



FRENCH MARITIME CLUSTER COMMITTEE SINGAPORE

How could French companies adapt to the Singaporean maritime strategy for the coming years?

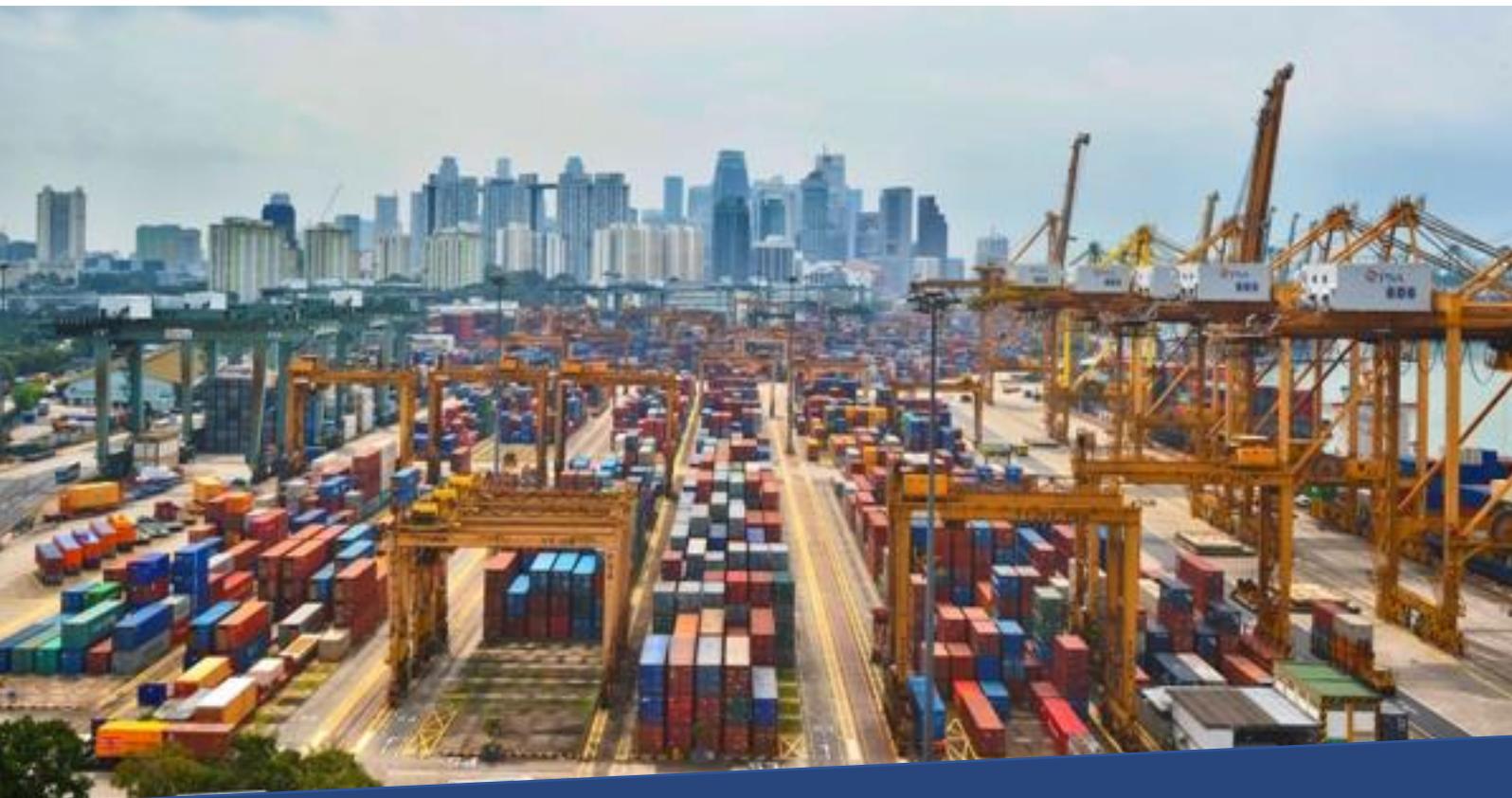


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Abbreviation

A*STAR	Agency for Science, Technology and Research
AMLPL	Advanced Maritime Leaders Programme
APAC	Asia Pacific
ASMI	Association of Singapore Marine Industries
BIMCO	Baltic and International Maritime Council
CCR	Carbon Capture and Recycling
CMF	Cluster Maritime Français
CNG	Compressed Natural Gas
DSTA	Defence Science & Technology Agency
ETF	European Transport Worker's Federation
FMCCS	French Maritime Cluster Committee in Singapore
IMO	International Maritime Organization
LNG	Liquefied Natural Gas
MAS	The Monetary Authority of Singapore
MCF	Maritime Cluster Fund
MEPC	Marine Environment Protection Committee
MINDEF	Ministry of Defence
MINT	The Maritime Innovation & Technology Fund
MPA	Maritime and Port Authority of Singapore
NOx	Nitrogen Oxides
NITEC	National Institute of Technical Education Certificate
NTU	Nanyang Technological University
PM	Particulate Matter
SGD	Singapore Dollar
SMA	Singapore Maritime Academy
SMF	Singapore Maritime Foundation
SMI	Singapore Maritime Institute
SMIB	Strategy and management of International Business (Advanced Master)
SNPO	Smart Nation Program Office
SOx	Sulphur Oxides
SSA	Singapore Shipping Association
TETA	Tripartite Engineering Training Award
TEU	Twenty-foot Equivalent Unit
USD	US dollar

Content of the study

Aim of the French Maritime Cluster Committee in Singapore

The French Maritime Cluster Committee in Singapore (FMCCS) has been created by the French Chamber of Commerce in Singapore with the support of the Cluster Maritime Français (CMF). The committee's main goal is to promote the French maritime economy in the Asia-Pacific area. With the interest of all French Chamber and CMF members in mind, this committee offers opinions and expertise on current issues and business trend perspectives. It delivers key insights into doing business in the maritime sector in Singapore and in the region.

The aim of the French Maritime Cluster is to inform its members, create synergies and gather industry members. It always seeks to identify and provide deeper, more insightful studies on the local markets.

Previous studies with ESSEC Business School

In the context of the Asian Strategy Challenge (ASC) program, the ESSEC SMIB students with the support of the FMCCS, have conducted strategic reviews of the maritime sector in Singapore:

- In 2014-2015, the Cluster worked closely with ESSEC students - as part of their ASC - to release a report on the Southeast Asian Maritime sector and the positioning of the French companies active in the maritime sector in the region.
- In 2015-2016, the focus was on the Singapore maritime market, in mapping its strategy, its main actors as well as its international presence.

Current study

In 2016-2017, the focus is to continue on the survey of this market, and explore how the French maritime economy can compete with or build synergies with the industry.

Presentation of the Asian Strategy Challenge (ASC)

The ASC is a program that offers the opportunity to ESSEC students of the Specialized Master in Strategy and Management of International Business (SMIB) to analyze a real and strategic issue an organization is facing. In partnership with skilled professionals

and under the supervision of a coach, the ESSEC SMIB students learn how to work as a team in order to foster professional competencies like autonomy, responsibility and creativity.

The team at ESSEC was composed of seven students and one coordinator, while the French Chamber of Commerce and the French Maritime Cluster Committee in Singapore teams were composed of four members, with one member based in France.

Strategy and Management of International Business (SMIB) - ESSEC Business School

(the background of each student is specified after his or her name)

Marie-Laure Caille – ASC Coordinator

Benoît Butruille – French Army officer

Myriam El Andaloussi – Jurist

Natasha Moussavi-Saeedi – Finance

Vincent Nanna – Political Sciences

Julie Revil – International Business Studies

Karim Tazi Labzour – Finance

Junqi Weng – Tourism Management Studies



French Chamber of Commerce and French Maritime Cluster Committee in Singapore

Gilles Bonavita

President of the French Maritime Cluster in Singapore



Frederic Vazzoler

Vice-President of the French Maritime Cluster in Singapore

Nicolas Sartini

Vice-President of the French Maritime Cluster in Singapore

Sylvie Berthaud

Business Committee and Conference Project Manager



Marie-Noëlle Tiné

Deputy-Director of the French Maritime Cluster

Methodology

Interviews with professionals

To develop a clear mapping of the main challenges the French companies are facing, the ESSEC team

has conducted 21 interviews with professionals in the maritime sector.

The subsectors interviewed are:

- Shipping,
- Bank & insurance,
- Oil & gas,
- Shipbuilding,
- Shipbroking,
- Naval defence and security,
- Certification

These interviews provided us with some insights and were useful to better understand the key challenges facing the maritime industry.

The list of the companies interviewed is available in the appendix.

Data collection

In parallel with the interviews, the team ESSEC, with the help of the French Maritime Cluster, has collected data from various reports and other

sources of information in order to establish a clear mapping of the maritime sector and to identify the future trends of the Singaporean maritime strategies.

Workshop

The main topics raised during these interviews have been discussed during a workshop that took place at ESSEC on February 14th 2017. The aim of the workshop was:

- to validate the main strategic issues faced by Singapore and the French players in the maritime market;
- and to share and add the missing information to complete this report.

Main topics addressed in this report

The professionals that we interviewed have shared their main concerns about their respective sub-sectors and the Singaporean maritime ecosystem. Three main topics have systematically been raised concerning the main challenges for the Singapore strategy and the synergies that French companies could benefit from.

- **Green Initiative, response to the IMO regulations:** the maritime sector is subject to future IMO regulations that strongly impact the entire maritime industry.
- **New Technologies & Future Trends:** The Maritime sector is witnessing a new technological paradigm brought by several disruptive innovations such as Internet of Things and Big Data. The interviewed professionals are pondering the future outcomes of these regulations.
- **Education, recruitment & marketing:** The French companies in Singapore conveyed the difficulties they face to recruit skilled labor and to retain Singaporean executives. Also, some companies are wondering how to make the maritime sector more attractive through partnerships with academic organisations.

The interviews have highlighted these topics. The workshop validated them.

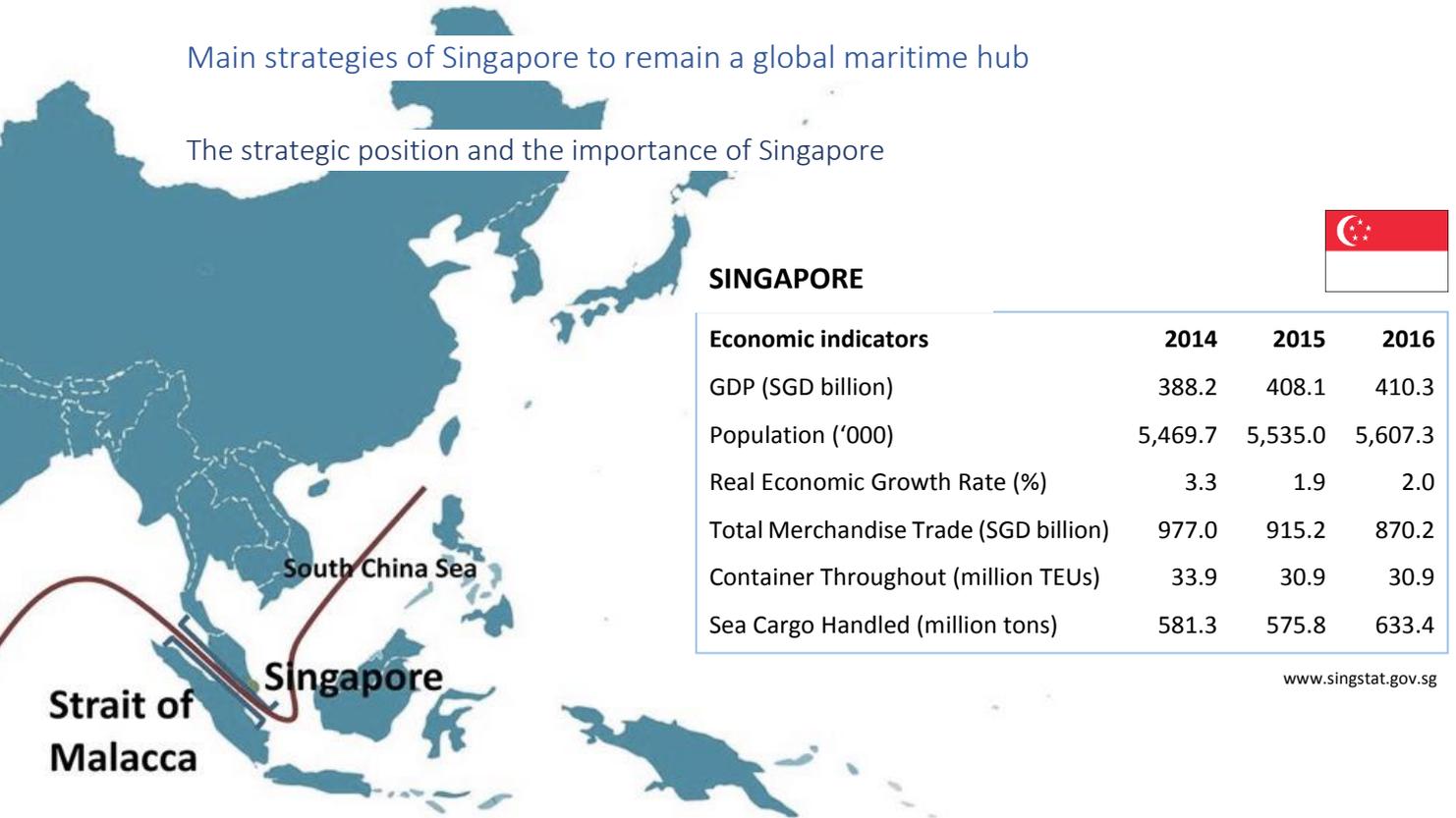
THE MARITIME SECTORS IN SINGAPORE



The maritime sectors in Singapore

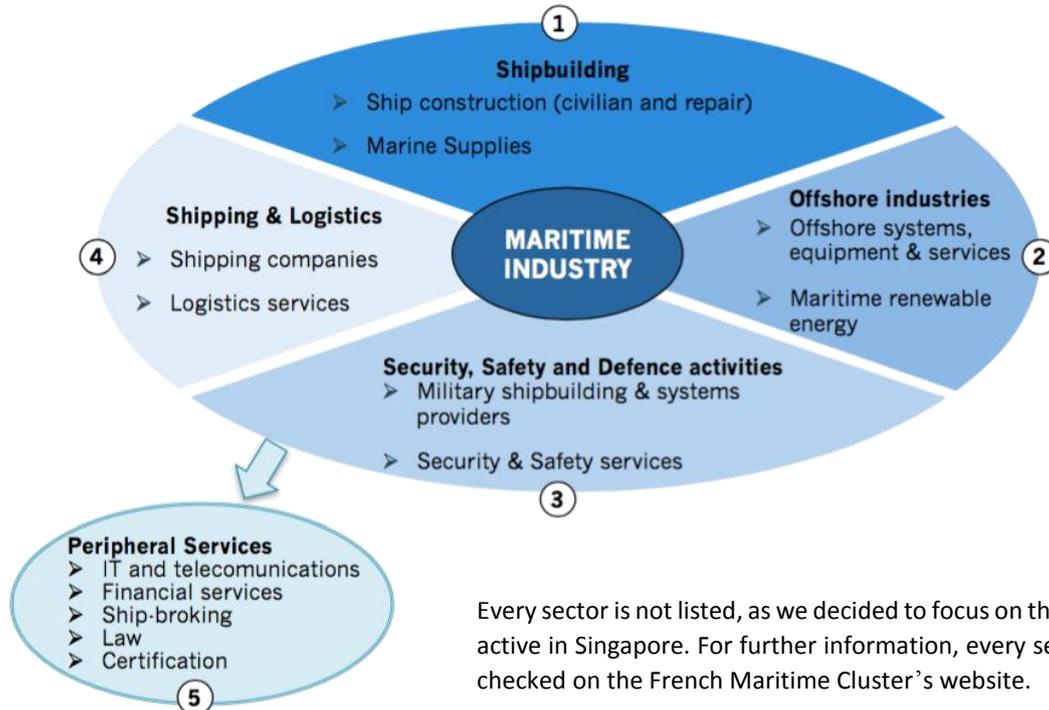
Main strategies of Singapore to remain a global maritime hub

The strategic position and the importance of Singapore



Singapore is a strategic center for maritime business thanks to its geographic location. Indeed, Singapore is located at the center of the main trade routes, thus, it is as a maritime gateway to the key Asian markets and a strategic center for maritime business. It can be considered as a hub that connects Asia to the World, knowing that from Singapore, 600 ports can be connected in over 120 countries.

Maritime sector: main actors



Every sector is not listed, as we decided to focus on the main ones active in Singapore. For further information, every sector can be checked on the French Maritime Cluster’s website.

Maritime sector: key figures

Shipping	- 2 nd world container port: 30.9 million TEUs in 2016 (vs 12.4 million TEU for Rotterdam) - World busiest port in transshipment: more than 130,000 vessel-calls annually - Sea cargo handled: 593.3 million tons in 2016 vs. 575.8 million tons in 2015
Refinery, Oil & Gas	- Singapore is one of the top bunkering (ship refueling) ports in the world, lifting more than 40 million tons of bunkers annually - World's 3 rd largest petrochemical refiner
Shipbuilding	- It operates the most technically advanced and efficient shipbuilding and ship-repair facilities in Southeast Asia - It holds about 70% of the world's jack-up rig-building market and over 65% of the global floating production storage and offloading (FPSO) conversion market
Defence & Security	6 th defence budget in Asia / 1 st in South East Asia (USD 10 billion in 2017)
Bank & Insurance	4 th world financial hub
Certifications	Singapore Accreditation Council based on international standards
Start-ups	12 th place in 2017 in Global Start-up Ecosystem Report ranking

Main Actors of the Singapore Maritime Cluster

Companies

The Singaporean companies obviously occupy an important part of the Singaporean maritime ecosystem. Some of the main companies include: ST Marine; Pavillon Energy, Pacific international lines, Keppel corporation, NOL-APL, Jurong Ports, PSA International. For many of them, the main stakeholder is Temasek, the first sovereign fund of Singapore.

Maritime Public actors

The Prime Minister Office spearheads the main strategies and visions regarding the future of Singapore and more precisely the Smart Nation Program which integrates the strategy of the maritime sector.

Several ministries are directly involved in the Maritime cluster. The Ministry of Defence (MINDEF), with mainly the Defence Science & Technology Agency (DSTA) and the Republic of Singapore Navy; The Ministry of Trade and Industry with the three main boards: The Economic Development Board, the SPRING and the A*STAR. The most important is the Ministry of Transport, which has the authority over the Maritime Port Authority (MPA).

The MPA, directed by Andrew Tan detains the regulation and management responsibility over the Sea business. The MPA also leads important policies of the Maritime in Singapore. The MPA manages some funds to invest in innovative projects to develop the Singapore Maritime business and enhance its hub position. Those funds are granted to every company whose projects are matching the Singaporean policy: for example, the MINT and all the Green Initiative funds, or the recently announced Singapore Maritime Cluster Fund aiming at education and formation programs. Through the Singapore Maritime Institute, the MPA leads the cooperation with the education system.

The maritime crisis

Genesis and impact of the maritime crisis

The global economic crisis of 2008-2009 resulted in an overcapacity that the maritime sector had never known before.

This sudden imbalance between supply and demand for maritime transport, was mainly caused by two factors: the dramatic decline in trade during the crisis and the massive and simultaneous delivery of many large capacity ships previously ordered in mid-2008, while the shipping industry experienced one of the best periods of its history.

This situation has had a disastrous effect on regular line operators, which experienced serious difficulties (including the biggest ones like CMA CGM). To reduce the available capacity and raise freight rates, ship-owners have delayed or even cancelled the delivery of new container vessels, temporarily dismantled vessels in operation, or anticipated the demolition of their vessels units.

Concentration of the shipping sector as a response to the maritime crisis

Concentration movements and operational agreements between ship-owners were reactions to the crisis. Such examples include:

- The German companies Hapag-Lloyd and Hamburg Süd respectively bought the Chilean CSAV (late 2014) and CCNI (in 2015).
- In 2016, CMA CGM acquired APL by absorbing its parent company NOL.
- China has merged its two national flagship CSCL and Cosco to form the world number four shipping group.

- During the summer of 2016, UASC and Hapag-Lloyd started to merge.
- In February 2017, Hanjin Shipping was declared bankrupt. The Hanjin's Asia-US freight has been taken care by other companies such as CMA CGM-APL and APMoller-Maersk.

These operations further concentrated the supply capacity in the sector. By mid-2016, the top 5 shipping companies controlled more than 50% of the world market in 2016 (compared with 23% in 1996).

Impact on other maritime sub-sectors

Shipbroking: Shipbrokers have also been impacted by the crisis because of the falling demand for freight and the reduction of ship calls.

Oil & Gas: the restructuring of the shipping sector and the fall in oil prices, have led to a strong decrease of the demand. Oil & Gas companies have had to slow down their exploration activities.

Shipbuilding and certification: the slump in global trade caused a decrease in demand for new vessels. As a result, ship-owners had to cancel some orders leaving shipyards in a turmoil situation.

Bank and insurance: regarding the increase of doubtful loans related to the maritime sector, banks had to cut back lending, lowering access to funding for investment purposes and working capital requirements.



Hanjin Shipping to go bankrupt in February 2017. Port of Oakland to receive empty Hanjin containers.

The challenges faced by Singapore

Fierce competition in the Straits of Malacca

The first main challenge Singapore has to face is the high competition from existing ports and new projects:

- Chinese ports,
- the Port of Hong Kong,
- Malaysian Ports: Port Klang, Tanjung Pelepas.

Competition is increasing in the straits of Malacca. For example, China has invested in the Malacca Gateway port and Carey Island trading port located in the proximity of Kuala Lumpur. Moreover, the Port of Tanjung Pelepas, located in Malaysia, has strengthened its position as a major container port. Indeed, it is located just on the other side of the Straits of Johor from TUAS in Singapore's north-west, so it has become an attractive option for container shippers, and it is planning to invest USD 2 billion to increase its capacity over the next fifteen years. Indonesia is also developing its container-port capacity, with plans to expand the Port of Tanjung Priok, located in Jakarta. In Subang, the Patimban Port is under construction, and is expected to be an alternative to Indonesia's already-congested large ports in 2017.

Competition also emerged from the new trade routes in Pakistan, Myanmar, and Arctic.

Instability in the South China Sea

The second important challenge is the unstable international relations following the South China Sea crisis which involve a series of territorial disputes involving Brunei, China, Taiwan, Malaysia, Indonesia, the Philippines and Vietnam. The latter claim the South China Sea to be their waters, knowing that it represents a strategic center for maritime businesses, while many non-claimant nations want this sea to remain as international waters. South China Sea represents USD 5 trillion in terms of international trade. It is a concern for countries but also for companies involved in Shipping, Oil & Gas as well as Naval Defence companies. Finally, the issue of the South China Sea, concerns the global economy and could represent both a significant threat to the overall maritime sector and also strong opportunities for Defence and Security.

Coming environmental regulations

The third main challenge relates to the International Maritime Organization (IMO) regulations, which covers safety and security, marine pollution, legal matters, technical co-operations and maritime traffic rules. As restrictions are being implemented, there is an urgent necessity to comply with these rules by 2020 and Singaporean and Chinese ports have communicated that they intend to comply with these regulations.

To respond to the overall situation and improve its maritime business, Singapore is conducting several strategic policies. We have identified three of their main concerns which will impact French maritime corporations as well and which we detail in the following pages. They relate to the Green Initiative, to New Technologies and to Education, Recruitment & Marketing issues in the maritime industry.

THE GREEN INITIATIVE



The Green Initiative, response to the IMO regulations

The IMO regulations

The International Maritime Organization (IMO) is a United Nations-backed organization that is in charge of developing and maintaining a regulatory framework for shipping. It mandates the reduction of Sulphur emissions in 2020 and of CO₂ in 2022. It is also pressing on new rules adoptions to regulate the cleaning of ships' ballast water and to reduce NO_x (Nitrogene oxides), which are already settled in other parts of the world (in North America and soon in the Baltic sea), but not yet in APAC. However, the Ballast Water Management Convention will enter into force on 8 September 2017.



The Marine Environment Protection Committee (MEPC) is a subsidiary body of the IMO Council. MEPC consists of all Member States and it is empowered to consider any matter within the scope of the Organization. It is concerned with the prevention and control of pollution from ships. More specifically, it conducts adoption and amendment of conventions, other standards and measures to ensure their enforcement.

The Green Initiative

The Green initiative has been adopted by the Maritime and Port Authority of Singapore (MPA) to anticipate the compliance with the international IMO regulations that will become compulsory in the next few years.

In Singapore, the MPA has committed to spend up to SGD 100 million over 5 years in the Maritime Singapore Green Initiative which is divided into three parts in order to cover all maritime sectors:

Green Ship Program:

Why: To encourage Singapore-flagged ships to reduce carbon dioxide and sulphur oxides (SO_x) emissions.

How: Ships adopting energy efficient designs which exceed IMO's Energy Efficiency Design Index and/or adopt approved SO_x scrubber technology,

exceeding IMO's emission requirements, can enjoy up to 75% reduction of Initial Registration Fees and up to 50% rebate on Annual Tonnage Tax.

Green Port Program:

Why: To encourage ocean-going ships calling at the Port of Singapore to reduce the emission of pollutants.

How: Ships that use approved abatement technology or burn clean fuels while at berth can enjoy 15% discount in port dues. Ships that do so throughout their entire port stay within the port limits can enjoy 25% discount.

Green Technology Program:

Why: To encourage local maritime companies to develop and adopt green technologies.

How: Companies can apply for grants up to 50% of qualifying costs to co-fund the development and adoption of green technological solutions

Implementation issues

First of all, from an economic point of view, integrating the Green initiative generates important costs of adaptation for the maritime actors. Indeed, it will imply to transform the existing ships in order to reduce the excess quantity of polluting emissions. However, it could also represent important opportunities for several maritime players such as Oil & Gas suppliers that could commercialize new types of fuels; shipbuilders that could suggest new motors and green solutions; and finally, start-ups which could innovate in green-tech.

Secondly, regarding the legal framework, international regulations can help to drive the private sector towards more sustainable businesses but could also lead to uncertainty in the absence of enforcement. Indeed, the IMO does not have power to enforce the conventions so there are no penalties in case of violation. Instead, enforcement relies on the member parties. Each government is free to decide how to enforce the regulations upon its own ships. Some states choose to set penalties or non-monetary sanctions in case of non-compliance.

This raises two issues:

1. The first one is that all companies will not be incited to comply with the regulations if they are not forced to do so and, in particular, to switch to alternative energies so that it could introduce differentiation among companies in a same country.
2. The second one is that multiple regional or local emission reduction schemes have a bad impact on shipping companies trading globally. Indeed, it may create a fragmentation of interests at the international level, where businesses are subjected to different standards in different locations, which could considerably affect the global maritime industry.

Opportunities for French companies

In a general perspective, building a sustainable global maritime industry through the Green Initiative constitutes an opportunity for the French companies in the short and long run.

In the short run, French companies may benefit from two advantages: from an economic perspective, they can enjoy discounts on initial registration fees and other costs as soon as they comply with the requirements of the Green initiative; then, from a more political perspective, it

may improve the image of the company in terms of green involvement and social responsibility.

In the long run, the adoption of green practices addresses economic and legal necessities.

Firstly, integrating sustainable efforts into companies' business strategies can lead to long-term gains for them, their stakeholders and the wider society¹. Indeed, sustainable development is not just about addressing environmental concerns, but also ensuring the economic sustainability of the industry. Integrating green practices into French companies' business strategy may also be an opportunity to innovate in environmental technologies and then become a leader in Singapore in this field.

Secondly, as IMO regulations will become compulsory in the next few years, it may be interesting for French companies to be the first mover in that field. In this regard, Total recently agreed with CMA CGM to provide solutions in reducing sulfur emissions through LNG (Liquefied Natural Gas) and the installation of scrubbers. Therefore, complying with the Green initiative may constitute a smart investment for the future.

The opportunities for French companies can be more specific. We will focus on this aspect in the following section.

Insights for French companies

In the short run: temporary and reactivity

Recommendation n°1: Scrubbers

The scrubber is a device that uses sea water and chemicals to remove sulphur from engine exhaust gas. The chemical reaction neutralizes the SO_x present in the exhaust gas. This reaction generates sulphates, which are then discharged into the sea. Scrubbers can be included in new ships or retrofitted into existing vessels in the shipyards.

It appears as a good short-term investment to comply with regulations as they reduce the

switching cost to an entirely new fuel system. Also, BIMCO (Baltic and International Maritime Council) considers this to be a solution that is cheaper than low sulphur fuel in the longer term².

However, not all vessels are suitable for scrubbers due to age or availability of space and therefore retrofitting is required. The price of retrofitting a single vessel is estimated to be around USD 5-10 million per ship³ (OPEX and CAPEX). Furthermore, the environmental benefits of scrubber can be discussed. Indeed, scrubbers can cut only one exhaust at a time so that they will not be able to match long term deadlines, requiring a drastic

¹ Report SMI – Singapore Maritime Green Initiative

²http://www.sustainalytics.com/sites/default/files/shippingemissions_july2013.pdf

³ Guidance to INTERTANKO Members for the Selection of Compliance Alternatives July 2012

reduction of both SO_x and NO_x. Besides, if the sulphur content in the fuel is more than 3.5% then the elimination of the SO_x is not 100%. Scrubbers cannot cut the emission of CO₂ and it reduces the PM only by 60%⁴.

Moreover, scrubbers are moving to a close-loop rather than an open-loop system to avoid sea pollution, raising the OPEX. Further regulations on scrubbers are already to be forecasted for 2023.

Recommendation n°2: Low-sulphur fuel (marine gas oil)

Oil & Gas companies could provide shipping companies with low-sulphur fuels. It helps them reduce their sulphur emissions. Low-sulphur fuels are typically marine fuels with a sulphur content that is much lower than heavy fuel oil, which has sulphur content up to 4.5%.

Compared to scrubbers and LNG, low-sulphur fuel investment costs are considered negligible because most vessels' engines can run on both heavy fuel (currently the most used fuel in the industry) and low-sulphur fuel. Technically speaking, the use of low-sulphur fuel is therefore the best solution as it requires limited initial investment costs.

However, the cost of refining fuel and converting it into low-sulphur fuel represents a significant cost for Oil & Gas companies. Moreover, low-sulphur fuel still allows the release of substantial NO_x and PM (Particulate Matter) emissions and does not eradicate SO_x emissions.

In addition, as the low-sulphur fuel is a blend of heavy fuel and distillates, the production of this hybrid fuels will strongly impact the demand for oil products. Also, there is a risk of unavailability of low-sulphur fuel as global market of marine bunkers constitutes around 250 million of ton per year and fuel suppliers will not be able to cover the demand in 3.5 and 0.5 low sulfur fuel.

In the middle and long run: sustainability and creativity

⁴<http://blog.schneider-electric.com/energy-management-energy-efficiency/2014/01/21/scrubbers-relevant-solution-shipping-industry/>

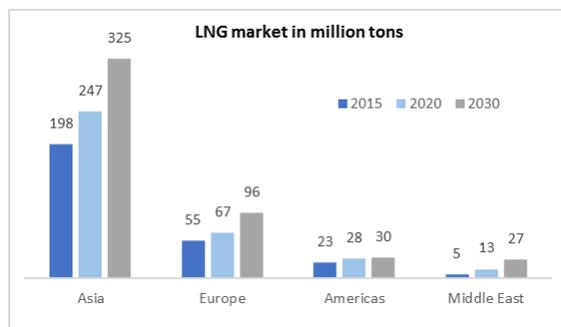
Recommendation n°3: Use LNG

Liquefied Natural Gas, or LNG, is defined as: “Natural gas in liquefied form as a result of lowering the temperature to below its boiling point of approximately -162° Celsius (about -260° Fahrenheit)”.

LNG consists mainly of Methane (CH₄), with minor amounts of other hydrocarbons (ethane, propane, butane and pentane). By liquefying the methane gas, LNG takes up only 1/600th of the volume of natural gas in its gaseous state, which means the gas can be distributed around the world more efficiently. By comparison, compressed natural gas (CNG) takes up around 1/100th of the volume of natural gas in its gaseous state, depending on the actual pressure.

However, the lack of LNG fueling infrastructure across the major bunkering destinations is one of the primary factors impeding the growth of the LNG bunkering market worldwide. The high cost of building LNG fuel ships has slowed down their adoption among the shipping companies. Furthermore, the storage of LNG at low temperature of about -162 degree Celsius poses as a key challenge to its usage as a marine fuel. The necessary additional safety measures for the storage of LNG increases the cost of production and design of LNG-fueled vessels.

Nevertheless, Asia is clearly the world's dominant market for LNG. It houses the world's largest importing country (Japan) and the world's largest single importer (Kogas in South Korea). The following chart⁵ demonstrates both the relative size of the Asian LNG market and its anticipated growth. Asia's LNG import volumes are projected to rise to approximately 247 million tons per annum (MTPA) by 2020 and 325 MTPA by 2030.



⁵ Singapore as Asia's LNG hub: the road ahead, Jones Day <http://www.lexology.com/library/detail.aspx?g=3042b949-b937-4e68-a5a0-fd2cc092bbe4>

In particular, as Singapore's goal is to be Asia's LNG hub, the city-state is adopting LNG as a sustainable alternative source of fuel in the maritime industry. More than 90% of Singapore's electricity is generated using imported natural gas. The Maritime and Port Authority of Singapore has extended the Green Ship Program (GSP) incentives to ships that are using LNG as fuel. Therefore, the Singapore government is making efforts to cut down the emission of sulphur and carbon dioxide.

Singapore LNG Corporation Pte Ltd (SLNG) has secured a SGD 1.11 billion term loan facility with five banks, namely Citibank N.A. (Singapore Branch), DBS Bank Ltd, Mizuho Bank Ltd (Singapore Branch), Oversea-Chinese Banking Corporation Limited and The Bank of Tokyo-Mitsubishi UFJ Ltd. Société Générale Corporate & Investment Banking acted as the Financial Advisor to SLNG in securing this loan facility.

Total & CMA CGM: Total understood this opportunity to invest in LNG, in its agreement with CMA CGM to provide it solutions reducing sulfur emissions through LNG.

LNG Bunkering Vessel, Zeebrugge, Belgium: the world's first LNG bunkering vessel for refuelling LNG-powered vessels at sea is being built by Hanjin Heavy Industries & Construction (HHIC) in Korea, under an agreement between Nippon Yusen Kaisha (NYK), Mitsubishi Corporation and Engie (Gas4sea Joint-Venture).

Total Marine Fuels Global Solutions has signed a Memorandum of Understanding (MoU) with Pavilion Gas regarding LNG bunkering cooperation in Singapore, at the international Gastech exhibition (Tokyo).

Recommendation n°4: Investment in R&D to find green innovations / technologies complying with IMO regulations

That is the field where French companies should focus on and innovate in order to ensure green shipping practices and economic growth in the long run. Indeed, there are many ways to innovate with LNG or fuel mixes (dual-fuel) usually made of natural gas and diesel.

In particular, these requirements are new opportunities for many companies that supply the shipping industry, including engine/scrubber

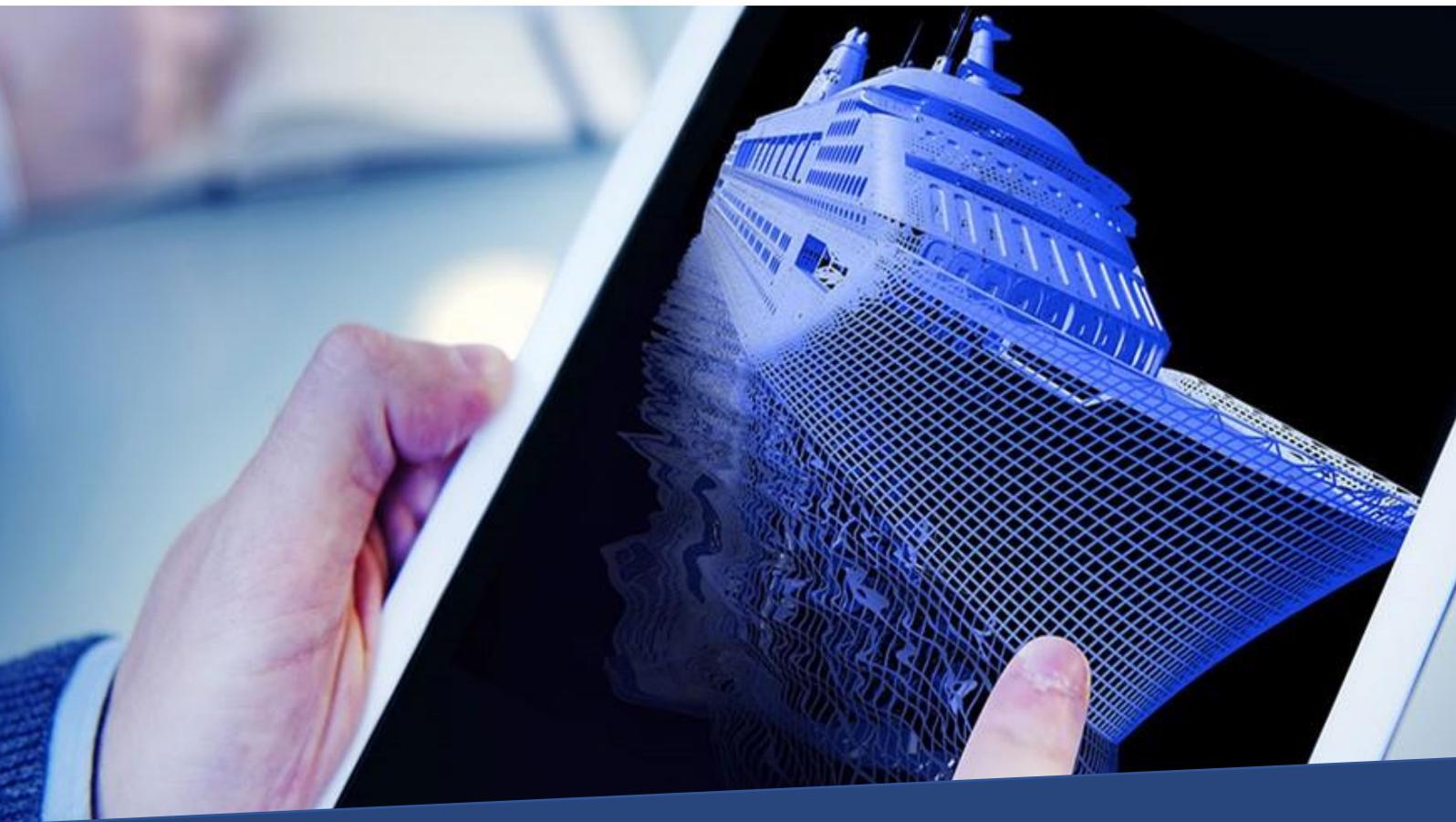
manufacturers, ship designers/builders and fuel/energy providers. For these companies opportunities lie in the demand for more efficient and pollution reducing technologies.

CMA CGM launched the Marco Polo Vessel in November 2012, which has the latest energy efficient technologies: an exhaust gas by-pass system, a ballast water treatment system, an electronically-controlled Wärtsilä engine that can reduce NOx emissions, and a pipe plan to facilitate the use of hyphenate low-sulphur fuel.

DHL has incorporated sustainability in its corporate strategy and viewed it as an opportunity to create and share value with customers. Indeed, they employ diverse carbon efficiency measures and have a portfolio of GoGreen products and services, including a new web-based carbon emission management platform. Its environmental protection programme "GoGreen", focuses on minimising carbon emissions through fleet renewal, energy efficiency, new technologies and employee engagement. Moreover, they developed a joint partnership with the Singapore Management University – the DHL-SMU Green Transformation Lab – in order to look for other innovative solutions in sustainability.

To conclude, it may be difficult to make a decision over those different recommendations, regarding the legal framework, which is in constant evolution. Therefore, we would advise French companies to combine short run and long run solutions in order to secure their activities. Companies that have delayed investment in cleaner technology or cleaner vessel fleets could be more vulnerable to these environmental regulations. In contrast, those companies that have been proactive and have anticipated these regulatory requirements will be better placed to retain a competitive advantage over their peers. For instance, investing in collaborative solutions and creating partnerships within maritime sub-sectors can enable French companies to comply with future legal constraints. These synergies can also strengthen the French positioning in the green and blue field with innovative solutions.

TECHNOLOGY & FUTURE TRENDS



Technology & Future Trends

What will the maritime industry look like?

The Marine world will undergo profound changes owing to the rise of emerging countries, new consumer classes and resource demand. These changes will mostly affect social attitudes, drive supply and demand in resources, technologies, goods and services. The effects have been particularly felt in the marine world: the demand for additional new tonnage for container ships for transporting manufactured goods, bulkers and tankers for commodity trades; the demand for drilling for Oil & Gas into ever greater depth offshore, for example.

It is not a prediction of the world in the coming years, but rather a description of what these giant forces are and how they might interact. It is a work in progress and the trends are at best indicative. Nevertheless, by examining a small number of the giant forces that we consider most influential, the trends presented should provide a good basis for framing strategy formulation discussions, and identifying policy options for threats and opportunities that arise from them.

The Industry is 4.0, due to the various technology and generational trends which are driving it. Maritime companies need far more than an outline idea of what is coming, because digitization, connectivity, transparency are of urgent concern as the industry needs to switch from a cost-driven to a customer-focused one. Manufacturers are being challenged from every direction and as a result they are being forced to provide new answers and methods of operation which take advantage of cutting-edge technology. The Maritime Industry has to do more than keeping up, it really needs to start adding value. To do so, it requires a better understanding of how the industry is changing. It will be possible through a better understanding of customers and by extension the context for creating new ways of servicing them and monetizing these new added-value services. The answer has been until now bigger boats, bigger warehouses, but the answer should be bigger ideas. From collaboration and crowd-sourcing to new materials and skill sets.



Singapore is anticipating the future

Smart Nation Program, MPA initiatives and Smart Port

The Prime Minister Office spearheads the main strategies and visions regarding the future of Singapore and more precisely the Smart Nation Program which integrates the strategy of the maritime sector.

The Smart Nation Program Office (SNPO)'s role is to consider perspectives and ideas from different sources, and integrate them to develop a whole-of-government, whole-of-nation approach to building a Smart Nation. To achieve the Smart Nation objectives, the Office will drive collaboration with and engagement of citizens and industry, oversee the development of cross-cutting Smart Nation enablers and coordinate the Smart Nation initiatives of the various agencies within the Government. Consequently, the SNPO also oversees the main perspectives for the maritime sector.

More precisely, we will focus on what the Ministry of Transport and the Maritime Port Authority are planning.

MPA Initiatives

Singapore is setting the trend. We have seen recently huge efforts made on technology, R&D, and port automatization. The MPA already announced the major axis of this evolution through its Call For Proposals (CFP) in 2016. The sectors were well-identified and expressly mentioned, such as the use of drones to facilitate maritime operations, additive manufacturing like 3D printing, Data Analytics, Harbourcraft Productivity, Ballast Water Management, Resistance to arctic & harsh environments.

In Singapore, The Maritime Innovation and Technology Fund (MINT) aims to support these initiatives. From local maritime companies and Maritime Cluster, Singapore is trying to enhance innovation and developing competitive advantage through R&D. It is divided into two main poles, the MINT-RD and MINT-PD. While the first pole emphasizes research and technology, the second one is focused on translation of state-of-the-art technologies from non-maritime industries for use within the maritime domain. Provided with 200

million dollars, the MPA is looking to enhance Singapore's position as a premier global hub port and to develop a maritime technology cluster that will generate new areas of growth and innovation linkages that will reinforce Singapore as an international maritime centre.

The MPA uses a comprehensive and pragmatic approach to set-up these innovative solutions. Singapore understood the necessity to involve both the public and private sectors, in order to deepen their interdependency and obtain the perfect mix. Singapore is therefore sending strong signals to the maritime world as it wants to position itself at a higher level. The key sectors include the Maritime Environment & Energy, the Maritime Operations & Logistics, the Maritime ICT & Systems, the Offshore & Marine Engineering, the Maritime Safety & Security.

Application: Port of TUAS

The idea to create a mega port was launched during a strategic committee held in 2010. The goal for the Tuas Port is to handle up to 65 million TEUs a year, nearly double the current total container handling capacity of 35 million TEUs. It will also result in greater efficiency. To do so, the MPA & IBM signed a MOU in 2015, in order to develop new analytics-based technologies, aimed at improving maritime and port operations to cater to increasing growth in vessel traffic in Singapore. It should integrate real time data, and help port operators to make more informed decisions.

Block chain and data analysis

The concern isn't new for Singapore. As we can observe on the picture below, Mr. Tan signed a Memorandum of Understanding with ship classification society, ClassNK in 2015.



ClassNK developed a Ship Data Centre in Tokyo, which aims to improve the use of Data gathered from ship operations. The maritime industry was once a very “low data” industry. Just a few decades ago, information on vessel operations was limited to mostly hand-written reports which were difficult to analyse, especially across large fleets. The transition into the digital age has led to diverse new technologies, some of which are only now applicable to the maritime industry. Technology has continued to advance at a rapid pace, and in the industry we began to see that software solutions were just as important as hardware. Even if no one could have predicted how important Big Data would become for the industry, we are just starting now to realize its potential and have started looking for a way to exploit new opportunities for the benefit of the industry. The industry players are also willing to share data as long as privacy and security are preserved. Shipping companies are ready to provide information if they can reap the benefits.

Through the Monetary Authority of Singapore (MAS), Singapore is also deepening partnerships in order to foster collaboration and emerge as a hub for fintech technology. The major agreements ratified last year are the R3 Asia Lab, IBM collaboration with KYCK or FreshTurf which aim to reduce the time and expense required to on-board a new client, or help improve the “last mile” of delivery services for consumers and businesses, or the final leg of a package’s journey to a customer’s home.

In addition, Singapore offers an incredible fintech startups ecosystem, quite diverse and including companies offering solutions for compliance and security, payments, enterprise-grade solutions, ID, trading, real estate, infrastructure, etc. For instance: Acronis, AgriLedger, Atores, BitX, Blockchain Foundry, CoinGecko, CoinHako, CoinPip, Coinut, Digital Billions, Digixglobal, Dragonfly fintech, DX Market, GoCoin, KYC-Chain, Otonomos, Tembusu Systems and so on.

Beside all Singapore efforts on innovation, we noticed a global technological improvement in the maritime industry worldwide.

Global technological trends

The rise of Connected Objects, Deep-learning and AI

According to Cisco in 2012 there were 8.7 billion connected devices, today, it is over 12 billion and by 2020, it is expected to reach in excess of 50 billion objects. These objects include everything from coffee makers to cars and jet engines. Using this tiny power chips, these devices are able to send us streams of real-time performance and environmental data about everything from their location to their temperature, speed and altitude.

Those devices are evolving to do more than that. Combined with advanced robotics and algorithms, they are part of what is possibly the most science fiction part of Industry 4.0, the cyber physical system. In this scenario, the robot, rather than being programmed, can actually be trained by humans on the factory floor. Thanks to deep learning algorithms which make this possible. From the supply chain point of view, it is even more profound. It is at the intersection of the cyber and physical worlds. It won’t be surprising to see sooner or later a machine which will guess in advance for which customer a product is intended and will know all the information about where and when it will be processed. Once the material itself records any deviations from the standard process, it determines when it is done, and knows how to get to its customer. The advent of these cyber physical systems and the real-time data they provide will mean that manufacturers will have an unprecedented window into, and opportunity to optimize, every area of their operations. Particularly as advances in communications continue.

Maritime connectivity has advanced massively, and that opens the doors to closer digital integration and adding value of which shipping hasn’t always been capable of the past.

From the smart ship to the unmanned one



« The biggest technological trend is ship intelligence that enables unmanned operations. But there will be intermediate steps like automatic and remote operation and robotization of tasks at a ship level. But at the same time what is going to fundamentally change shipping - like the advent of steam, diesel and containerization - is unmanned ships. It is where we get the chance to redefine what a ship is, what it looks like, how it operates, how it is designed and make a big impact on how efficient it is. »⁶ This quote is from Mr. Oskar Levander, VP Innovation, Engineering & Technology at Marine Rolls Royce.

The SmartShip as an autonomous and cyber-physical system is emerging thanks to the falling cost of microprocessors and the development of distributed networks where data is analysed and turned into actionable information by the individual component or system. And instead of waiting for a human to intervene, that component or system will take action itself via actuators, based on the decision its algorithm makes. As cyber-physical system is the essence of an autonomous ship, one which could sail unmanned.

Unmanned or autonomous vessels will require redundancy, reliability and massive data rates for comprehensive sensor and command control requirements. Parallel connection with multiple satellite systems will be essential. What is also interesting to link is the ability for Maritime to benefit from technology transfer, and especially from the automotive, defence and aerial industries. The time to realization of the autonomous vessel will likely follow the arc of market availability of the autonomous car, which is receiving a massive amount of interest at present. We could imagine that market availability will also depend on insurance and regulations, rather than the capabilities and availability of the required technologies.

Some steps have already been done by Accenture and Hyundai Heavy Industries. Back in 2015, both companies have collaborated to design a 'connected smart ship' that will enable ship owners to better manage their fleets and achieve potential operational savings through the application of digital technologies. Using a network of sensors that will be built into new vessels, ship owners will be able to capture a range of ship voyage information

including location, weather, and ocean current data, as well as on-board equipment and cargo status data. By applying real-time analytics to new and historical fleet data and using data visualization technology to present the insights, ship owners will be able to monitor their vessel's status and condition to make data-driven decisions that support more efficient operations. As ship owners seek innovative new ways to reduce vessel operating expenses, this collaboration will deliver a range of real-time services to improve the efficiency of their ships.

Some start-ups already started to revolutionize life onboard, we can quote a few examples:

- KYMETA: Provides antennas that use new MSA-T (Metamaterials Surface Antenna Technology) which enables wide-angle, all-electronic beam steering with no moving parts.
- MTN: Leader in maritime connectivity, it has delivered the first calling app for maritime crew. OceanPhone Mobile leverages the WiFi infrastructure on vessels as well as MTN's network, for calling and messaging, allowing the crew to use their own smartphones and tablets.
- KVH: new wireless communication system that allows devices to interact with each other without relying on batteries or wires for power. the technology could enable a network of devices and sensors to communicate with no power source or human attention needed.
- ROLLS ROYCE & VTT: smart workstations which adjust themselves based on who sits down at them and a bridge window which serves as a heads-up display, showing not only navigation information, but also the routes of one's own ship and other ships. Augmented reality technology enables crew-members to keep an eye on obstacles that would otherwise be obscured by distance or weather.
- THALES: Thales invests each year 3 billion euros in R&D, and offers a wide range of services adaptable from defence to maritime. The company delivers tailored solutions for all types of missions: protection of maritime approaches, blue-water security, protection of deployed naval forces and power projection from the sea.
- ECA: Highly specialized in automation and control technologies, ECA Group provides state of the art remote applications. From deep water exploration to pipeline inspection, Seabed survey

⁶ Future Nautics Report, July 2015. p.14.

to mission training, ECA Group is actively engaged across the full range of maritime activity.

- DCNS: The French company is continuously investing in R&D and can also offer diversified and complementary services to maritime industry, such as monitoring the coastline and securing Ocean.
- TRAXENS: The French start-up is offering a real-time container monitoring service and is backed by CMA-CGM and MSC.
- SAFRAN developed a navigation system from defence to shipping: BlueNaute. It will permit to comply with IMO SOLAS regulations.

Due to all changes stated previously, there is room for French companies to catch up with the trend. Below is the methodology on how to do it.

Insights for French companies

As the Singapore Strategy is to move towards digitization, by multiplying partnerships in R&D, investing, funding start-ups, supporting innovation, French companies have a high interest in pursuing the same strategy and go along with that profound change.

Go along with Singapore Strategy

The objective is to equip French companies with the knowledge and context to develop a strategy for, and a real vision of what Maritime and its sub-industries will become.

The Maritime Industry has been called sometimes the « weakest link » regarding its supply chain. Current manufacturing depends upon long and tightly integrated supply chains, but these supply chains are going to become an even more crucial area of competitive advantage for manufacturers in the future and there are some very good reasons why. With approximately 3 billion new consumers expected to enter the consuming middle class by 2030, demand is going in one direction, and traditional manufacturing strategies which focus on long supply chains and low-cost in emerging countries are unlikely to be optimal in the future. The new business perspectives emphasize proximity to demand and proximity to innovation. Both are crucial in a world where evolving demand from new

markets places a premium on the ability to adapt products to different regions and where emerging technologies that could disrupt costs and processes are making new supply ecosystems a differentiator.

A better cooperation

Understanding the problem and the customer is a good start, but only a first step though. What the industry's challenges are already showing is that collaboration, even pre-competitive collaboration between suppliers, is essential to overcoming complexity. Meaning that traditional corporate paradigm of developing, testing and manufacturing products within a vacuum model is untenable. Maritime needs to start leveraging the power of the global brain via crowd sourcing to start innovating and solving some of the intractable issues ship operators face. New models for leasing equipment, or cloud-based as a service product which streamline and simplify procurement, maintenance and end-of life recycling could make a real impact upon shipping. The acceleration of augmented reality solutions for maintenance, training, healthcare, are all needed, but not in isolation. Unless real dialogue and collaboration takes place, complexity will only increase.

Singapore has clearly understood the stakes, and the city-state is multiplying initiatives and projects

to foster innovation. Until now, the question of how to create a better, cheaper, less complex maritime products and services, and make servicing the backbone of this revolution can be raised. Indeed, Singapore is used to be rigidly stuck in that competitive, secretive way of doing things which says that telling anyone what you're doing is a dangerous mistake. We do hope a change in mindset, and Singapore is showing the way.

A better understanding of the customer

It will radically change Maritime as a business, and there is an urgent need to technologically scale up to remain competitive. But the industry needs to appreciate the challenges the customers are facing, and their part in both addressing and solving problems. The industry needs to innovate with them, collaborate with them and potentially far more broadly with each other. The industry should keep looking at strategies to add value as suppliers both to businesses and consumers, taking advantage of new technologies to help them. Shipping can be a good illustration: most of shipping companies were focused on costs and profits instead of working out on how cyber-physical systems could change the current business paradigm.

The Maritime Industry is more deeply observed, from emissions to cyber-security to underwater noise. That end-consumer's influence is only going to grow. Customers are insisting on transparency, accountability and security from the companies and products they interact with and purchase, and those preferences will have a major impact on the supply chains of which shipping is an integral part. Blockchain technologies based on the principle of distributed ledgers are likely to form the basis of secure transactions and already start-ups are building applications which enable a consumer to digitally investigate the entire lifecycle and journey of the product they are going to purchase.

Among the quantity of Data, select the qualitative part

Up until now businesses have relied upon descriptive analytics which report the past, and predictive analytics, which use models based on past data to predict the future. Even by using the available reliable information, leaders have often been mistaking. Now, big data is delivering

prescriptive analytics, which use models to specify optimal behaviours and actions. We are entering an era where productivity gains are less likely to come from big corporate bets and investments, but rather from relentless, iterative improvements enabled by really smart use of data. In essence, data is going to become the heart of business in the future. Traditionally leadership has been about understanding the business, being able to take difficult decisions about where an organization is going based on a limited amount of information, and having the confidence to bring employees and stakeholders. In the future, data will be the business.

It will provide more reliable information and insights than has ever been available before. We are talking about a subtle but profound change in the nature of what it takes to lead a company, with mathematical and digital skills at its heart. It is up to the current generation of shipping and maritime leaders to ensure we remain competitive. In order to do so, gaining a working knowledge of how the data generated both within organizations and from equipment and sensors connected via the industrial internet can be leveraged. Big Data is starting to become crucial now. But the term Big Data on its own doesn't have value. What is important is to identify what data is going to bring value to the companies and how it would be an optimization tool to increase revenue, or control costs.

« Shipistics »: A need for new skills and new managers

This term is quite new, due to the massive digital complexity of the Industry and how profoundly it is going to change the way that we work, trade and compete. Shipistics refers to the digital approach of Maritime, using data science, managing machines connected to the industrial internet. It requires new capabilities over and above traditional engineering, taking into account the new digital approach.

The biggest shifts will happen in leadership and management roles. It will necessitate management and leadership roles to be increasingly cross-discipline. Traditional, mid-level operations management roles will be supplanted by the Business Operations Data Analysts. These individuals will require operations and management experience, together with deep domain knowledge and combined with analytical fluency and familiarity

with analytical tools. These new employees will be able to manipulate data, but also give it the necessary context in order to bring it bear to drive business impact and ROI.

One other important focus is on data scientists. They will be intensely curious and interested in discovering new insights, and have a creative approach to identifying and solving problems. Prerequisites for the job are a deep theoretical knowledge of statistics and computability, and the ability to use and create if needs be, diverse data science tools.

Nowadays, the Singapore Maritime Industry gathers 5,000 companies supported by 170,000 employees. The demand will keep growing, and the Minister of Manpower launched a USD 1.2 million campaign called the Tripartite Engineering Training Award

(TETA) to train more Singaporeans to be marine engineers.

PROGRESSIVE WAGE OF MARINE ENGINEERING OFFICERS

TETA Cadet	5th / 4th Engineer	3rd Engineer	2nd Engineer	Chief Engineer
	(CoC Class 5)	(CoC Class 5)	(CoC Class 2)	(CoC Class 1)
US\$ 668	US\$ 3,000	US\$ 3,500	US\$ 6,000	US\$ 7,000

Source: Singapore Maritime Officer's Union

Traditionally, seafaring skills are very much time-based learning, that is, the longer they work on-board a ship, the better skills they have. But now with simulation training, the marine engineering cadets' skills are accelerated with real-time feedback in a risk-free environment. It is a win-win situation for them as well as the shipping companies.

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EDUCATION, RECRUITMENT & MARKETING



Education, recruitment and marketing

In this part of our study, we focused on two main aspects of Education challenges relative to the Maritime industry. Firstly, on the relative decrease in the attractiveness of the seafaring profession in general and secondly, on the fact that there is a major challenge for French corporations to attract, recruit and maintain local talents within the group, particularly on highly qualified labour.

Maritime education in Singapore

The different paths to join the maritime industry in Singapore

Maritime plays a major role in Singapore. It only takes a few online searches to understand that the industry is in the DNA of the country. The maritime industry accounts for 7% of Singapore's GDP and employs about 170,000 people in the city-country.

Singapore and its most famous maritime related institutions such as the **Maritime Port Authority (MPA)**, strongly highlight the variety of educational programs and trainings available to start a career in the maritime sector. The Maritime education in Singapore includes a wide range of courses, modules at tertiary institutions as well as continuing education and training courses for all ages and academic levels, even in most prestigious universities in the country such as NTU, Ngee Ann Polytechnic, Temasek, SMU and others.

Maritime programs are influenced and enriched by MPA and **A*STAR initiatives**. The Maritime Port Authority is a statutory board under the Ministry of Transport of the Government of Singapore, founded in 1996 by the MPA Act and more than just being a Port Authority, it is the developer and promoter of the maritime industry. It is involved in improving the business environment for maritime industry. As such, it is responsible for finding partners to collaborate on new scholarships, maritime related courses and initiatives, for raising awareness on the job opportunities in the industry, facilitating interactions between prospective maritime employers and the students, and attracting them to join it.

A*STAR being the Agency for Science Technology And Research, was founded in 1991 under the Ministry of Trade and Industry of Singapore, to drive mission-oriented research which advances scientific discovery and technological innovation. A*STAR plays an active role in developing talents and leaders for research institutes. It works in close

collaboration with national universities to develop programmes, share knowledge and train/sponsor researchers. On November 1st 2016, A*STAR and NUS established a National Centre of Excellence to advance Singapore's Marine & Offshore Engineering industry. They formed a Joint Venture, named "Technology centre for offshore and Marine, Singapore" (TCOMS), to spur research excellence and advance Singapore's Marine & Offshore Engineering industry.

How to embrace a Maritime career in Singapore?

In the country, students can join the maritime industry right after Secondary School, after Junior College/Polytechnic or while engaging in further studies.

The **Maritime Career website** (www.maritimecareers.com.sg) is a Maritime ONE initiative and a powerful tool, for students and workers to get all the available trainings in the country but also to find jobs.

The website is a source of information on maritime careers and education in Singapore for students, recent graduate from institutes of higher learning including polytechnics or universities and people looking for a job in the maritime industry.

The website suggests more than 25 Diploma courses and several scholarships to allow students from different educational levels (after secondary school, after junior college/polytechnic, executives) to embrace a career in the maritime industry.

Sponsoring maritime education in Singapore (students and workers)

As part of the importance for the country to keep the industry attractive and exciting, the government and the maritime industry, support the development of talents in the region by offering scholarships and sponsorships from various institutions including MPA, industry associations and private companies. MPA through **MaritimeONE**

and more specifically the “Maritime Careers” website, communicate on all available financial supports. Through it, students can find out all types of available scholarships to finance their NITEC, Diploma, Bachelor, some courses, etc.

For Students:

There are **16 referenced scholarships** from After Secondary School to Junior College/polytechnics on the website:

		Scholarship providers
After Secondary School	9 scholarships available	<ul style="list-style-type: none"> • AMSI ⁽¹⁾ • MPA ⁽²⁾ • MaritimeONE ⁽³⁾ • TMSS ⁽⁴⁾ • Howe Yoon Chong PSA Endowment fund ⁽⁵⁾
After Junior College-Polytechnic	7 scholarships available	<ul style="list-style-type: none"> • MaritimeONE • ASMI • Keppel group ⁽⁶⁾ • MPA • Howe Yoon Chong PSA Endowment fund • Sembcorp Marine Lua Cheng Eng scholarship ⁽⁷⁾

Source: *Maritimecareer.com.sg*

Detail of the scholarship providers:

(1) ASMI (Association of Singapore Marine Industries)

The ASMI scholarships are financed by ASMI members (usually shipyards and marine companies) and offered at Diploma, University of Higher NITEC levels in Ngee Ann Polytechnic and Singapore Polytechnic. The following scholarships exist:

DIPLOMA LEVEL:

- ASMI scholarship
- ASMI Marine &Offshore Technology Scholarship
- ASMI Marine Engineering Scholarship

UNIVERSITY LEVEL:

- ASMI Marine & Offshore Undergraduate Scholarship
- ASMI Marine Technology Scholarship

HIGHER NITEC LEVEL:

- ASMI Scholarship
- ASMI Marine Offshore Engineering Scholarship

(2) MPA Sponsorship

Opened to GCE’A’Level/IB students with outstanding academic track records and Polytechnic students who graduate with Diploma with Merit. MPA offers overseas scholarship with a bond of 6 years (or 5 for non-English speaking countries) and local scholarship with a bond of 4 years. Funds cover maintenance, computer and all compulsory fees related to the course.

Being a MPA scholar gives the student the opportunity to intern at MPA before and during his studies, to be updated with the latest news on the Maritime industry, to take part to networking events, and to have the possibility to join MPA after his studies.

The selection process includes interviews, writing tests, test on the ability to think and present and on leadership and creativity skills.

MPA also offers the **Beacon scholarship**, which is an umbrella talent development programme among agencies within the Ministry of Transport, the Civil Aviation Authority of Singapore, Land Transport Authority and Maritime and the MPA of Singapore. Its aims at offering career opportunities in the Ministry and its agencies.

(3) MaritimeONE Scholarships

It is an initiative managed by the SMF (Singapore Maritime Federation) and its partners (ASMI, MPA, Singapore Shipping Association and other private partners such as Singaporean and foreign companies), having pledged their commitment to the scholarship programme by providing the funding for scholarships and offering possible opportunities in their companies for the scholars. They offer target at different levels of education, in five of the most prestigious universities in Singapore, being: Nanyang Technological University, NUS, SMU, Singapore Polytechnic and Singapore Institute of Technology. They also support scholarships in foreign universities such as Chung-Ang University in Korea, University of Plymouth and Newcastle University in the UK, the State University of New York, and double programs such as the Maritime Institute Willem Barentsz (the Netherlands) with Singapore Polytechnic or the Singapore Maritime Academy with Singapore Polytechnic.

(4) Tripartite Maritime Scholarship Scheme (TMSS)

Tripartite Maritime Scholarship Scheme is sponsored by the MPA, shipping companies and unions, groom promising students between 17 to 24 years old, to become Ship Captains and Chief Engineers of ocean-going merchant ships and be the leaders of Singapore's maritime industry. There are two possible tracks: whether obtaining a Diploma in Nautical Studies at Singapore Maritime Academy under Singapore Polytechnic and follow designed training phases to become Deck Officer and then Ship's Captain or obtaining a Diploma in Marine Engineering at the SMA to become an Engineer on Board and finally a Chief Engineer.

(5) Howe Yoon Chong PSA Endowment Fund

Fund named after Mr. Howe Yoon Chong, a visionary Singaporean who made important contributions to the country. PSA has set up a SGD 16 million endowment fund to honor this man with contribution from PSA, Temasek Holdings and SL Ltd, to award bond free scholarships to students aged 25 and below. It aims at paying for the students' tuition and other compulsory fees and providing book and living allowances. It is under the auspices of Trailblazer Foundation Ltd., a registered charity under the purview of the Commissioner of Charities of Singapore. It is an approved institution of a Public Character.

(6) Keppel Group Scholarship

The Keppel Group Scholarship Scheme was launched in 1989, with the aim to provide young individuals with excellent academic records the opportunity to further their undergraduate studies in prestigious universities and to grow within the Keppel group. Each year, scholarship provides tuition fees annual allowances of SGD 12,000, reimbursement of computer/notebook purchases up to SGD 2,000, air tickets and hostels fees for exchanges, etc.

The Singapore-Industry Scholarship (SgIS) in partnership with the Singapore Government. It is an initiative which aims at developing a strong core of Singaporeans to anchor strategic sectors in the country (from engineering, aviation, tourism, power, maritime, healthcare, arts and social services).

The Keppel Offshore & Marine (O&M) Scholarships

Offers scholarships at the Higher Nitec, Diploma and Undergraduate levels within: NUS, Nanyang Technological University, SIT, Singapore Polytechnic and ITE.

(7) Sembcorp Marine Lua Cheng Eng scholarship

All those scholarships are attributed according to specific criteria and students can apply to most of them online through the BrightSparks portal.

For workers:

For workers, the **Maritime Cluster Fund (MCF)** schemes is in charge supporting industry's manpower and business development and productivity improvement efforts.

There are 3 key components under MCF Development:

The **MCF Manpower Development**, which co-funds maritime companies in the development of manpower, training initiatives and capabilities, the **MCF Business Development**, which supports expenses incurred in the initial development of new maritime companies and organizations created in Singapore, or existing maritime companies and organizations expanding into new lines of maritime businesses. Finally, **MCF Productivity** is in charge of supporting maritime industry initiatives, which will lead to productivity gains.

The **MCF Manpower Development** component is accessible to companies, company-supported or self-sponsored individuals and focuses on developing pertinent skills of employees:

- **Training@Maritime Singapore:** to upgrade knowledge and expertise of local maritime personnel through attendance of MPA-approved training programmes. Providing both external and in-house trainings.
- **Talent@Maritime Singapore:** which aims at encouraging companies to invest in the development of expertise through attachments and career development programmes (industrial attachment, overseas attachment, management associates; to support grooming of oval talent for management and leadership positions).
- **InvestManpower@Maritime Singapore:** to encourage maritime enterprises or industry

associations to adopt well-structured HR and training infrastructure, tools and processes so as to attract, train and develop their talent pool.

The MCF covers the following sectors: ship owning/operating, ship management, ship financing, ship brokering/chartering, maritime law/arbitration, marine insurance, port terminal management planning & development, marine engineering & naval architecture, as well as seafaring.

Besides this government-lead initiative, private companies also partake in workers' sponsorship or training services.

This is the case of the **Employee Development Schemes (EDS)** from **Keppel O&M**; offering sponsorships to deserving staff who would want to pursue their studies through the EDS. It equips staff with the relevant skills to apply to the company based on the knowledge gained from the schools. Sponsorships include; Diplomas, Specialist Diplomas, Bachelors, Masters and PhD. The school may range from local institutions to recognized overseas institutions subject to approvals from the Management.

Llyod's Register Foundation is also another example of private company financing students wishing to embrace a maritime career. As such, they offer PhD programmes in partnership with Llyod's register Foundation, in local universities linked to their own projects.

Providing trainings to global maritime leadership

Besides trainings and sponsorships offered to students and workers by the Singapore government and its maritime partners, the MPA Academy was founded and repositioned in 2014 to provide the right trainings to maritime leaders (for senior port and maritime officials at the Chief Executive and CEO level). It aims at delivering them the tools to build new capacity to transform their organization in an increasing complex and globalized environment. The MPA academy has the ambition to become a global centre of learning for the MPA, by providing trainings for the MPA officers (enhancing their skills and knowledge), by conducting trainings through MPA's multilateral and bilateral technical assistance programs and by

sharing knowledge and experience, for the benefit of the international maritime community with MPA's partners.

The MPA Academy has developed the Advanced Maritime Leaders Program (AMLPL) as a 5-day flagship program which will be exportable internationally.

The latter includes:

- Transformational leadership
- Managing change and transformation
- The leader in action
- The leader in managing crisis
- Networking events

Main challenges observed in the Maritime sector

What are the challenges which French corporations have to face while recruiting maritime labour locally?

Through our interviews, we have noticed that many corporations did not find the right labour to answer their manpower needs. As a consequence, we discussed those elements with four actors from the sector during our interviews.

Some Singaporean employees may demonstrate a lack of engagement in French corporations. In the French culture, employees usually overstay in the companies after the official end of the working day in order to bring forward some subjects, to discuss with colleagues or to show motivation. This behaviour could be perceived as unusual in Singapore. This creates a form of misunderstanding between both sides.

Another issue, which French corporations struggle with, is the difficulty to retain Singaporeans in the long term in the company. They tend to easily quit a job for another one even if the income differential is not significant. This is linked to the historical existence of a low level of unemployment in the country and the ease to find many opportunities. Such behaviour doesn't reinforce trust from French corporations towards Singaporean employees.

From a more technical point of view, and this is particularly true for some big French Oil & Gas corporations, it appears that most Singaporeans are

not trained with and used to the same software as their French homologues. Those software programs are in fact massively used in French corporations or French universities. Therefore, companies which are mostly looking for operational recruits, resent spending time and money on local manpower and despite hiring constraints, prefer to recruit French instead of locals.

The maritime industry is lacking of attractiveness in Singapore, but elsewhere too

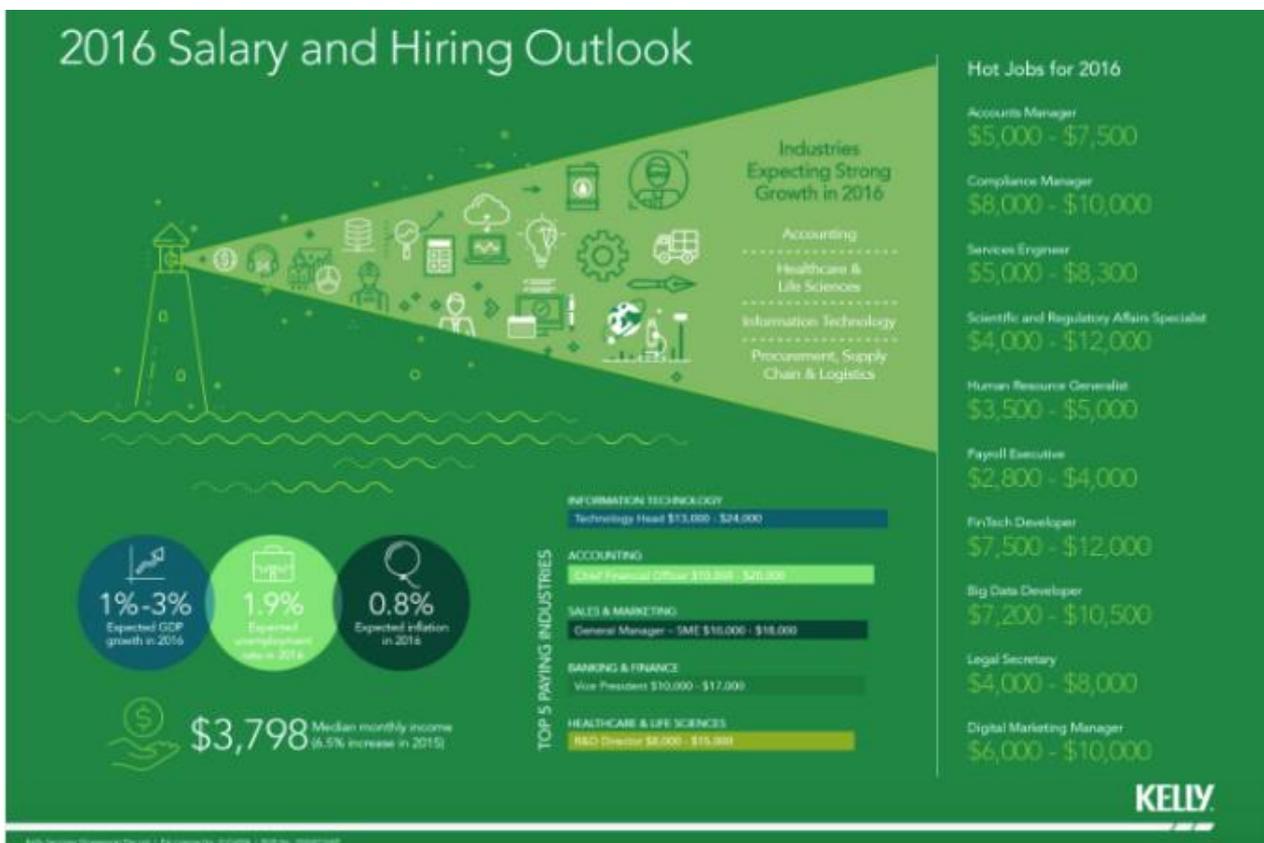
The relative attractiveness of the seafaring profession has steadily decreased over the years globally mainly due to specificities of the profession itself.

We have noticed that for most of the students, the seafaring profession mainly echoes to the Oil & Gas industry and to the shipping professions. Two industries, which suffer from a global, negative perception from the new generations and which were highly affected by the recent crisis. They mostly appear quite polluting and their reluctance to evolve towards greener energies and processes do not convince most of young graduates. Knowing

that the maritime industry consumes 40% of the world’s oil production does not help either.

In Singapore, a study conducted by the MPA in 2015, revealed the low awareness of people towards the maritime industry in general and its vital economic contribution to Singapore. What’s more, it put the stress on the fact that careers in the maritime sector were perceived as outdated and consisting of menial and blue collared jobs of low prestige without room for growth and career diversity. This trend has been observed in Europe too and made some actors react to the situation. The European Community Shipowners’ Association and the European Transport Worker’s Federation (ETF), have observed an increasing shortage of qualified labour on board EU-flagged ships during the last decade in the shipping industry, and thus have decided to conduct a joint study funded by the European Commission, to map the various available career paths in the seafaring profession.

Moreover, in Singapore, the traditional Maritime industry does not figure in the list of most paid jobs, as revealed by Kelly Services Singapore, in an article published in the Straight, in May 2016 (cf. Document 3).



Document 3: The top paying industries in Singapore in 2016 (Kelly Services)

We noticed that most of the graduates ready to join the industry, usually have relatives who have succeeded/worked in the field and which inspired them to join the industry.

As mentioned above, one of the major reasons why students tend to prefer consulting, banking and finance or even IT or healthcare studies, is obviously linked to the fact that career paths appear to be clearer, the salaries are attractive and also they may appear “cleaner”.

Furthermore, we are living in a world where international mobility has never been that much an accessible reality. There are many opportunities today to travel either through work missions or during free time for leisure. As a consequence, the Maritime industry does not appear as the necessary option to satisfy people’s international attractiveness.

The maritime industry also implies some difficult lifestyle choices. Some implies to live away from home (and family) and for long periods of time, working seven days a week and with intermittent access to digital communications. This may be quite difficult to convince the digital generations, women and the Singaporean citizens, knowing that in the top two factors for men and women’s factors of happiness figure their relationship with their partner/spouse (*survey based on 18 to 50 years old Singaporean, conducted by Ipsos APAC and Toluna, in March 2014*).

There is also the deteriorating image of the industry in terms of security, as it can appear quite dangerous with the increasing risk of piracy and criminalisation of seafarers in case of a maritime accident.

Insights for French companies

French companies are thus facing two major issues; the first one relates to finding the right people locally to answer the jobs’ needs and the second point deals with the attractiveness of the maritime industry as a whole.

Develop academic programmes and sponsor education

One option would be for French corporations to develop the right programs with local universities and schools to train the right people according to their needs. Once those programs created, they could financially sponsor them (offer sponsorship programs or even apprenticeships to get students discover the industry as soon as possible).

French corporations should also encourage international academic partnership between French schools and universities to develop trainings, which match the future maritime needs.

Increase visibility in local events and maritime oriented programs

Singapore is highly engaged in maintaining and developing awareness towards the maritime industry and is working on correcting misinterpretations towards the industry. The city-state organizes various events and activities to work on the lack of mainstream knowledge about the shipping industry and seafaring among the student/young population.

In Singapore, there are a few organizations in charge of promoting the maritime education and image through students.

Those organisations include:

 **MartimeONE (Outreach NETwork):** it is an initiative which was created in April 2007 by the Maritime and Port Authority (MPA), Singapore Maritime Foundation (SMF), the Association of Singapore Marine Industries (AMSI) and Singapore Shipping Association (SSA), to collectively raise awareness of the maritime industry as well as to profile education

and career opportunities to students, their influence groups and committed individuals via different outreach initiatives. The goal is to create a vibrant Maritime Singapore recognized as a pillar of the country's economic growth and an industry of choice for students and jobseekers.

MaritimeONE offers scholarship programmes funded by maritime partners ready to finance education and then to offer possible job opportunities in their companies for the scholars. The partners are the following ones.



As we can notice, there is not any French company in the list.



Another important actor which is in charge of developing strategies and programs for academic partners, developing the policy and R&D aspects of the Maritime industry, for the sectors of port, shipping, maritime services, offshore and marine engineering, and subsea is the **Singapore Maritime Institute (SMI)**.

SMI works in partnership with major Singaporean Universities which are; Ngee Ann Polytechnic, Temasek, SMU, NTU, NUS, and Singapore Polytechnic, among others.

The Singaporean Universities also work with international partners (academic and corporations or associations of corporations) among which, France is again quite absent. Countries like England and particularly the University of Newcastle is well

represented, the Netherlands, Australia, Germany are also recurrent partners.

Those two main institutions, which develop trainings and offer sponsorships, do not work with French corporations. However we can notice a couple of foreigner peers such as Llyod Register (UK), ABS (USA), Bertling (Germany), Fednav (Canada), China Navigation (China), etc.

We believe it would be highly beneficial to French corporations to join those institutions and try to develop the adequate programmes. What is more it would definitely increase their visibility in the country.

We also noticed, having participated in a couple of them, that French corporations were rarely present in career fairs. Being part of those would be a great opportunity to be known by the Singaporean students and it may ease the development of local sponsored programmes afterwards.

Rethink HR careers management within the French corporations in Singapore

As stated above, we underlined the issue of maintaining Singaporeans in the companies on a long-term basis. Losing their investment on human capital is a major prejudice. Therefore, we suggest adapting human resources careers management to the local culture.

Rethink the remuneration package taking into account the employees' sensitivity to marginal revenue increase and to change in status (importance of "keeping the Face" and of social recognition).

- Value seniority in the company and communicate on the benefits of it.
- Identify talents and develop attractive solutions to keep them in the company.
- Organize more seminars and inclusive events to retain employees.
- Stress growth opportunities in the maritime industry.

Identify the employees' motivations to remain in a company and conduct surveys and in-depth interviews to understand them, having a linked with local universities would help too

Tips to retain Singaporeans in a group:

The total income and their job position (name status) are two major aspects for Singaporean to value their jobs.

Consequently, small and regular increase in salary combined with a change in the job's name (even if the task remains the same), are effective and easy strategies to implement to retain local employees.

From one job to another Singaporeans can expect 10 to 15% income increase on average.

More global insights on how to increase the attractiveness of the maritime industry

To enhance the awareness and correct misinterpretations about the industry and the career opportunities offered by it, MPA engaged in a renewal of the Maritime Singapore image as a whole and launched a series of events and activities in April 2016. The **Maritime Singapore** is the entire eco-system of the maritime industry in Singapore. It is composed of Singapore's global hub port, the international maritime center and Singapore's strategic maritime interests.



The renewal started with a new logo which represents how the world converges upon Singapore as the destination for global trade (depicted in the logo by the central "X"), the blue for the sea and the red for Singapore. The combined colours giving an indigo colour which states for the resilience and the vibrant industry of Maritime Singapore. Singapore also developed a tripartite partnership between the MPA, the maritime industry and the unions in building Singapore into a vibrant and leading maritime center.

A series of events and activities were also launched such as:

- **Singapore Maritime Week** (17-22 April and since 2006): a leading event in Singapore targeting professionals from the maritime

industry (conferences, exhibitions, dialogues and social activities).

- **Maritime Youth festival** (inaugurated in July 2016): a fun-filled event targeting at youths and the general public to find out more about the maritime sector.
- **The Maritime Singapore Connect**: a one-stop maritime career services center launched in 2016, which is in charge of providing career advisory services and guidance to students and job seekers. It has an online portal, which allows the public to search for maritime careers, education or training-related information. It is run by the Singapore Maritime Foundation with the support from the MPA. (*cf Document 4 in the following page*).

Other events are organized with industry partners in collaboration with the MPA (seminars, career fairs, roundtable discussions and training programs)

All those elements clearly state that the maritime industry is a major concern for the city-state and illustrates the fact that Singapore is well engaged here again to answer an issue its industry is currently facing by taking concrete measures and actions.

However, we also noticed the strong absence of the French corporations in those events.

It would be important to focus on the future of the maritime industry which will increasingly become technologically sophisticated on board vessels. The introduction of new operational innovations is creating new demands on the skills of the officers and crews, especially in IT, communications and engineering, which open new career opportunities and also levels up the qualifications required to join the industry.

Communication should emphasize the excitement of working in extreme or unpredictable operational environments and on board diverse ships and varying trades.



Document 4: Aim of the Maritime Singapore Connect

SYNERGIES & INTEGRATION



Synergies & Integration

In Singapore, French companies could create and use their synergies to address the challenges we have detailed in the previous pages. Such a thing would be mainly possible by sharing information on the markets, both on Singapore and the whole Asia-Pacific. Singapore as a maritime hub in Asia-Pacific seems to be the right place to be the forum of the French maritime companies operating in the region. All the subsectors belonging to the global maritime are present in Singapore: Shipping & Logistics, Banking & insurance, Shipbuilding, Oil & Gas, Shipbroking, Naval Defence & Security, Maritime Classification. Information sharing already exists within these sub-sectors, the purpose of the French Maritime Cluster Committee is to enhance cooperation between all the French companies working at sea in Singapore. The goal is to strengthen the position of French companies in the region.

Action and success of foreign maritime clusters

We have observed some strong foreign maritime clusters, active in Singapore. Thanks to their synergies they succeeded in taking strategic positions into the Singapore maritime cluster. The actions of the Norway maritime cluster permitted the signature in October 2016 of a strengthening collaboration agreement in the maritime, between the MPA and the Norwegian Ministry of Trade, Industry and Fishing. It includes cooperation on some main topics: innovation, maritime environment and education with the creation of the Bachelor of Science in Maritime Studies and Master of Science in Maritime Studies jointly conducted by BI Norwegian School of Management and the Nanyang Technological University (NTU).

In February, MPA extended the existing Memorandum of understanding with DNV GL, the Norwegian maritime classification firm, to include autonomous systems and intelligent shipping.

We can also notice the strong ties built between the MPA and the Port of Rotterdam largely supported by the Nederland Embassy in Singapore. Since last year they strengthen their partnership through a series of collaborative projects on port solutions. Currently, the main topics are LNG bulker and innovation regarding green practices.

Thanks to the strong collaboration between firms, associations and state agencies, some foreign clusters realize a good and beneficial integration in the Singapore maritime ecosystem, crowned by official agreements and MOUs with the MPA.

We can notice that in these cases, the strengths of this cluster are the closed ties between associations, state agencies, the royal Embassy and

firms. They continuously maintain exchanges and info-sharing. Their objective is to be well integrated as a country entity and work directly with the MPA. People who work in the firms are engaged in their country cluster and also in the Singapore maritime cluster.

The Actors of the Singapore maritime cluster

To integrate the Singapore maritime ecosystem, it is important to know who are the local actors present in Singapore.

Companies

The Singaporean companies obviously take an important part of the Singaporean maritime ecosystem: ST Marine; Pavillon Energy, Pacific international lines, Keppel corporation, NOL-APL, Jurong Ports, PSA International.

PSA for instance plays a role in the maritime innovation in Singapore, the firm became a venture capitalist through *unboxed*, financing start-ups in innovative solutions for port terminals. Its incubator, *PSA living lab*, is also helping start-ups in the project “Port of the future”. PSA has committed about SGD 150 million to innovation programs that include automated-guided vehicles, crane automation, predictive maintenance, wharf side automation and video analytics projects for its terminals around the world.

Recently, PSA went along the phase II of its joint-venture with CMA-CGM: the Lion Terminal. It will bring the annual operating capacity from 2 million to 4 million TEUs.

Singapore Technologies Marine Ltd (ST Marine), subsidiary of ST Engineering, is a premier shipyard providing turnkey shipbuilding, ship conversion and

ship repair services for both naval and commercial vessels to in the naval defence and commercial markets. The company used to build joint ventures with foreign companies for Naval programs. For example in 2009, the JV between ST Marine and DCNS for the six Formidable-class frigates program for the Republic of Singapore Navy.

Maritime Public actors

The second principal actor is the Administration of the Republic of Singapore through several ministers:

- The Prime Minister Office;
- The Ministry of Defence (MINDEF), with mainly the Defence Science & Technology Agency (DSTA);
- The Ministry of Trade and Industry;
- The Ministry of transport, which has the authority above the Maritime Port Authority (MPA).

Some funds are managed by several governmental agencies such as SPRING and A*STAR (Agency for Science, Technology and Research). A*Star oversees engineering institutes and promotes innovation through funding. The maritime is one of the targets through some technologies: autonomous vehicle and robotics, green technologies and LNG and so on. Those funds could be a good target for French companies, above all SMEs which could match Singapore's needs.

The Defence Science and Technology Agency (DSTA) is responsible for performing acquisitions management, systems management, development system for the Singapore Ministry of Defence (MINDEF) and the Singapore Armed Forces. The Naval Systems Program Centre, part of DSTA acquires and integrates advanced surface and underwater naval systems for the Republic of Singapore Navy.

Recently Collecte Localisation Satellite (CLS) a subsidiary of CNES (French Space Agency) and IFREMER (French research institute for exploitation of the sea) as performed in being part of two collaborative projects: the 28 of February 2017, it was awarded by the MPA to be the operator of Singapore Long-range identification and tracking (LRIT) Data center (monitoring Ships) in accordance

with SOLAS IMO regulation. CLS also signs in February 2017 a MoU with the DSTA and ST Engineering to participate into the development of TeLEOS 2, the new Earth observation satellite which aim mainly the maritime area in Singapore.

Associations and conferences

Some cluster associations are involved in the maritime sector. There is mainly the Singapore Maritime Foundation (SMF) who promotes the maritime sector in Singapore as well as the Association of Singapore marine industry. On top of it, the Singapore Shipping Association (SSA), the presence of French is real, but Norwegians, British, Germans are much more involved in it. We can notice that there is a strong presence of westerners in the "council" of SSA. They belong to several companies, we can give some of them: Enesel S.A (Greek-UK); A.P Moller (Danish); DNV-GL (Norwegian). There isn't any French people or people from a French company in the council. Many other executives from several well-known maritime companies are involved in the committees, but only very few French ones. We can nevertheless guess that with the move of CMA-CGM Asian headquarters to Singapore and with the acquisitions of NOL-APL, it will reinforce the participation in such association.

The Business of conferences is a speciality of Singapore where participation prices and speaking fees are expensive. The main event is the **Singapore Maritime Week** where French companies are attending. Business France gathers SMEs through the "French Pavillon". Some executives and companies from other countries are strongly present in conferences as well.

In 2016, the second edition of the "**Norway Night**" was organized by the Royal Embassy of Norway that received some of the main Singaporean actors such as the Minister of transport. The event is sponsored by maritime companies DNB Bank, Thome Group, Wilhelmsen, DNV-GL and by shipping and Oil & Gas associations. The third edition of the Norway Night will occur during the 2017 Singapore Maritime Week.

In the Defence sector, French Companies are strongly involved in conferences and meetings such as IMDEX. The main companies attending are CNIM, DCNS, Cilas, ECAgroup, DCI, Safran, MBDA, SOGENA, Thales. The Singapore-France Defence Industry Small and Medium Enterprises (SME) in

October 2015, gathering DSTA, DGA and Defence sector SMEs could also be seen as an example.

The French players

The French trade advisors (*Conseillers du Commerce Extérieur*) in Singapore, responsible for monitoring economic situation for the French administration, helps companies to come and make business in Singapore, especially SMEs.

Business France helps companies, especially SMEs to settle and make business in Singapore. It is strongly involved in the maritime sector and has direct ties with the French maritime cluster in Paris. It is also visible thanks to La French tech in the Start-up environment, with the France-Singapore

innovation Days. The French Pavillon Créative France gather French companies during the Maritime week in Singapore.

The **French Maritime Cluster** in Paris gathers many companies, Agencies and Administration working at sea in following the situation of Singapore Maritime as an Asian hub and an important maritime place in the world.

The **French Chamber of Commerce in Singapore**, gathers many companies, enhances synergies by overseeing and animating the network of French companies in Singapore. It hosts the French Maritime Cluster in Singapore, which constitutes one of the Committee of the Chamber of Commerce.

Insights for the French companies

- Micro-conferences within the French Maritime Cluster to improve **sharing**

The French Maritime community in order to share experiences and information about the market, while respecting private companies' information and integrity could benefit from regular mini-conferences on chosen topics. It could strengthen info-sharing about local partners, Singaporean policy and current news in the maritime.

- Occupy space and adopt a French **marketing strategy**

The French Maritime Cluster has to be more visible. French companies as well as agencies should reinforce their presence in the maritime media landscape in Singapore. It is important to raise the French visibility. Even if some strong actors such as CMA-CGM, Total, Bolloré logistics, Bureau Veritas or DCNS are quite well known, it is not the case for smaller companies. As a cluster, the French flag is maybe not as well seen than others.

It is necessary to maintain the presence in the Maritime week. The French Pavillon Créative France. We can improve that presence in settling a “**French Night**”, with French companies, business agencies and association, with Singaporean partners.

Some other professional's meetings could be targeted. We can take the example of IMDEX in the Defence sector, where French companies are quite well represented.

It is primordial to enhance French maritime “Marketing” by promoting more the French cluster and French companies within the maritime ecosystem in Singapore. There are some ways to do that:

- Be present in specialised magazines such as Wave or in Singapore classic newspaper and internet TVs.
- Be present on the internet and moreover on social media could be a plus.
- Be present during numerous conferences seems to be important as well, even if they are expensive, time consuming and despite there is a myriad of it. Drawing a schedule and share about what is interesting could be profitable for all.

- To be involved in Singaporean associations to **improve integration**

In addition to that, being involved directly in the Singapore Maritime cluster through the associations, like SSA for shipping is a way to be present and seen by Singaporean actors. If many non-Singaporean executives

representing big western companies could be present and moreover, participate to the board of such associations why not some French ones? We strongly encourage French managers to be involved in associations such as the following ones:

- Singapore Maritime Foundation;
- Singapore Shipping Association;
- Association of Singapore Marine Industries;
- Marine Offshore Oil and Gas Association, Singapore;
- Maritime Law Association of Singapore;
- Centre of Maritime Studies;
- Society of Naval Architects & Marine Engineers Singapore.

➤ To benefit from the **Help** of the French Business Community

For French companies, which are willing to operate in South-East Asia, especially SMEs, they could be helped by French Agencies: Business France, the Embassy services for business, Bpi France, the CCE in Singapore, The French Chamber of Commerce in Singapore and the French Maritime cluster. BpiFrance for example provides international growth loans, export credit, and export insurance. For start-ups, The French Tech (Business France) could help French start-up to settle in Singapore. The FCCS, through its Business Club department, is helping French companies to settle in Singapore and welcomes them into its Business Center.

Conclusion



As a conclusion, five final orientations should be given to enhance French synergies through the points we just draw before:

1. **Improve synergies between the maritime sub-sectors could be profitable.** Improving trans-sector knowledge and a better understanding, could lead to profitable solutions. At a global level, the Agreement between CMA-CGM and TOTAL could be taken as an example. In the same way, defence and security companies could have some solutions to bring to civil sectors and vice versa.
2. **Improve information sharing from other non-maritime sectors to Maritime:** the maritime sector could transfer the best practices of the other French innovative sectors such as IT, Digital Economy and Aerospace. The information sharing could occur in Singapore which is a Maritime hub that strongly promotes innovation.
3. **Strengthen the integration of French companies into the Singapore ecosystem:** we can take the example of the French Defence sector which is quite well integrate in Singapore with good collaborations with partners and customers. Indeed, the French Defence companies are highly represented in professional meetings such as IMDEX.
4. **Increase the help from big groups well established in Singapore towards French SMEs,** could enhance the entire French business community.
5. **Create new structures in Singapore to promote French Innovation and enhance synergies:** Singapore is encouraging innovation through structures and funds through Labs, incubators and financial support. French companies, associations and agencies could benefit from that. They can settle project in common gathering people, funds and ideas to create profitable synergies in Singapore. They should include Singaporean actors.
 - Settle a French **Start-up incubator** in Singapore
 - Create a French **Open Innovation Labs** to raise new ideas and implementations
 - Gather people and ideas in a **Think Tank** on the Maritime in South East Asia

Appendix 1 – List of companies interviewed

We would like to give a special thanks to all the executives who received us and gave us valuable insights for this report.

We would like to thank Mercuri Urval as well for inviting us to their workshop on the Shipping Industry Trends for 2016-2017, and for their insights on the Maritime Education in Singapore.

COMPANY	CONTACT	RANK/FUNCTION	DATES
APL	Matthieu Girardin	Deputy Chief Trade Officer	23/11/2016
AXA	Sundeeep Khera	Head of Marine – Singapore; Marine Cargo Practice Leader – Asia	22/11/2016
BRS	Dominique Courne	Managing director	19/01/2017
BUREAU VERITAS	Dr.Xiaobo Chen	Director of Deepwater Technology and Research Center	29/11/2017
BUREAU VERITAS	Julien Boulland	Project Manager / Sr. Naval Architect / LNG Services specialist	06/03/2017
BUSINESS FRANCE	Karine Gresset-Cognon	Head of Infrastructure, Transport and Industry Department	09/03/2017
CMA-CGM	Julio Bellota	Product Manager	07/11/2016
CNIM	Eve Bonnardel	Business development Manager for SEA Defence	01/12/2016
CREDIT AGRICOLE	Denis Letessier	Head of Shipping & Offshore	17/11/2016
DCI-NAVFCO	Florian Casanova	Regional chief representative	24/11/2016
DCNS	Patrick Valentini	Country representative	18/01/2017
ECA GROUP	Thomas Gerard	Regional Sales director	08/02/2017
ENGIE	Denis Bonhomme	ENGIE Global LNG Singapore	08/12/2016
LOUIS DREYFUS (SINARMAS)	Matthieu Lavoine	CEO	22/11/2016
MARECHAL ELECTRIC	Lionel Lemaire	Managing Director	02/12/2016
MARINELEC	Jean-Benoit Delpy	Asia Sales Manager	16/01/2016
MPH Consulting Services	Nicolas Jollet	Account Manager MPH Consulting Services	01/03/2017
POTEN & PARTNERS	Manon Amouretti-Dumontier	Senior LNG Consultant	17/01/2017
TOTAL	Yves le Bail	VP Asia Pacific (Delegate China, Thail, Camb, Viet)	14/11/2016
WLADIMIR	Wladimir de Beaupuy	Managing director	24/11/2016
ZODIAC MILPRO	Erlé Dumontier	Head of Business Development	16/01/2017

Appendix 2 – Main sources and websites

About Singapore

Maritime and Port Authority of Singapore (MPA)	www.mpa.gov.sg
Port Singapore Authority (PSA)	www.globalpsa.com
Maritime Singapore	www.maritimesingapore.sg
Singapore Maritime Foundation	www.smf.com.sg
Singapore Shipping Association	www.ssa.org.sg
Association of Singapore Marine Industries	www.asmi.com
Singapore Maritime Academy	www.sp.edu.sg
Marine Offshore Oil and Gas Association, Singapore	www.moogas.org
Maritime Law Association of Singapore	www.mlas.org.sg
Centre of Maritime Studies	www.maritimestudies.nus.edu.sg
Society of Naval Architects & Marine Engineers Singapore	www.snames.org.sg
Singapore Maritime Week	www.smw.sg/2017
IMDEX Asia	www.imdexasia.com

About France

The French Chamber of Commerce in Singapore	www.fccsingapore.com
The French Maritime Cluster	www.cluster-maritime.fr
The French Maritime Cluster Committee in Singapore	www.fccsingapore.com/committees/French-Maritime-Cluster
Business France Singapour	www.businessfrance.fr/singapour
BpiFrance	www.bpifrance.fr

Appendix 3 – Contact list

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