, Southern Asia, India, Middle East, Africa, Europe and the Americas. No wonder this has already led to the construction of some of the world's biggest ships.

The trade development will necessitate more ships, and/or larger ships, and/or navies to protect these ships. Ports will have to become larger and more efficient. There will be greater potential for impact on the environment – or conversely, greater opportunity for environmental mitigation technologies and techniques. Perhaps just as importantly, it will also require more professionals – the IMO Secretary General has recently called for the *“shipping industry will need to find around 40,000 qualified officers to cope with a potential doubling of the fleet over the next 15 years and expected growth in seaborne trade”* [V].

Naval development in terms of platforms will be slow in terms of traditional platform numbers. That will happen because the growth in naval power will come from new developments likely to occur in the on-board (and off-board) systems. There will be plenty of opportunity for electronics wizards, and the few crew personnel who are required on board, but probably fewer opportunities for Naval Marine

Engineers and Naval Architects. The growth potential there will continue to be in achieving ever better margins of performance, silence and safety.

On the offshore energy front, it was clear to us that the demographic and economic drivers will produce higher demand for energy. That pressure will apply as much offshore as onshore, and we anticipate a doubling of the number of floating offshore platforms. New areas of oil and gas production include West Africa, the Arctic, and South East Asia. Renewable energy offshore, if the investment comes through, will be in Europe and South East Asia, where strong enough winds occur close enough to electricity grids. Converting latent tidal and wave energy into electricity at a competitive economic rate still seems some way off, although areas of high energy density close to grids (such as the waters of Northern Scotland) offer significant potential.

If you have watched the price of oil move steeply upward in the last few years, or saw it drop sharply in recent months, you will be feeling some short term uncertainty. In the long term that we looked at, these variations tend to even out. Our industries may still be prone to short commercial and political cycles where unexpected shocks can destroy profits, disrupt supply chains and upend business models. But GMT2030 offers a positive vision for the marine industries as a whole, with real opportunities for business, investors, employees and stakeholders.

Without ships there is no world trade and even the most pessimistic global economic health scenario described in GMT 2030 sees a big future for shipping. More trade means more ships. That means more business for maritime people.

Commenting on GMT 2030, Richard Sadler, Lloyd's Register's CEO, said [W]: *"What is striking is that even in the most negative of the scenarios envisaged, maritime growth is strong. For anyone looking for a future in an important sector, they have to consider maritime: whether for employment, investment or an understanding that, without seaborne trade, offshore energy and naval power, the geopolitics of tomorrow will be highly fragile and quality of life precarious. The sea and its industries are vital for our global future."*

So the world's maritime markets look pretty good, and I suggested earlier that we tend to take a world view from here in Scotland and the UK, so the opportunities are certainly big enough for us to pursue. I see the local opportunities as very positive as well – let me cite the Ministry of Defence re-commitment to the next five years of Babcock's service contract at Faslane; the BAE Systems investment of £200m at Scotstoun; the establishment in Edinburgh of the Green Investment Bank; and the recent creation by the Department of Energy & Climate Change of an Oil and Gas Authority (OGA) in Aberdeen (*"shaping the future of not just the industry but the entire UK economy"*). The OGA will maximise economic recovery from the remaining 15-25 billion barrels of oil equivalent if we can overcome the high cost of production and depressed price of oil.

Consequences

How can we compare the possible futures outlined in GMT2030 with our current situation?

First, I hope it is clear that we have reasonable data to hand, which suggests a positive future. The world looks most likely to continue to have lots of valuable jobs for maritime professionals. It will remain important to adapt and to communicate, possibly travelling widely to follow these opportunities. At least as important, it will be increasingly important to have a very clear value proposition, because we will be working in fields with millions of competitors, who are already working on similar projects in China, India – and soon Africa. That suggests to me that we should be trying to keep a step ahead of our competition in the value we can offer, which means we should be undertaking research – not doing the next thing that will be important, but researching the thing beyond that. In turn, we should be finding new capital for research investment in the maritime.

All of our sectors seem likely to keep growing, so there are reasons to suggest we can be relaxed about survival, and more focussed on working together to compete with other groups around the world. They have established maritime industrial strategies, and are already competing with us, whether we know it or not. There may be a role for Government in helping to generate some of this co-operation, but it will only happen if maritime businesses kick-start it, and actively pursue it.

A future for maritime professionals

I have enjoyed a career in the maritime sector so far, and with sea-salt in my blood, I would very much like to think it will continue in the same sector. My day job is about creating sustainable high value jobs in the maritime sector for other people, through Babcock International Group. We employ thousands of men and women in Scotland, many of whom we are training for professional roles. I would be unlikely to serve myself, my colleagues, or other maritime professionals in Scotland if I did not try to understand the future of our sector. So I spend quite a lot of time reading, analysing and thinking about the market environment around us. I am convinced that most likely futures contain a wealth of opportunities, which is a fantastic basis to proceed on. Of course there are competitive challenges, but the opportunities provide motivation to address those. I believe that our strengths are significant, and that we can overcome our weaknesses.

We have a very positive potential future in sustainable high value maritime jobs. We already work hard to achieve this, and we must consider how we could do that more easily. I believe a future in which we make the most of our abilities will transpire if we co-operate. In my view we should take some collaborative actions concerning demand and supply.

Together, we should ensure sustainable future demand for maritime professionals by:

- listening to our customers big picture needs;
- identifying and developing next generation maritime technologies and value propositions;
- demonstrating a worthwhile and clear vision for our sector; and
- empowering our trade associations and institutions through consolidation.

Together, we should ensure a supply of good quality future maritime professionals by:

- conquering ignorance of our sector and our professions, especially with potential employees and policymakers;
- focussing our encouragement of young proto-engineers through a consolidation of SeaVision, Primary Engineer, Tomorrow's Engineers and The 5% Club, which I see as the most effective initiatives but currently separate;
- encouraging more women to engage in our sector, through such organisations as Primary Engineer and WISE; and
- publicising our heroes, through the Scottish Engineering Hall of Fame, highlighting how and why they led the growth of the sector in their day.

Any one of these would be a big task when I look around us at the moment. Each would be insufficient in itself, and so a co-ordinated, planned or strategic approach would make more sense. One or all would require significant discretionary effort by leaders in our sector. I include leaders in the professions, in business, in academia, and in government, because we are all part of the "maritime industrial eco-system". I believe we should seek to work with the foremost academics in leadership, business and technology.

Clearly, if we work together, we should work in conjunction with Government. I echo the Chamber of Shipping call [ref. X] last month for a strategic partnership with the Scottish Government. The partnership will be most effective if it includes a range of Scottish maritime economic interests with

growth potential, and is aligned to the existing partnerships with the UK Government. The general need for Government to have maritime policies has recently been affirmed by Flitsch et al [Y].

Your future

So I have pointed you to a possible range of futures, but unlike many IESIS transactions, this paper does not set out to prove a new technological theory or describe a successful engineering development. I hope to have prompted a question for the audience, and reflections on what individuals will do with the futures we see before us.

By itself, this SWOT analysis is insufficient to formulate any forward looking plan, and of course it has not been validated by discussion. However, by considering and discussing these topics we may at least claim to have put ourselves ahead of some of our competitors. So, having considered a possible future, what is your reaction? What would you like your future as a maritime professional to be, and what future would you wish for your colleagues, and successors?

If you have a vision of how you would like the future to look, then consider how it could be achieved. It is unlikely that clients will simply hand us more work “because we deserve it” or “because we REALLY want it” - I don’t find the “talent” show contestants’ argument very convincing.

So, more practically, how could we make ourselves more attractive to the international buyer of maritime services, and how could we make that sustainable? Would a multi-institution discussion about how we should pro-actively develop our capabilities be a worthwhile activity? Are the institutions, which act mainly to preserve the quality of professions through standards and reviews of output, able to help us generate enough income to maintain quality? Should professionals work with business minds to develop a new way of Maximising Economic Development for our maritime professionals? Should we involve government and its agencies in the discussion, and if so at what point? How much effort or resources would you want to put into the effort in your own company? How much effort would a company invest in a joint effort?

I look forward to the discussion.

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REFERENCES

- A. UK Inter-Professional Group, (UKIPG) undated, Guide to the Revalidation of Professional Competence, accessed [here](#) 2 December 2010, not available 23 January 2012
- B. Baxter et al (Editors), 2011, "Scotland's Marine Atlas" (Ch2 Physical Characteristics), Marine Scotland, Edinburgh
- C. "Coastal region statistics", Eurostat, 2012 (available [here](#))
- D. "The economic impact of the marine and maritime sector on the UK in 2011/12", Oxford Economics for the UK Chamber of Shipping, January 2013
- E. "The economic impact of the UK Maritime Services Sector", Oxford Economics for the UK Chamber of Shipping, February 2013
- F. "Scots and the Sea" JDG Davidson, Mainstream 2003
- G. "A strategy for growth for the UK Marine Industries", Dept BIS & UK Marine Industries Alliance, 2011 and "Sustaining a thriving maritime sector", DfT, 2014, available at <https://www.gov.uk/government/policies/sustaining-a-thriving-maritime-sector>
- H. "The Road Ahead", Prof Tom Devine, Scottish Engineering Lecture, Glasgow, May 2014
- I. "The Future of the Ocean economy" OECD, November 2012
- J. Scotland analysis: Science and research, Dept. BIS, Nov13 (inc reference to Labour Force Survey, Quarter 3 2012–Quarter 2 2013. Standard Occupational Code (SOC) Minor Group 211 ('Natural and Social Science Professionals') and SOC Unit Code 2311 ('Higher Education teaching professionals'); BIS, International Comparative Performance of the UK Research Base 2011, 2011; PraxisUnico, Spin Out Survey Annual Report 2013. and PraxisUnico Spinouts UK Survey; World Economic Forum, The Global Competitiveness Report 2012-13, 2012; Johnson Cornell University, INSEAD and the World Intellectual Property Office, The Global Innovation Index 2013)
- K. Declaration of the European Ministers responsible for the Integrated Maritime Policy and the European Commission, on a Marine and Maritime Agenda for growth and jobs the "Limassol Declaration", 2012
- L. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Blue Growth opportunities for marine and maritime sustainable growth COM2012-494
- M. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - An Integrated Maritime Policy for the European Union COM2007-574
- N. "UK's Engineering shortage can – and must – be fixed", Eric Bonino (Chairman, Shell UK), Daily Telegraph, November 2014
- O. "Review of Engineering Skills", Professor John Perkins, Dept BIS, November 2013
- P. "Why the West Rules--for Now: The Patterns of History, and What They Reveal About the Future", Prof Ian Morris, 2010
- Q. "Future of Maritime Transport" European Commission Futurium (available [here](#))
- R. "Anthropogenic pressure on the open ocean: the growth of ship traffic revealed by altimeter data analysis", Jean Tournadre, IFREMER, AGU
- S. "Global Marine Trends 2030", London, 2013, Cheng F, Fang I, Incecik A, Carnie P.
- T. "Future Global Shocks: Improving Risk Governance" OECD Reviews of Risk Management Policies, 2011
- U. Roger Adamson of Futureonautics quoted in "Man bites dog: unmanned ships and the future of navigation", August 2014
- V. "Officers needed for growth", Tradewinds, 09 October 2014 ([here](#))
- W. "Horizons", Lloyd's Register magazine, May 2013
- X. Press release, UK Chamber of Shipping, 13 Nov 2014, accessed [here](#)
- Y. "Maritime policy in the North Sea region: Application of the cluster approach" Flitsch et al, 2014

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