In cooperation with

Fraunhofer CML

GL

Best Practice Ship Management

Study 2013

Foreword

Ship managers are under increasing pressure. Overcapacities in the market are driving charter rates down. Ship owners face higher costs to finance vessels. Ship operators fight for cargo and drive down their main cost block, which is fuel. Ship managers sit in the middle and have to look after more and more for the same management fees to gain owners management contracts. At the same time lie the requirements on availability of the vessels. Quality and safety of operations, management and treatment of crew and transparency of costs spend are increasing. GL and Fraunhofer CML experts conducted a study involving about 100 ship managing companies across the globe to find out what they are doing to improve their operations and what they consider as "best practice" in the industry.

"Best practice" in this study comprises all approaches, procedures, business models or tools that ship managers are using to do their business smarter, safer and greener, i.e. to be on top of competition.

We invite the reader of this study to check these best practices against his own operations and get inspiration and ideas on additional improvement areas. Especially in the process and supporting tools part, we see a lot of hidden potential that will make a big difference in costs, quality and/or speed of a ship manager.

We wish you find some interesting points in this study. Enjoy reading!

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Table of contents

List of abbreviations

bn	Billion
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
ICT	Information and Communication Technologies
IFRS	International Financial Reporting Standards
IMO	International Maritime Organization
ISM	International Safety Management
ISO	International Organization for Standardization
KPI	Key Performance Indicators
LCM	Life Cycle Management
MLC	Maritime Labour Convention
MSC	Mediterranean Shipping Company
PMS	Planned Maintenance System
PSC	Port State Control
QS	Quality & Safety
QHSE	Quality, Health, Safety & Environment
SEEMP	Ship Energy Efficiency Management Plan

Best practice – a management view

Best practice is an accepted procedure, described systematically in the existing solutions and experiences of successful companies. It can be therefore used by practitioners as a reference for the possible adaption.

A comprehensive restructuring of an organization / company is usually not practical, and the conditions under which different companies operate differ significantly, rendering "blueprint" solutions impractical. However, the organization's success can be improved, at least in certain areas through the implementation of ad-hoc measures (good practice).

77% of the respondents said that their organizational structures or processes are being changed at the moment, or new methods / tools are being introduced. Given the current pressures shipping is in, this is not surprising.

Those respondents who negated this question mostly mentioned the fact that the investments are planned mid-term. Few companies referred to other priorities, or indicated that so far everything works fine.

The great interest in best practice within the shipping industry shows that almost 90% of respondents are actively seeking best practice within their field of action. Over two-thirds compare their operations to the competition and 38% are looking to take advantage of external consultants. Other stated options were: benchmarking, internal and external working groups in the industry or to seek more integration / combination with other companies in the group.

Are you actively changing your organizational processes, approaches, or inventing new tools to master the current market today?

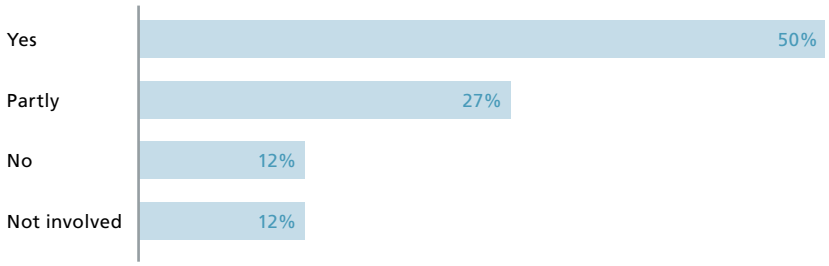


Figure 1 – Active change of processes

Which part of your companies' ship management faces the biggest challenges regarding the mid-term future (several indications possible)?

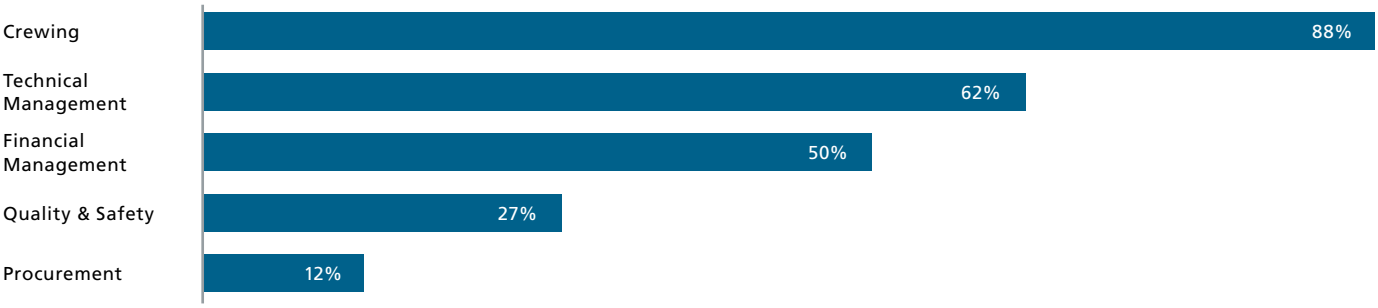


Figure 2 – Biggest challenges of ship management (mid-term future)

Are you actively seeking examples for best practice as an organization?

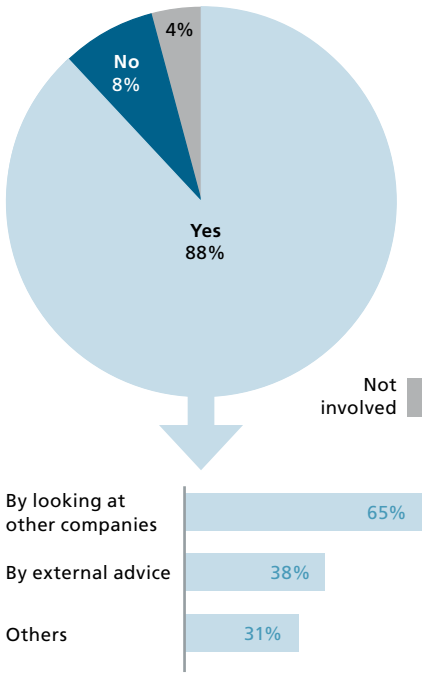


Figure 3 – Actively seeking for best practice examples

A first indication for the need of best practice is the question of which topics in ship management are currently of particular interest, and for what reasons.

Among the top three, the surveyed shipping companies place Crewing, Technical and Financial Management as the greatest challenge for the mid-term future, followed by Quality & Safety Management and Procurement. We will use this ranking as the guiding agenda for this study.

As reasons, besides the dominant issue of cost pressure, are especially the large number of new regulations and compliance requirements to be named. Among others were "lack of financing, and low level of earnings for a prolonged period" cited.

The collection of best practices in this study should not be seen as a recipe, as many companies have different pre-conditions to work from. It would also be difficult to see that the success of a company depends on the pure number of best practices is adopts. The collection should rather be seen as food for thought for shipping companies to improve their performance, to trigger discussions for areas to look at and assess sensible changes.

What are the reasons (several indications possible)?

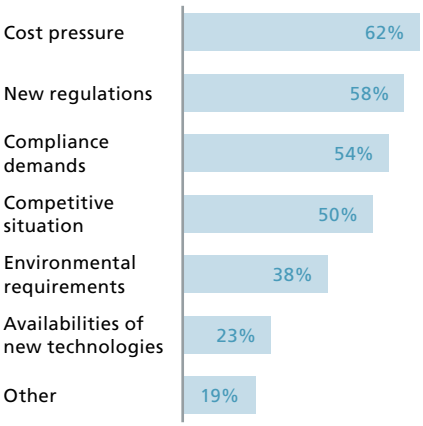


Figure 4 – Reasons for the mentioned challenges

Figure 5 – Core tasks of ship management

The market of ship management

Ship management comprises functions / services like Technical Management, Procurement, Crewing as well as Quality & Safety Management. The Financial Management aspect was added into this study which is less a service provided to a ship owner but relevant to the ship manager himself and functioning as an enabler to provide the services rendered in an efficient and transparent way.

More than 1,500 companies are globally managing more than ten vessels each. Only 150 manage more than 40 vessels, which results in a long tail of mid-size entities. These ship managers in total manage approx. 25,000–30,000 vessels, which leaves another 20,000 vessels managed by smaller entities. Potentially this would result in a market size of 3–5 billion US dollars, i.e. a fee / revenue volume of 3–5 billion US dollars p.a. to the ship managers.

There are three types of ship managers:

- Many ship management activities are integrated into large owner-operator companies, like the big container liners (such as Maersk, MSC or Hapag Lloyd) or exist as separate group companies (such as NYK Shipmanagement, Columbus Shipmanagement from Hamburg Süd), that also serve external ship owners.
- Many tanker and bulker owners manage their own vessels in own shipping entities and charter them out.
- However, a significant portion of that market is served by 3rd party ship management companies, which provide ship management services to ship owners (such as V.Ships, Anglo Eastern or Columbia Shipmanagement) without being a significant owner themselves.

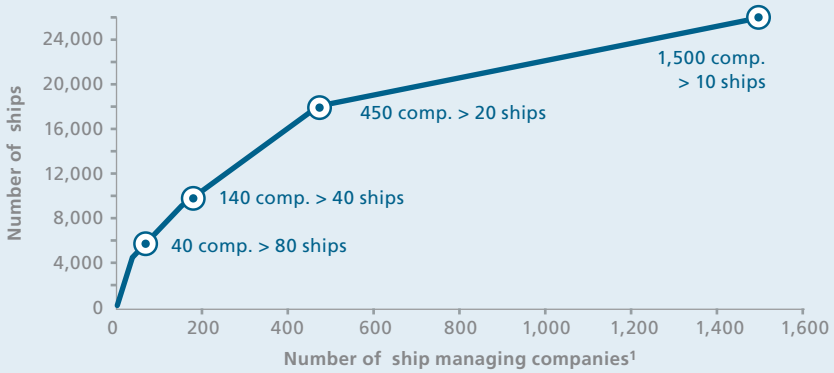


Figure 6 – Size distribution of ship managers (Clarksons Research, 2013)

The market presents itself substantial with, despite the current challenges, a good outlook. The global fleet is growing. Technically more challenging assets underlying stricter regulations with more difficult to find crew and increasing pressure and costs and quality will nurture professional ship management services be they 3rd party or in-house. Larger entities will have advantages here though.

If ship owners are asked what they require from a ship manager, the priorities lie in high reliability, low operational costs, high crew quality and good communication with the ship managers.

Best practice in Crewing

Crewing is a key ship management service and field of competency of any ship manager globally and rated as biggest current challenge for a shipmanager in this study. Especially the big 3rd party ship managers offer their crewing services to many shipping companies and in-house ship managers.

In 2010 almost 1.4 million seafarers were active. The situation for global seafarer supply and demand was one of approximate balance for ratings and a modest shortage of officers. There is particular concern over the current and future availability of senior management level officers, especially engineers, in the Far East and the Indian subcontinent.

69% of respondents are actively looking at best practice measures in crewing, the highest value among all areas. 77% follow organizational measures, 73% process measures and only 52% IT measures, the lowest IT measures value in all fields.

Based on the in-depth interviews of Fraunhofer and GL we could identify three areas of activities among all ship managers participating:

- Organizationally, many shipping companies re-insource crewing activities again to gain more control and quality than with purely "temporary workers" via crewing agencies. As qualified crew becomes harder to find, many ship managers build up a pool of own officers that keep coming back to their vessels. It is then possible to involve senior officers much more in the vessel management, quality control and financial performance. This can be done by employing them themselves or at least managing this pool closely together with the agency. This requires proper integrated systems to do so.

- Culturally, a lot of focus is given to training, development, welfare package and teamwork. Many experienced seafarers say: gone are the days when the crew would hang out together in their spare time, making music, playing games and enjoying their time together. Today everybody stays in their cabin with their notebook, which poses a challenge to teamwork and a "feeling part of" a company or a bigger task.

- Process-wise, re-insourced crewing processes need proper system support also given the increasing requirements of the Maritime Labour Convention (MLC). In the past this has been an investment area of the big global crew managers, but many respondents stated they look into this area more intensively now.

As one respondent put it: "To get the same senior officers back onboard of the same vessel is the ultimate goal of crew planning. Lesser crew changes means lower costs and more commitment from senior officers for 'their' vessel."

Based on the interviews of this study and research conducted by GL and Fraunhofer, we would summarize key elements of best practice in crewing:

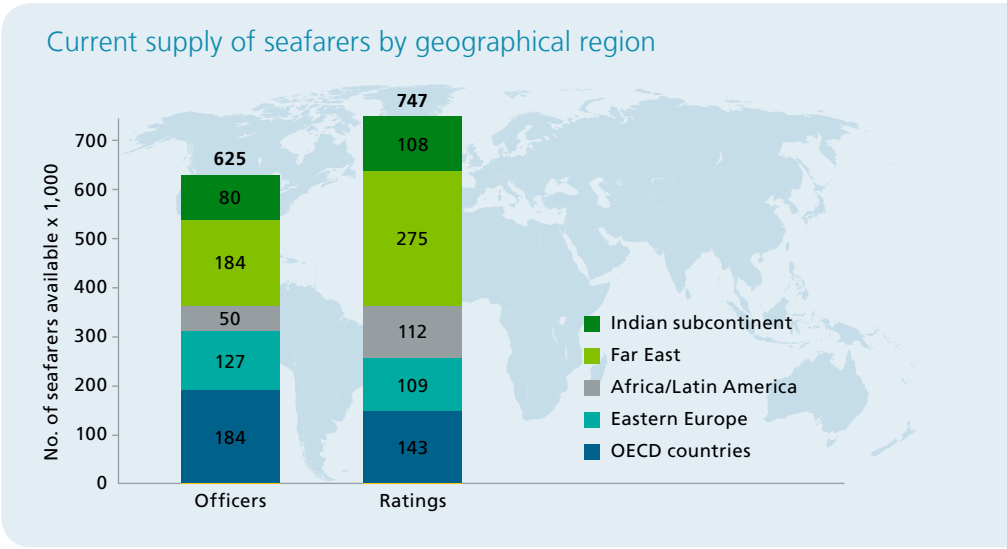


Figure 7 – Current supply of seafarers by geography (BIMCO/ISF Manpower 2010 update)

Invest in culture and teamwork

Especially as multi-cultural teams pose a challenge to human interaction, to invest in teamwork and a team culture is still seen as worthwhile and highly recommended. At the end, the quality of the work depends on the whole team, not a smart chief engineer. The team should also include the shore-side personnel. This requires time and opportunities to be given by the management (I) for proficiency in a common language (English) and (II) personal interaction, be it in common trainings or regular company events, be it on the vessel fostered by a master doing something for the team culture.

Invest in crew welfare packages

Apart from efforts to retain qualified crew members with attractive remuneration and leave packages, along with providing ongoing training, ship managers look at an additional field of investment. As young and qualified crew become harder to find, many quality ship managers invest in infrastructure that connect the employees onboard to the outside world as the young generation has got used to in the last decade. This typically involves allowing an easy option to call home, Internet access onboard and private notebooks in the ship's network. Although there are significant costs involved and cheap bandwidth is still an issue, it is currently a best practice to attract good crew that always has a chance to choose. This trend is solid. Crew welfare will also be the driver to better connect vessels to shore communication-wise, much stronger than any business application.

Integrate training, appraisal and development management systems

The next level of crewing best practice comes when training, appraisal and development schemes run integrated as a Human Resource Development Management system. Training is adapted to current development needs that come from the current work appraisals but also from the laid out career development path of the crew member. Active feedback of the superiors as well as the crewing manager is driving this process. Demanding tasks and developing skills go hand in hand. A transparent hiring and development process from cadet to master, regardless of their nationality, is another building block to that.

Use a combination of personal and computer-based training

With higher safety concerns, technically more challenging vessels and younger crew, training is a key concern for crew managers. Many computer-based training offers are available in the market that will not substitute personal, on-the-job or classroom-style application but complement them. Timing and speed can be better adapted to personal preferences, checking learning success and results can be integrated and trainings can be well suited to onboard work hours. Crew training should include the day-to-day skills, personal safety, regulations etc., but more focus should be laid on new technologies and time for emergency response on bridge and engine simulators, as respondents in the study put it.

Use an integrated crewing solution onboard and onshore

The times of Excel sheets and pinboards for crewing activities are definitely over for those who want to be involved in crewing processes. Integrated crewing software packages offer functions for all data, certificate etc. administration as well as the crew planning and scheduling, (automatically) matching manning requirements with available crew for the next months. The integration also links up processes in-house with local crewing agencies that work in the same system, receive requests for open positions, enter all master data etc. In addition, upcoming MLC requirements need a further proof of compliance, i.e. documentation that is best prepared and managed electronically. Many ship managers get ready for MLC process-wise and use this change to implement an electronic crewing system, as it achieves two goals in one go.

The Maritime Labour Convention (MLC)

The "Maritime Labour Convention, 2006" (MLC 2006) of the International Labour Organization (ILO) will govern the working and living conditions onboard a ship for more than 1.4 million seafarers worldwide. It defines requirements concerning occupational health and safety, fair employment contract conditions, adequate accommodations as well as access to medical care, health care and social security. The new convention brings together more than 60 existing ILO standards. When the Convention enters into force, in August 2013, all international merchant ships of 500 gross tons or more will be obligated to carry a Maritime Labour Certificate and a Declaration of Maritime Labour Convention compliance onboard, documenting its compliance with the national regulations of the vessel's flag state based on the MLC 2006.

The convention is seen positively by many quality shipping companies, which have many of the standards for their crew in place anyhow, as it prevents unfair shipping practices and competition on the back of crew. The real effect on administrative burdens and the enforcement of e.g. Port State Control needs to be seen. Many shipping companies use their MLC projects to review their crew-related processes and information flows and implement a supporting IT system that helps to get the right information to the right place and keep their crewing experts focusing on finding good crew, not typing data from A to B.

Best practice in Technical Management

Ensuring the (technical) availability of a vessel and balancing maintenance costs with costs of defects or even off hires is a key competency in every ship manager. Chief engineers onboard and the superintendents in the office combine their skills and practical experience to achieve that. Technical Management is, after crewing, considered the 2nd most challenging area for the mid-term future. Increasing regulatory and compliance pressures are seen as adding to the complexity of this equation.

When looking at clusters of answers, 77% of all respondents checked either cost or competitive pressures – making commercial questions the number one issue of the industry, closely followed by 72% who checked compliance or regulatory pressures.

These pressures are perceived as intense with less than 5% of respondents judging that in their organization "everything works fine". Of the many areas where improvements are being thought by the industry, one sticks out: 50% of all respondents focus their improvement programs on processes, a distant second being investment strategy (19%).

65% of all respondents are looking at best practice measures in the Technical Management field. 77% of those respondents state organizational measures, 85% process measures and 69% IT measures.

Life Cycle management (LCM) as a fairly new thinking in Technical Management receives quite some attention. Three-fourths of the respondents are familiar with the concept, with over half of it regarding it as important for the future. 82% of these focus on machinery and 74% on hull structures. Lower total cost is the number one advantage, followed by higher information availability and very interesting evidence of environmental performance.

How do you see the new concept of Life Cycle Management?

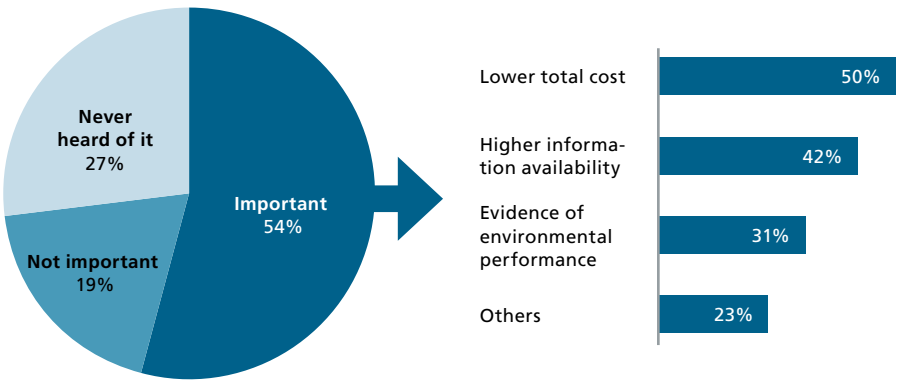


Figure 8 – Assessment of relevance of LCM

Reporting, monitoring and verification of emissions

Although shipping is considered the most efficient mode of transport, it is carrying 90% of world trade today. Shipping emissions account for approximately 3% of current global CO_2 emissions, but are expected to more than double by 2050 if no additional measures are taken to reduce the sector's carbon footprint. At the end of 2012 the European Union turned away from the discussed emission trading scheme to agree that "a simple robust and globally feasible approach towards setting a system for monitoring, reporting and verification of emissions based on fuel consumption is the necessary starting point." This direction fits very nicely into the newly introduced IMO measures to reduce CO_2 emissions for ships in operation, which are the Ship Energy Efficiency Management Plan (SEEMP) and (still voluntary) the Energy Efficiency Operating Indicator (EEOI) as a KPI to measure CO_2 emissions from vessels (taking into account the transport output).

Energy management, environmental matters and performance monitoring are increasingly important subjects for Technical Management departments today. Technical managers today often work in close cooperation with the marine operations teams to achieve this task. We also see dedicated "Energy / Environmental superintendents" taking over these tasks, which become more and more supported by professional tools. This subject is so important and complex that it deserves its own study.

The in-depth interviews conducted in the course of this best practice study revealed a number of similarities across ship managers:

- Many ship managers move away from a pure vertical organization to a more process-based one. The best known example are the so-called fleet teams, where technical, purchasing, crewing and/or accounts experts sit together in one organizational unit to serve a certain number of vessels.
- The days of paper-based workflows in ship management are gone. The increasing complexity of commercial, regulatory and other challenges seem to leave ship managers with no option but to build their processes around IT solutions that "cut" across units and departments and provide consistent and "real time" information to the many stakeholders. Most ship managers see IT investments increase even in these commercially challenging times.
- Planned maintenance systems are clearly a central part of the increasingly integrated process and IT landscape, but the innovators in the ship management community look beyond. Life cycle management, hull integrity and condition based maintenance concepts, expecting further cost efficiencies and uptime improvements.
- With cost pressures rising and forcing comprehensive approaches, this life cycle management increasingly focuses on hull and structures as well, beyond the traditional machinery-based approaches. The challenge here is to stay close to the vessel itself, despite the administration around it. As one respondent put it: "We all have focused too much on 'papers' and we are asking every day for more and more paperwork, forgetting the 'hardware', i.e. ship's structure."

Based on the interviews of this study and research conducted by GL and Fraunhofer, we would summarize key elements of best practice in Technical Management:

Organize along processes

Human behaviour in business follows a lot of organizational boundaries and structures, despite the everywhere seen work on a collaborative company culture. Organization still matters and many ship managers move away from a pure vertical organization to a more process-based one. The best known example is the so-called fleet teams, where technical, purchasing, crewing and/or accounts experts sit together in one organizational unit to serve a certain number of vessels. This reduces interfaces and waiting times, gives clear ownership and accountability of results. It is also easier to put clear KPIs to those teams and trigger process improvements within the teams.

Build processes around a state-of-the-art planned maintenance system

Although planned maintenance systems (PMS) have become commonplace across the industry, the way they are used differs. A PMS is much more than just an onboard documentation of jobs. The use of the PMS as a central communication platform for all technical matters and tasks in a shipping company is a first best practice. This not only reduces calls and e-mail traffic, but creates a central task list for all people onboard and onshore. Planned maintenance systems of today are highly integrated with procurement / purchasing systems and quality and safety software systems both process-wise and data-wise. All three functions typically come from the same vendor to reduce interfaces and issues around updates / upgrades. These systems include maintenance planning as well to ensure that skills, spares and time are available before the voyage.

Harmonize and centralize the management of master data

Many ship managers have learned their lessons how freely it allowed their technicians to put equipment or maintenance job data into the PMS. At the end, each vessel, even technically identical sister vessels, looked different and any synergies in managing a fleet get lost or at least harder to uncover. Today equipment and planned maintenance data are entered and managed fleet or vessel-group wide via a central source and central responsibles. Individual users are blocked from changing master data themselves. In this manner, ship managers typically reduce the number of maintenance jobs to a manageable size or combine tasks to real jobs. 500–1,000 recurring jobs are often enough per vessel.

Manage a key element of your maintenance budget: dry dockings

Dry dockings are the biggest chunk in a ship manager's maintenance budget. However, most ship managers report that a 20–30% cost overrun to the dry dock budget is rather common than an exception. Several measures are attempted to improve that situation.

Not the superintendent for that vessel but special and dedicated (teams of) superintendents take care of all dry docks across the fleet. This allows a better building up of competencies for that field.

Personal visits to the vessel to prepare the dry docking specification often are employed. In best practice organizations, specific dry dock tools are introduced that collect all technical information, specify a tender, come to final orders for the yard and the equipment manufacturers and allow the project management on site for the dry dock team. Especially in the dry dock preparation one deficiency becomes often apparent. How much does the shipping company know about the condition of the steel structures?

Pay attention to hull maintenance

Attention of the Technical Management team onboard and onshore is largely paid to all machinery equipment onboard. For many good reasons: Many jobs need to be done according to manufacturer specification, there is a lot of "wear and tear", systems and procedures fit well to machinery parts, the persons in charge are "engineers" (not naval architects). Often, the "hull maintenance" (and structures maintenance) rests on the surveys of class societies.

In the dry dock at the latest, the negligence of the steel structure becomes apparent and creates unwanted cost. This can be avoided by a more structured hull integrity management approach. This typically comprises regular visual inspections of all compartments and ratings according to different criteria (such as coating, corrosion, deformations and cracks), the specification of failures and assignment of short-term maintenance measures (e.g. recoating of an area), to prevent structural deficiencies from getting worse until the next dry dock. Very often, hull integrity systems are implemented to support this process and combine this information with the mandatory thickness measurements. As one respondent put it:

"Best practice integrates these hull integrity tools with the PMS used and are accessible onshore and onboard."

A simple guide to condition monitoring

Conferences are filled with condition monitoring and condition based maintenance expert advice. However, ship managers' and experts' views can be condensed in a few key aspects:

- Trust your visual inspections: Looking, listening, smelling or manual measuring has always been a trustworthy source of condition information to the engineers onboard. To enhance using this data, an electronic capturing to allow trend analysis or comparisons might be added. As the crew cannot be everywhere at the same time, we observe intensified use of simple digital cameras to monitor a room or equipment.
- Take vibration measurements: Rotating auxiliary machinery can best be condition monitored by taking regular vibration measurements and comparing them to warning and alarm levels of the manufacturers. The method is proven and reliable, the set-up is easy. Systems are available to support this.
- Do regular oil analysis: The information received from it tells you a lot about your main engine, if you capture the results from the laboratory systematically.
- Enrich your Information base with some performance measures: Pressures and temperatures already measured somewhere put into the right context can enrich the above gained information.

Only if you did this, putting more sensors and cables for e.g. crank bearing wear analysis or monitoring of combustion chamber parts and other online measurements will make sense.

Extend the view across the vessel's life cycle

Common in the manufacturing industry, the view across the complete life cycle of a product becomes more important in shipping today. The effectiveness and suitability of an equipment or system is not decided at the purchase but over its lifetime, taking into account all maintenance and repair efforts, possible off-hire hours and other costs involved. For this the right information sources need to be built and maintained. Often today this knowledge sits in the head of experienced chief engineers or superintendents, with the risk that this is more anecdotic than systematic.

Embrace condition based maintenance

Maintenance schemes in shipping still follow a typical planned schedule according to running hours or calendar, no matter whether maintenance is technically needed or not. It would be helpful if chief engineers could look inside the equipment to assess its actual condition. Following the well-known concept of "never touch a running system", condition monitoring and following condition based maintenance approaches become more wide-spread among technical managers in ship management companies. Large industry pilot projects have proven the advantages of the concept. The benefits do not so much lie in saving maintenance work, but more in reducing defects, especially defects stemming from badly executed maintenance.

Best practice in Financial Management

While Finance and Accounting departments normally do not have much influence on a company's financial performance directly, they play a huge role in providing accurate data and thereby enabling other departments and the management to make the right decisions. On top in the current financial situation, having solid and true numbers produced and reported to banks and investors is vital. We received open feedback from ship financing banks that the current state of Financial Management in many shipping companies has room for improvement, but the ability of providing accurate and consistent figures often plays a role for them in investment decisions (as much as financial performance as such).

But not only banks play a role in ship financing. According to a survey from Norton Rose in 2012, 31% of shipping executives expect private equity investment to be the main source of funding over the next few years.

Despite the stated importance, only 45% of the respondents actively look at best practice measures in Finance measures, of which again the majority are process and IT measures (55% of respondents each) while organizational measures this time are last (50% of respondents) related. This is not corresponding well to the importance and mid-term challenges seen in the Finance area, which ranked 3rd in this study. However, among the respondents finance staff had the smallest representation, which might distort this picture a little.

We summarize the findings in the in-depths interviews done by GL and Fraunhofer as follows:

- Finance teams are not well integrated into the operational business, which is more and more seen as problematic. One respondent stated a possible cause and solution: "Managers with field experience should be employed in finance." The separation not only has an organizational or cultural dimension but is also caused by disintegrated processes and systems.
- The complexity build up in the too-separated Finance departments is historically grown with many businesses and needs to be reduced, which will help also the re-integration into the business. We have seen chart of accounts with 1,000 and more accounts for relatively "small" businesses.
- State-of-the-art process supporting and data collecting and reporting systems have found only little use so far. Many small local providers built accounting systems 10–15 years ago which are still in use. The large ERP suites are not shipping specific. Modern systems would not only enable more reliable numbers in less time but also help integrate finance processes with operational ones.

Based on the interviews of this study and research conducted by GL and Fraunhofer, we would summarize key elements of best practice in Financial Management:

Integrate Operations with Finance

While it is evident that commercial commitments are extremely important to the company's fate, it has now become best practise to integrate operational functions like Purchasing closely with Accounting and Financial Management. This ensures that for example any order placed by the Purchasing department will immediately appear as a commitment in the liquidity forecast, giving the company's treasurers a much more reliable basis for liquidity planning.

In general, liquidity drains can be seen much earlier, giving the company more leeway e.g. to secure further funds. Extending the focus also to operational figures, the company gets a much more complete picture of its commercial position and its exposure to certain market circumstances, enabling the company to define hedging strategies against dangerous scenarios on time. On a more micro perspective, it also helps in calculating KPIs measuring the quality and effectiveness of the company's day-to-day activities in order to identify room for improvement.

This will also foster the much needed close cooperation between the Finance department and all other departments immediately involved with vessel's day-to-day operations.

A last integration area is planning and forecasting with the actual figures and the actual operations throughout the year. To ensure you report on items you have planned to be able to compare, to easily produce forecasts on the year end throughout the year and to do so without "Excel monsters" is a definite best practice.

Simplify and harmonize the accounting structures

Shipping companies often work with a large number of legal entities, having to work with and to report to many owners and charterers in different environments. The more important it gets to simplify the accounting structures:

- Use a harmonized chart of accounts that is valid for each legal entity and is administered centrally with a clear guideline on what to post where. Although some minor differences might exist for local accounting standard reasons, 90% can be harmonized. Integrating all group companies on a single accounting platform with worldwide access under a standard group chart of accounts will speed up the process of preparing group accounts extremely, e.g. by defining standard intercompany transaction accounts and automatic intercompany posting, which can be eliminated in group accounts later easily without any manual intervention. This is also supported by slimming down the extent and the level of complexity of intercompany transactions.
- This chart of account should not be "misused" to fulfil any reporting need you have. From a management accounting perspective, it should only hold the cost elements like personnel, spares, lubes, insurance, travel etc. costs, which will keep the chart of account handy. You end up with much more simplicity if you use cost centres (where is the cost located, e.g. a vessel or a department) and cost objects (why do these costs incur, e.g. a voyage or a contract with an owner) as additional dimensions. Modern accounting programs handle a vast number of such financial dimensions.
- Last but not least, management accounting should follow legal accounting standards, so a second (internal) evaluation e.g. for a financial instrument or depreciation should be avoided ("One true number"). The now widely spread tonnage tax systems all across the world also eliminate the need for different accounting practices for commercial and tax depreciation and other tax-related issues, so establishing "one single version of the truth" additionally covering the management reporting is becoming standard – this also includes harmonization of e.g. IFRS and local GAAP accounting wherever possible.

What are Business Intelligence Systems

A standard technology is receiving a lot of attention especially from finance managers, but also purchasing managers or Quality & Safety managers in the industry at the moment: Business Intelligence Systems. They are built to integrate data from different source systems, e.g. a finance system, a crewing system and a PMS/purchasing system, to perform reporting and analysis asks. They allow a flexible analysis trail through the figures presented and a differentiated reporting per target group "in a few mouse clicks". The technology is built for only that purpose, so linking up

Centralize the invoice registration process

It is still common practice that invoices coming to the shipping companies arrive directly at the desk of the receiver in any department. When the supplier sends a reminder or at the latest end of the year, the responsible employee realized that there are costs missing on the P&L and on the reports that were sent to the bank, shareholders etc. in the last months. This can be avoided if you define a central place where invoices arrive and are registered in your finance system right away. This can be done in the Accounting department or simply at the front desk. From now on this invoice can take its approval steps up to the payment and it can no longer be forgotten in a drawer.

A further improvement of this procedure would be an electronic approval workflow from this point onwards. A proper scanning solution with modern OCR (Optical Character Recognition) techniques does not only register any invoice's existence, but also the contents, so that the need to pass on physical documents disappears. A document management system would take up the scanned invoice and route it through the departments for approval up to an audit-proof archiving procedure and link to the accounting system.

source systems, producing reporting applications etc. is no longer a big IT project. The technology is non-proprietary, so typically a full eco-system of know-how and resources exist in the market to deploy them for the user. And the technology is inexpensive coming from a more corporate world 20 years ago and is now easily available and applicable for small and mid-size companies.

Automated three-way matching (order, packing slip, invoice) will reduce transaction processing and give the company greater control on acceptance of suppliers' behaviour, with automated posting vastly enhancing accounting productivity. All this also greatly increases the quality of the data provided.

Harmonize and automate reporting

Some professionals in management accounting feel they spend their day producing the same numbers to different addressees in different reports. Best practice in the industry is the use of a specific analysis and reporting software packages, often called Business Intelligence Software. They are made for exactly that purpose, sit on top of all operational systems, such as accounting systems or ship management systems, and are able to produce various kinds of reports, even more allowing a flexible reporting and analysis of information (Why do we deviate from the budget?). This will give you more time to understand and analyze the wealth of the information you typically have hidden in your operational systems. It will also give you room to work along a predefined reporting calendar with a slimmed-down reporting package for the management or introduce so-called flash reports, the key figures very close to month end, as another two best practices we have collected.

Invest in cash management procedures

When budgets get squeezed along the value chain in shipping, cash becomes a highly important figure for the existence of a shipping company. Nevertheless, a pure accounting view on revenues and expenses does not help here for operational purposes. What is needed and a definite best practice is a smart and short-term (e.g. 13 weeks) and mid-term (e.g. twelve months) cash forecast and active cash management based on this. Expected payments from customers must be combined with needed payments of suppliers given payments to own personnel and to banks. Cash should be pooled to make best use of cash-at-hand. There should be dedicated experts dealing with it, to get the right attention and focus of all management in the company that "cash is king".

Best practice in Quality & Safety Management

With the rise of regulations and competitive pressures, the role of dedicated Quality & Safety (QS) or even Quality, Health, Safety & Environment (QHSE) officers has increased significantly. Whereas the safety part is typically not disputable, as it is about colleagues' health and life, the quality part of the role always has to find the right balance between helping the operative work to improve quality without overly increasing administration. Looking at some statistics, fires and explosions are still the 3rd largest reason for the total loss of vessels and in 5th place among all reported accidents at sea. With regard to PSC statistics, the lack of fire safety onboard remains in 1st place and contributes to every 5th detention of vessels in port.

The number of yearly maritime incidents is showing a downwards trend, after a period of strong yearly increases during 2000–2007. While more than 1,100 casualties were officially reported in 2007, a little more than 900 were counted in 2011. An increasing percentage of maritime incidents occurs in ports or docks or in restricted waters, whereas the share of incidents at sea is decreasing, according to casualty statistics in 2011. For 2012, the same trend is being observed.

This trend is also valid looking at the total number of ship losses, which has decreased from 177 in 2001 to 106 in 2012, the reasons though remained relatively stable.

Maybe this improvements is the reason that only 45% of the respondents actively look at best practice measures in Quality & Safety measures, of which again the majority is organizational (79% of respondents) and process (73% of respondents) related. 58% of the respondents also look at IT measures.

In the in-depths interviews, we could again see some similarities among all participating ship managers:

- The set-up of dedicated Quality & Safety (QS) teams that report directly to a senior executive or the CEO of the shipping company has found its way throughout the industry. Many respondents stated that the most experienced and best personnel should

What does Port State Control often find?

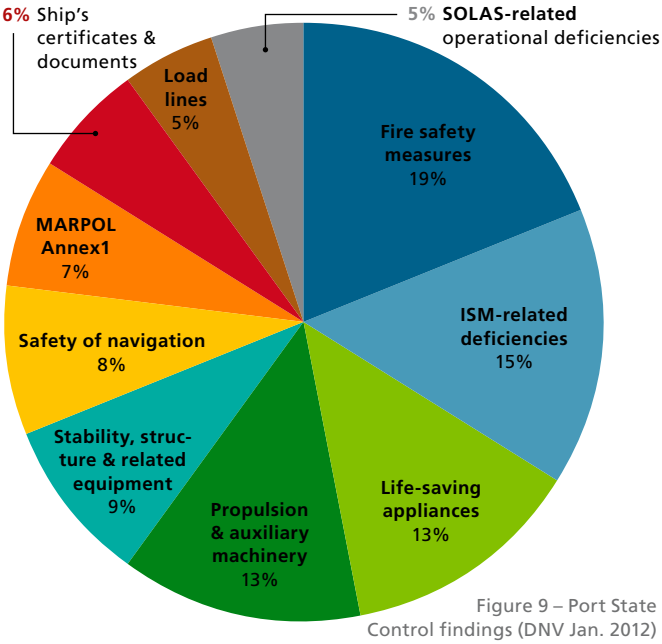


Figure 9 – Port State Control findings (DNV Jan. 2012)

Where do maritime incidents happen?

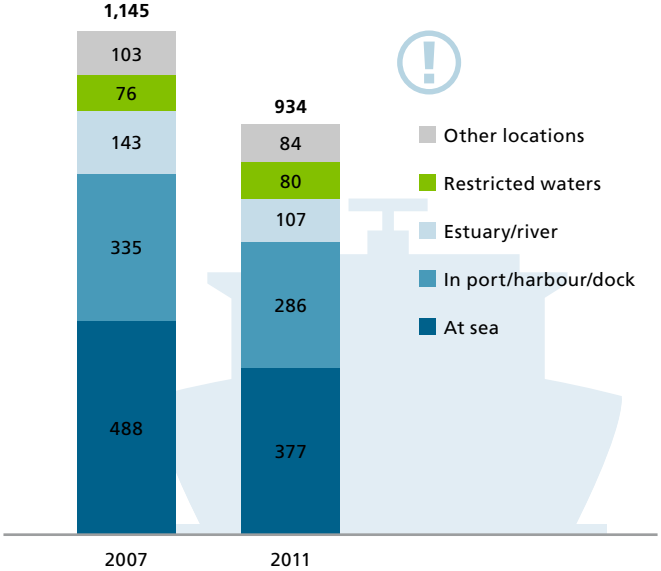


Figure 10 – Maritime incidents development (IHS Fairplay Casualty statistics, November 2011)

be given these tasks. This gives the important subject the visibility and the professionals the power they need to accomplish their tasks. The influence and budgets assigned to the QS teams have increased significantly in the last years. However, there is the feedback that there is some frustration from the operational teams that QS has not developed beyond guidelines and manuals in many cases.

- The critical success factor is awareness of the individual crew member that he can make a difference in both directions and all focus of a Quality & Safety management system is directed to this. A lot of creative ideas could be identified in getting Quality & Safety issues into the minds of seafarers. Formal training schemes with the superiors or with video or computer-based material are possible, but also simply a regularly changing picture in the crew area of the last accident happening in the fleet, which is selected and explained by the QHSE officer.
- Process supporting information systems allow the Quality and Safety experts to look up from their desks with a much faster and easier information access and basis for targeted actions.

Based on the interviews of this study and research conducted by GL and Fraunhofer, we would summarize key elements of best practice in Quality & Safety Management:

Move from QS to QHSE

As environmental and occupational health subjects become more and more important, the scope of QS departments widens to Quality, Health, Safety & Environmental (QHSE) matters. The benefit lies not only in additional subjects getting attention, but also that combined procedures ease implementation as well as reduce conflicting information and paper being given to the crew. Respondents recommend that industry certification schemes, not only mandatory ISM / ISPS or MLC but also ISO 9001, 50001 and OHSAS 18001, help to establish integrated and state-of-the-art procedures. Not only give they good guidance but prove compliance to the highest degree in an increasingly competitive market.

Deploy and monitor regular crew training on safety issues

More than everything else, the quality and safety of operations depends on crew awareness, which is kept on a high level by continuous training and information. The means are many – from simple weekly update "pictures" to complete computer-based training programs. Given that messages need to be sent to more practical than academic staff, less text and more pictures are the preferred mode.

What caused shipping losses in 2012?

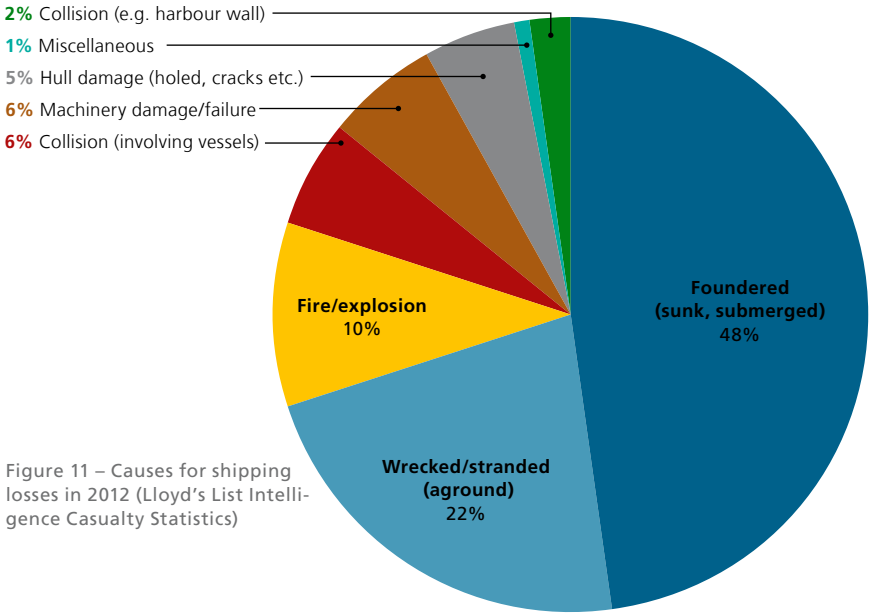
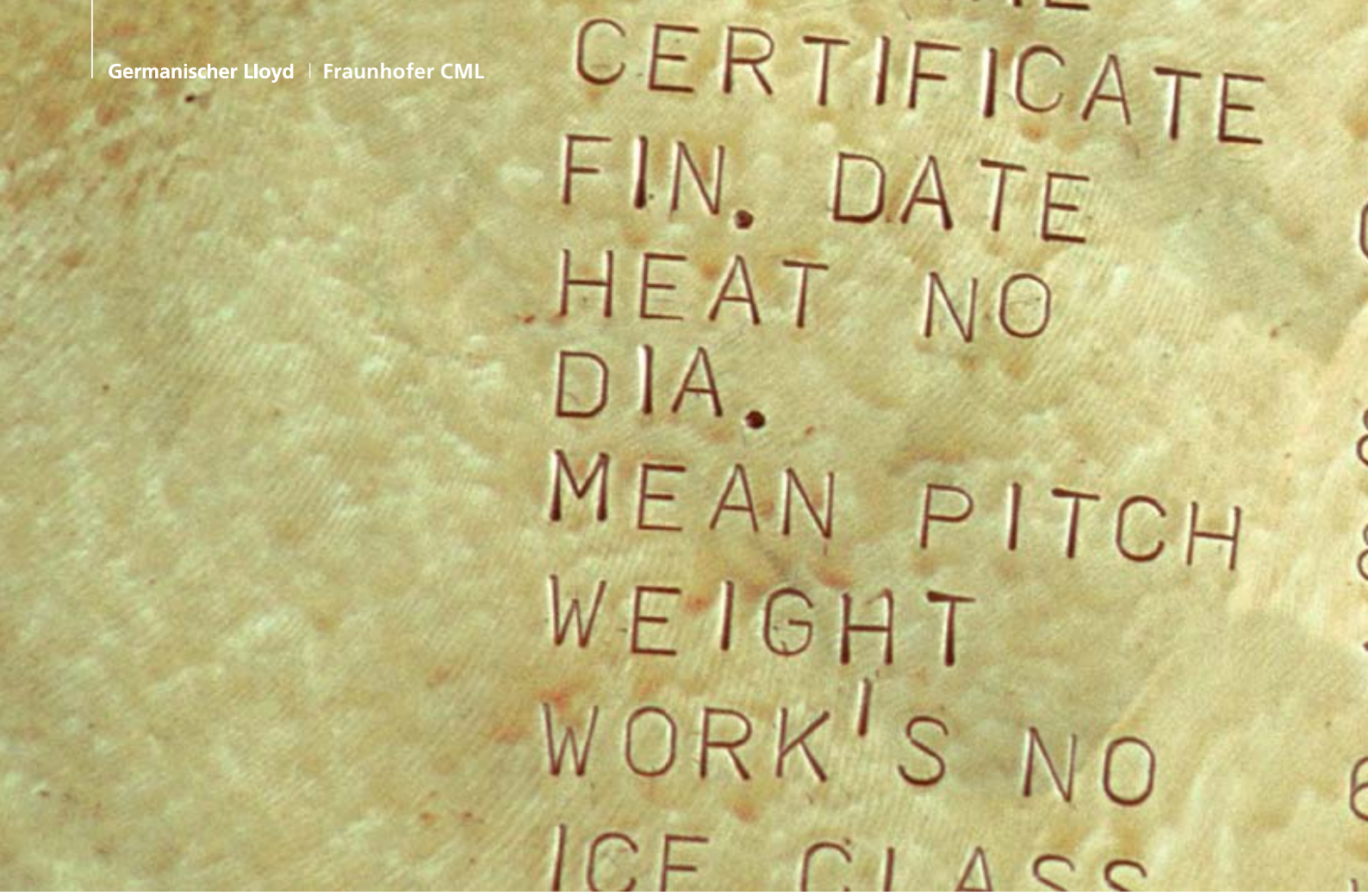


Figure 11 – Causes for shipping losses in 2012 (Lloyd's List Intelligence Casualty Statistics)



Nurture a "no accusation / blame" culture

Quality and especially safety improve if there is an open culture among all staff to name issues without accusing somebody. Especially pinpointing a "near miss" and discussing how to avoid it the next time is challenging, if everybody involved feels bothered or even blamed for something. All senior staff together with the QHSE expert depend on this culture and need to invest in a common understanding that avoiding any incident is worth openly discussing any improvement areas in Quality & Safety together and not because somebody did it wrong.

Use integrated Quality & Safety solution

Process support for QHSE departments has in the last years come to some broader usage and acceptance. On the one hand because good tools are available, on the other hand as QHSE professionals see an ever-increasing amount of paper, forms, checklists and reports that can no longer be processed manually. The solutions typically comprise a complete onboard–onshore reporting for all findings and incidents, structured descriptions, conditions, root cause analysis functionality, fleet-wide action tracking etc. A key part of the Safety Management Manual becomes electronically available and manageable. Other functionality that supports QHSE professionals are certificate (expiry) control, document handling and onboard distribution, drills and trainings planning and control. All the available data are used for a comprehensive and up-to-date reporting.

Automatically produce regular quality and safety KPI reports fleet-wide

Many QS departments use comprehensive KPI reporting as a key management tool to assess performance of the fleet and the impact of taken safety measures to the performance. How have the accidents or non-conformities developed? What have been the major causes of near misses? What incidents have caused environmental damage? With proper process automation, the production of such KPIs in a state-of-the-art reporting and analysis solution (often called Business Intelligence Solutions) is no longer a time consuming Excel exercise but is available at a mouse click. The time can much better be used to understand the information given and derive the right actions from it.

Have risk assessment integrated in regular processes

Although mandatory in the ISM code for some time now, there is still uncertainty how to best conduct and document risk assessments onboard. Best practice is a close integration with the processes that need these risk assessments, e.g. critical inspection or cargo operation. Again, if additional paper is to be avoided, integration in the QS solution is helpful. Documentation is then done automatically and keeping an overview becomes easier.

Non-maritime standards to look at

Management systems as laid out in different certification standards, if introduced and managed properly, help to keep good processes in place that produce quality services and to show that to their customers at the same time. A few key non-maritime standards find their way to shipping companies that are worth to look at:

- **The Quality Management System standard (ISO 9001)** is the most widely used management system certification today and looks after how companies produce quality products and services while meeting the needs of other stakeholders and comply to regulations. For shipping companies, it makes sense to combine this certification with the ISM / ISPS certification, as there are overlaps / synergies to be taken advantage of.
- **The Environmental Management System standard (ISO 14001)** sets criteria for an environmental management system to use resources more efficiently, produce environmental products and services and compliance with relevant legislation. It ensures that that environmental impact of an organization is being measured and improved.
- **The Energy Management Systems standard (ISO 50001)** should help an organization to follow a systematic approach in achieving continual improvement of energy performance, including energy efficiency, energy security, energy use and consumption. While the ISO 9001/14001 standards are looking at improving a management system, the ISO 50001 is raising the bar by actually looking at improving the energy performance. With the requirements to reduce emissions from shipping and rising bunker prices, this standard becomes a high attention from shipping companies at the moment.
- **The Occupational Health & Safety standard (BS OHSAS 18001)** promotes a safe and healthy working environment by looking after a management system that helps organizations to consistently identify and control health and safety risks, reduce the potential for accidents and aid legislative compliance. It was developed outside of the ISO schemes above but allows it to integrate well into the larger system of ISO certifications.

Best practice in Procurement

The procurement of spares, supplies and services is another elementary task of every ship manager to keep the vessel ready to sail. He does that on the account of the owner. Although low operational costs are a key differentiator for ship managers, there is no immediate effect of good purchasing in their pockets. This might be a reason why this function often gets less attention compared to Technical Management. However, the budgets handled are still significant with a steady trend to rise, as the following pictures show. Tighter regulations and new international maritime conventions on safety, manning and the environment will continue to exert pressure on budgets post-2013.

What is spent to operate a vessel p.a.?

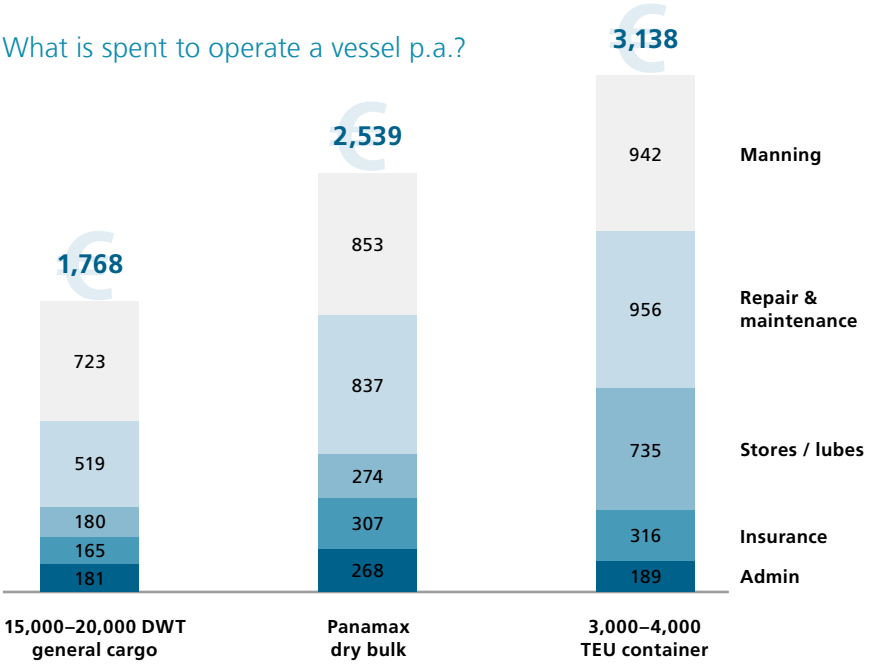


Figure 12 – Annual operating budgets for a vessel in K€ (Drewry, Ship Operating Costs 2010–2011)

The in-depth interviews conducted in the course of this best practice study revealed a number of focus areas in Procurement across all ship managers:

- Many respondents look at organizational and process matters to improve data quality and reduce manual effort. Purchasing systems have become commonplace, however to make everybody work within the processes remains challenging. Also, data quality is still a big issue to many shipping companies to reduce wrongly ordered parts or a lot of communication with the supplier.
- This will give purchasers more time for real sourcing activities that also involve proper demand planning, which is supported by organizational adoption of purchasers' roles. Although this is seen by many respondents, the way to this is still long, as day-to-day activities consume too much time from staff.
- Increasing reliability and quality demand will also change the treatment of suppliers to a more long-term, less transactional manner. Even if the majority sees this change of suppliers'

role happening, there seems to be a cultural difference in regions where bargaining each transaction is perceived as the purchaser's value to the company.

- Another common result of a more long-term and strategic view on procurement is the extension from a pure purchasing to a whole supply chain management perspective which is added to the role of purchasers according to many respondents. This not only includes materials and vendor management, but also the whole transportation, storage, material and information flow part, which can be optimized to a shipping company's benefit.

Based on the interviews of this study and research conducted by GL and Fraunhofer, we would summarize key elements of best practice in Procurement:

No purchase outside the system (no "maverick buying")

The days that purchasing is done by fax and phone are definitely over. Software systems are commonplace and for ship managers they need, as said above, to be closely integrated with the Technical Management information, i.e. spare parts need to be connected to equipment and to maintenance jobs. Since there is money leaving the company, a best practice procedure is the need for a system-generated purchase order for all things purchased. Invoices will not be accepted without prior purchase order. These procedures not only enforce approvals for purchases and give early indication of committed expenses. They also keep the Procurement department involved and a chance to consolidate demands from different angles of the organization in a professional way.

Increase of total ship operating costs in %

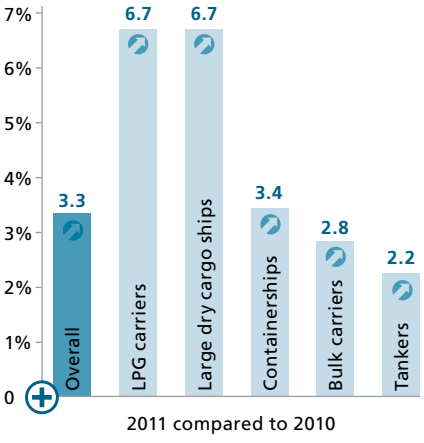


Figure 13 – Annual operating budgets development per ship type (Drewry, Ship Operating Costs 2010–2011)

Harmonize and centralize the management of master data

Following the best practice in Technical Management a central and harmonized management of spare parts, supplies and services as "articles" in the system, supplier trade agreements and storage information is a key foundation of any professional purchasing work. There are defined processes for setting up which master data with approvals and four-eye principles (e.g. for supplier bank data). The ship management company uses fleet-wide standard catalogues for any supplies and "templates" or "articles" for recurring services. Spare parts are the same across vessel groups. Supplier information comprises commercial conditions and trade agreements. There is a harmonized storage management across the fleet.

Automate and simplify the process

If the master data are set up in the background, the purchasing process can be simplified, reducing the manual correction needs for the purchaser. A request from board is based on specific articles, leaving no room for interpretation. The superintendent can approve the request in the system. Many ship managers allow direct purchases for small ticket items from board to the supplier (within the system), keeping this away from further processing in the office. Order, delivery note and invoice match together. The mere invoice registration enables this fully automatic "3-way match" to post the invoice. Manual checks and approvals are only needed if deviations occur.

Communicate with suppliers electronically

Unlike in other industries, shipping has not yet found a standard for electronic data interchange (EDI) that exchanges messages (inquiries, orders, invoices) electronically from the procurement system of the ship manager to the sales system of the manufacturer. However, this is a clear best practice in many shipping companies that have found individual solutions with their key suppliers. With the rise of the Internet in the last decade, the popular e-commerce marketplaces could take over that role of managing the electronic communication with suppliers, next to their original purpose, which is providing access to a global supplier base for better quotations.

Plan demands fleet-wide

Given a well-fed Technical Management system in which spares are connected to maintenance jobs, a proper history of supplies and services needed and a fleet-wide transparency of material on stock, purchasing managers can well in advance plan what they need to buy by when. This not only reduces the number of "urgent" transactions but increases lot sizes, drives down costs with suppliers and reduces logistics efforts and costs. Typical supplies then come in a "standard box" per voyage / round trip. Critical and expensive spare parts are held in logistically sensible locations – not on every vessel. Purchasers can strike an economic balance with the technical team on maintenance planning.

Embrace strategic sourcing activities

A buying decision is typically twofold: (1) buy from whom – sourcing (2) how to buy it – purchasing. Up to now this study shed light on the second part and the processes involved. However, a significant best practice in ship managing companies is to dedicate enough time for taking the right sourcing decisions. In other industries, a clear organizational separation in the Procurement department can be witnessed. There are commodity / category managers or lead buyers that are responsible for certain "markets" (e.g. electrical equipment, safety equipment, steel) and there are purchasers that process the requests, place the actual orders etc. To a large extend, this is hardly found in shipping companies. Sometimes purchasers have a part-time "lead buyer" role and specialize in certain markets and materials. As a result, ship managers get a strategic view on global supplier markets for their main categories of spares, supplies and services and can optimize costs, quality and availability. There is a sound decision where to use long-term frame agreements and where to individually tender. There will be time to assess, whether it makes sense to participate in purchasing pools and in which. Consideration can be given to assess the risk of a failing supplier and how to mitigate etc.

Reduce number of suppliers

As a common result of a more long-term and strategic view on procurement, the role of the supplier is changing. An often stated, best practice is the reduction of the number of suppliers and intensifying the relationship with the then key suppliers. Building relationships of trust, common understanding and commitment with suppliers and service providers will often much more guarantee a responsive and cost-effective approach to procurement. This comprises a stringent supplier evaluation process, assessing quality and timeliness of delivery as well as annual assessment and planning talks. In this way, not only quality and costs stay in line but the transactional work of the purchasing team is reduced, giving more time for a more strategic view on the sourcing activities.

How does e-commerce in shipping work

An e-marketplace provider is operating an Internet site which allows shipping companies to find new suppliers or suppliers to get in touch with new buyers for their products. The site is open to many buyers and sellers by providing commerce-related functionalities like catalogues, ordering, wanted advertisement, trading exchange functionality and capabilities like request for quotations.

The Procurement system of the shipping company is electronically connected to the e-marketplace and sends all information over it, as is the sales system of the supplier. So when a ship manager wants to tender a spare part, it sends this tender to a number of suppliers on the marketplace who offer these parts, receives electronic quotations into its purchasing systems, selects one and places an electronic order, receives the electronic order confirmation, an electronic delivery confirmation etc.

All orders via the e-marketplace and all data (incl. often not typed in prices per line item) are automatically entered in the purchasing system of the ship manager. Next to the significant processing advantages, the access to a wider supplier base will allow more competitive prices. An advantage that is higher if fewer articles are part of framework agreements.

The importance of ICT

In shipping as well as in private life, the rapidly growing number of media and types of information and communication demonstrates its increasing significance. Today, there is barely an area affecting the shipping industry, which evolves as dynamically as Information and Communication Technology (ICT).

This also demonstrates the assessment of the role of ICT in the implementation of best practice today. More than 50% mark the highest possible value "Big potential" in our survey. On top, over 90% of the respondents expect an increasing importance of ICT in the future, only a few see a stable importance.

The ICT field in shipping can be structured into:

- Software
- Communication
- Navigation
- Automation

While the last three are strongly connected to hardware, the software segment develops applications that run on any PC. Every year an estimated amount of USD 500 million is spent on core fleet management applications.

So far, shipping has treated investments in software technologies very conservatively. If the investment level is compared to the one for similar technologies in the oil and gas industry, the picture is dazzling. For each USD 1,000 the oil and gas industry invests into new assets, USD 35 is invested into software technologies. In shipping, for each USD 1,000 CAPEX, only USD 7 are put into comparable software technologies, i.e. only 20% in total. There is a lot of room for catching up. The change is already happening today, despite or because of the difficult overall market situation.

Role of ICT in implementing best practice today

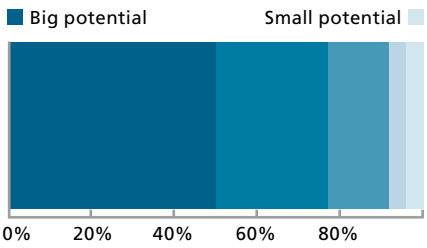


Figure 14 – Role of ICT in implementing best practice today

Role of ICT in implementing best practice in future

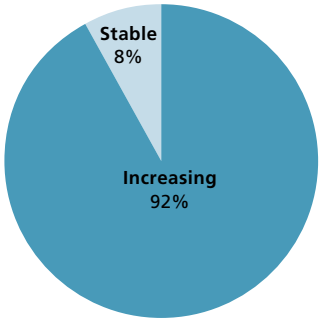


Figure 15 – Role of ICT in implementing best practice in future

Main opportunities in using ICT

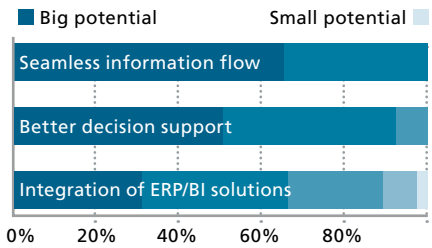


Figure 16 – Main opportunities in using ICT

Main challenges of using ICT

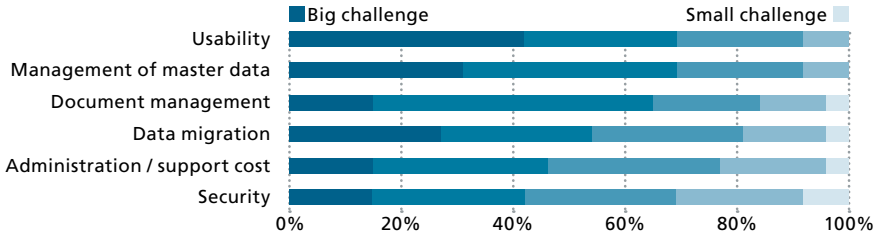


Figure 17 – Main challenges of using ICT

As main opportunities seen in using ICT, respondents state seamless information flow, better decision support and integrated solutions as highest ranked, which confirms many of the stated best practices above. Other opportunities seen are cost reduction by reduced personnel, employee motivation or planning capabilities.

However, to reach these goals a set of challenges is commonplace. Not surprisingly, usability is ranked highest here, which is often a main hurdle for crew to be better integrated into IT-supported processes. The second key challenge is the management of master data, which is supported by many best practices above. Other challenges mentioned are training, integration into existing systems and language barriers.

The picture of the role of IT is complemented by two market snapshots in 2009 and 2011 with approx. 200 shipping companies across the globe in which some clear trends can be established.

1. IT budgets are not cut back

Despite costs pressures across the board, more than 80% of respondents do not cut back on their IT budgets, half of them will even increase the investment level into software technologies.

2. A generation change in management lowers barriers

A younger management generation has low to none barriers to computers anymore. Having grown up with them they are, in contrast, surprised how much purely paper-based processes they find in a traditional shipping business.

3. Software usage strategies vary but come closer together

Shipping companies either look for one integrated solution or follow the "best of breed" approach (each function from a different vendor), they rely on in-house developments or mix these strategies. However, with better solutions in the market, a moving away from in-house developments and towards more integrated solutions from one vendor can be observed.

4. The buying criteria are stable

Key buying criteria have and will be quality of the product (content and technology-wise), reputation of the provider, its service orientation, user- friendliness and value for money. Simply a low price is rated as becoming less important, as it is often paid twice in the long run. However, respondents admit that price is so easy to compare.

5. Many implementation projects fall short of expectations

Expectations on a software implementation project are high: higher transparency, process efficiency, less interface communications, better compliance are all seen as results of successful implementations. However, the internal effort involved is often underestimated. And more than the functionality of the different solutions does the implementation support make a difference at the end.

6. Need for services around software is increasing across the board

Following this, there is an increasing need for services such as implementation and integration support, process consulting and decision support.

Appendix

Methodology

The base for this study was twofold:

- Numerous expert interviews and discussions from GL professionals around the globe in the full last year 2012.
- An electronically submitted questionnaire that was filled out by decision-makers from shipping companies.

In total, responses and interviews of more than 80 shipping companies could be used for this study. During this phase, the anonymity of the questioned persons and their corresponding companies as well as the privacy policy was preserved to the full extent by GL and Fraunhofer CML. A good mix of company sizes, geographical locations and functions of respondents in shipping companies could be achieved. We would like to thank all participants and contributors!

Participants – geographical distribution

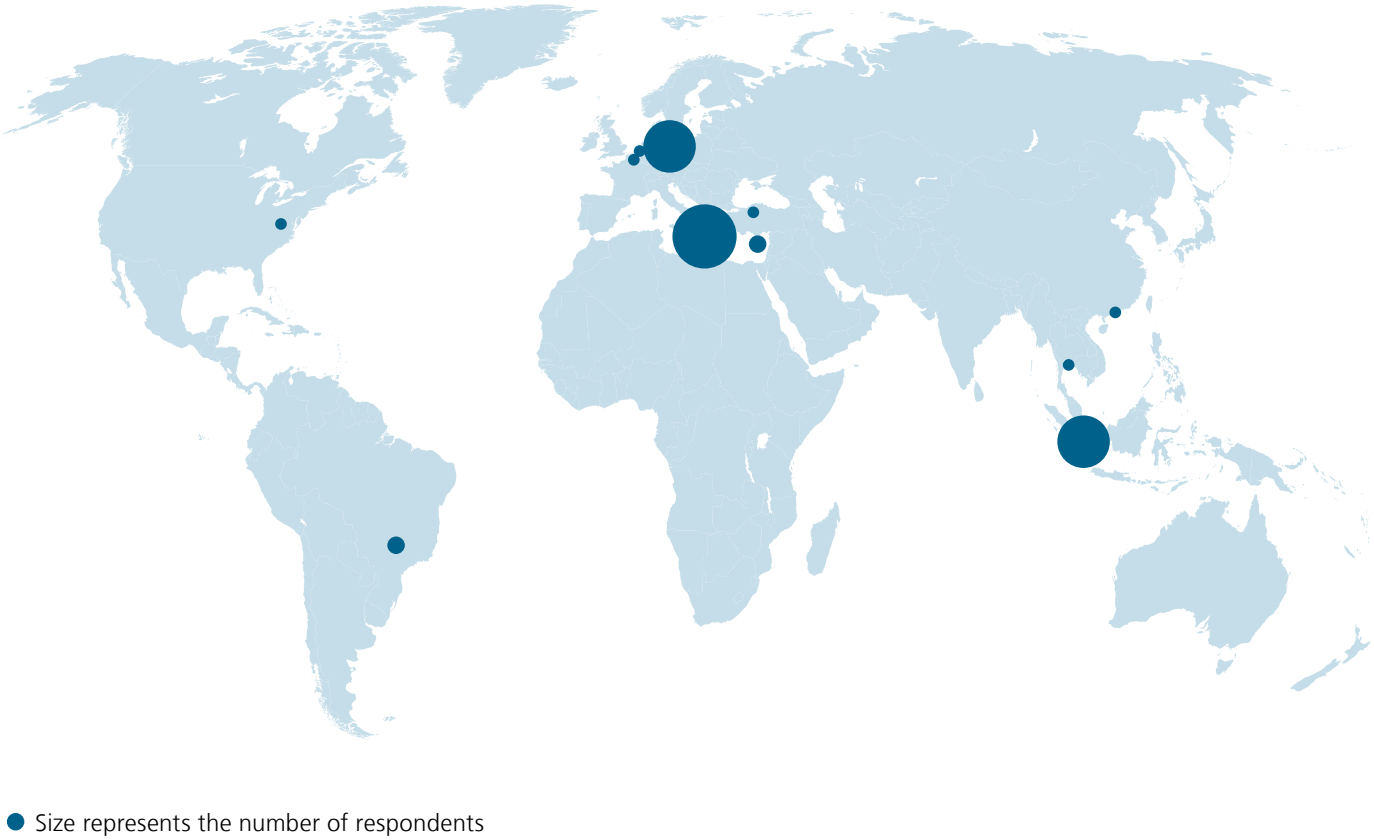


Figure 18 – Geographical distribution of respondents

Company profile

Who has been questioned? Participants – type of ship manager

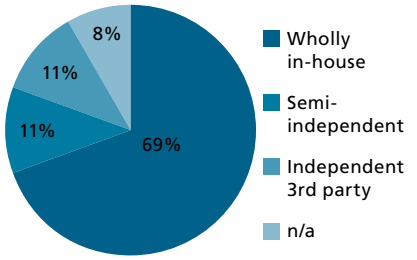


Figure 19 – Participants – type of ship manager

Participants – company size

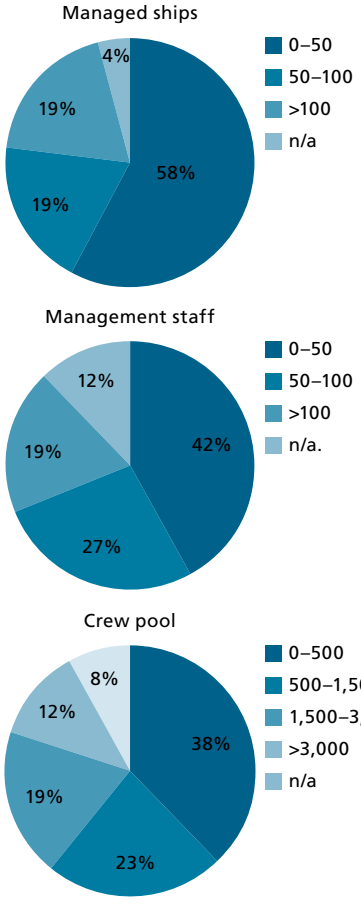


Figure 20 – Company size

Fraunhofer CML

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We thank the shipping community to have taken time for this study and we thank the team of GL and Fraunhofer CML, who has put this all together.

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0E845 · 2013-04-01