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Competitiveness and Benchmarking in the Field of Marine Equipment

Study for the European Commission Directorate–General III D/5 Maritime Industries ETD/98/502029

Public Report

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0 Executive Summary

The performance of the marine equipment industry attract an increasing attention in the discussion about the competitiveness of shipbuilding in Europe. Consequently, it is of strategic interest for European industrial policies as pursued by the European Commission to maintain a viable and dynamic marine equipment industry. The purpose of this study named "Competitiveness and Benchmarking in the Field of Marine Equipment" is to better understand the conditions within the European marine equipment industry, to analyse its global position and to derive appropriate policy instruments.

This final report represent the results of the study regarding structure and size of the marine equipment industry including market justification for merchant shipbuilding. Within the four dedicated working modules the study discusses opportunities for performance justification and new technology application in the supply chain:

- Module 1 - Marine Equipment Industry Structure and Statistical Market Evaluation
- Module 2 - Marine Equipment Market Forecast for Merchant Shipbuilding 2000–2005
- Module 3 - Benchmarking Methods and Tools for the Maritime Sector
- Module 4 - Marine Supply Chain Management

The views, evaluations and figures given in this report represent calculations, extra- and interpolations, assumptions and interpretation of the working team. The work has been performed based on the best knowledge and experience of the participating consultants and by the application of high quality standards. Interim results of the study have been discussed and justified with the Commission, the European Marine Equipment Council and its Member Associations. However, the results of the study could have been better justified and further improved, if the industry would have been more prepared to contribute to the study. It would increase the quality of future studies, if the motivation and interest of the industry to support respective measures can be increased. Continuous support of the national industrial associations is very much required in this field.

0.1 Module 1: Marine Equipment Industry Structure and Statistical Evaluation

In default of a harmonised structure for the marine equipment industry, it was a primary task for the study to make appropriate definitions. The proposed structure distinguishes System Suppliers, Equipment Suppliers, Material Suppliers and Subcontractors in the fields of Manufacturing and Engineering. This structure shows itself in a total of 18 sections and 93 product-groups. The proposed structure, as a compromise between completeness and accuracy, allows the assignment and sorting of more than 2000 different products in the maritime supply sector, which gives an idea on the complexity and the heterogeneity of the industrial branch. The study further proposes for all the different product groups an assignment to the official Nomenclature of Economic Activities in Europe (NACE), which is used by Eurostat, the official body of the European Union for statistical analysis. This allows the use of official statistical data for comparisons and statistical evaluation on the equipment industry in the study, but also for future analysis.

On this basis, as a post-study-activity, the authors recommend the following two actions:

Action 1:
Discussion and agreement of the proposed industry structure for marine supplies by EMEC and its Member Associations including the proposed industry classification according to the European NACE classification index used by Eurostat.

Action 2:
On the basis of the harmonised industry structure, building or adaptation of national industry databases to a common format through the national associations and suitable for a consolidation on a European scale. Since this would be a non-profit activity, but may create a basis for easier evaluation of the industry and unified search opportunities for customers, the authors propose this task to be considered for supporting measures of the European Commission.

As a second task the authors performed a statistical evaluation on the size of the global market for marine supplies including national and sector fragmentation represented in form of national industry portfolios. This analysis values the annual global market to ~61 billion Euro, of which the European Union Member States take a share of ~19 billion Euro (~31%). This market volume represent the total demand for marine supplies for newbuilding of merchantships, boats, offshorevessels and platforms, shiprepair and the navy. The major demands splits into Engines and Mechanical Engineering (~26%), Subcontracting (~20%), Electrical Engineering and Electronics (~18%) and Steel Products (~15%). The given figure for the total market volume may be regarded as conservative, since some necessary corrections for direct Navy purchases have been left out due to a lack of data and corrections for direct purchases of the Offshore Industry have been made carefully.

The EU 15 trade balance on this basis is evaluated to be ~4,5 billion Euro, ~25% of the annual production value. It is estimated that the industry is employing about 240.000 persons in about 9.000 companies. Germany and the United Kingdom are representing ~50% of the EU 15 production value and both show export records of ~ 60% (including EU trade). These two are followed by The Netherlands, Italy and France representing in total another 28% of the EU industry and still showing export records of ~40%.

The experience gained by performing the statistical analysis of the industry which includes extra- and interpolations and assumptions of the authors due to unavailable data (e.g. some national input/output analysis) leads to the following recommendation:

Action 3:
The authors propose to enter into a continuous maintenance and improvement of the national market evaluation, i.e. maintaining the national industry portfolios as developed in this study as a basis for a consolidation on a European level. In order to increase the quality of the national portfolios, especially the calculation of the demand split into the different industry sectors, the availability and the quality of the national industrial input/output analysis need to be improved. Those should further be harmonised according to the rules of Eurostat as a basis for future analysis. It is recommended to the national associations to enter into respective discussions with their national statistical bodies.

Action 4:
As a bottom-up justification of the statistical analysis data from a European database as proposed under Action 2 may be used. However, it may contribute to the quality and the comprehensiveness of the data, if the shipyards would be prepared to perform an analysis of their supplier base. This could help to identify and justify more supply firms acting only regionally and could answer questions on the origin of supplying companies. The aggregated result of this analysis might be of interest for both, the shipyards and the suppliers. Therefore it is recommended to launch respective discussions between EMEC and CESA to prepare the ground for such an analysis. Since the result would be of general interest and contribute to a better evaluation of the industry, the authors propose a respective study to be supported by the European Commission.

0.2 Module 2: Marine Equipment Market Analysis for Merchant Shipbuilding

The forecast for the Marine Supplies Market generated from Newbuilding work over the forecast period (7/2000 to 6/2005) values the total market to ~110 billion Euro for five years, ~22 billion Euro/a. The results of the analysis for 21 different shiptypes shows the bulk carriers taking by far the biggest single share with more than 20%. This is followed by cruise ships, tankers and container ships with ~10% each. The other 50% are spread over the other 17 shiptypes. The split over the supplier sectors has been estimated as follows (the given figures implicitly includes values for subcontracts):

- 27% Steel + Pipes
- 22% Propulsion, Power Generation
- 12% Auxiliary Engines
- 11% Accomodation
- 11% Electrical Plants, Electronics, Automation
- 10% Ship Operation, Painting
- 7% Cargo Handling

Additional to the information on the supplies markets the authors performed further analysis on the existing fleet and were building Ship Type Portfolios for all shiptypes. These contain information on the fleet structure, recent price trends, the countries where the ships have been predominantly built and the major owner/operator countries per shiptype. This analysis shows Japan being the top building country with top market shares in 13 shiptypes, leaving Europe with 4 shiptypes (Cruise, Dredgers, Tugs, Offshore Drilling/Production). The dominance in the operator sector is not that significant, showing Japan being top operator for 8 shiptypes and Europe for 6 (Crude Oil Tanker, Bulker, Container, Dry Cargo, Tugs and Dredger).

According to the statistical analysis performed in Module 1 of the study, the total size of the world market for marine supplies has been valued to ~ 61 billion Euro. The share of marine supplies for shipnewbuilding within this total market therefore represent ~ 36% (~22 billion Euro/a). It can be said that the European share in this market (25 – 40%) is threatened in the same way by Far East competition as the European shipyards. This is even more true for suppliers in the direct vicinity of shipyards, often subcontractors exclusively working for the neighboured shipyards. The authors are therefore of the opinion that the suppliers in general should develop a double strategy, which at the one hand secures their domestic (European) market by building alliances with the shipyards and on the other hand building sustainable market positions in export markets (beyond Europe). Due to the heterogeneous structure of the industry including many SME's, this is a challenging task and may lead to a consolidation of the industry into bigger companies first. However, the process may need some guidance and moderation which may be provided jointly by the shipbuilding and suppliers associations on a European level including key industry firms.

On the experience gained in the study, the authors are of the opinion that on the basis built in this study it would be possible to establish a continuous market forecast for the marine supplies industry and therefore would like to recommend the following post study action:

Action 5:
Maintenance of the shiptype portfolios in order to discuss and evaluate the marine equipment market forecast for shipnewbuilding on a continuous level. This includes the continuous evaluation of available fleet data and shipbuilding forecasts. On this basis the extended forecast for marine supplies can be build provided that appropriate cost structure data for different ship types is available according to the industry structure as proposed in Module 1. To improve the quality of the calculation schemas it would be essential to encourage shipyards to contribute respective cost structures for future activities. This can be an activity to be discussed between EMEC and CESA.

0.3 Module 3: Benchmarking Methods and Tools for the Maritime Sector

The study propose a structured view on the marine suppliers in four groups: General Products of low value, Critical Products in terms of price, Critical Products in terms of technology or processes and Strategic Products. This view allows the definition of Performance Indicators according to the individual characteristics of the four groups and the measuring of the competitiveness and of the performance of supply companies assigned to these groups. As underlying benchmarking methodology and toolset for the approach it has been decided to use ENAPS the European Network of Advanced Performance Systems. ENAPS has been developed on a European scale and covers beyond economic benchmarking also benchmarking for operational processes by means of deterministic measures. ENAPS has been adapted to the use for marine suppliers benchmarking and is proposed also for the use in future benchmarking activities.

It was the original idea to justify the chosen approach and to calibrate the defined subset of specific indicators by mean of a limited study on European level with interested companies in three supply fields: Standard Components (e.g. pumps), Engineering-to-Order Products (e.g. propeller) and Assembly-to-Order Products (e.g. Navigation Systems). After discussions with about 200 European companies it turned out that just 8 were finally prepared to participate in the studies field test. This result was somewhat unexpected and turned the result of the study in a different direction. In spite of being in the position to calibrate the performance indicators and to get a representative result about the performance of the industry in selected areas, it must be said that most companies in the branch are not prepared to participate in benchmarking exercises. By analysing the reasons, the dominant answer was the unavailability of respective measures combined with capacity reasons. In comparison to benchmarking exercises in other industries (e.g. automotive, aerospace), it can be said that another reason might be that the marine suppliers are not frequently challenged by audits (covering process quality) from their customer industries (shipyards).

The benchmarking exercise performed with the limited number of participants, therefore, just delivers some examples which show the principle outcome of benchmarking analysis. According to that, the outcome for the community in the moment is very limited, but may be of benefit for the participating companies, which will receive the results with further clarifications. But, from the lessons learned by performing the study, the authors would like to recommend the following action:

> **Action 6:**
> The knowledge and the awareness about benchmarking and the potential benefits by applying respective approaches needs to be increased within the marine supplies industry. This action may include the building of permanent benchmarking services through offering a suitable tool, services and support through the national associations in a common European format. A respective service could be combined with the building of a common European database for the industry as proposed in Action 2. The services can be jointly developed and offered with the support of external consultants. The authors further recommend to apply for support from the Commissions Services through the European Benchmarking Initiative.

0.4 Module 4: Marine Supply Chain Management

This working module has focussed on the processes of marine supply chains and their information technology support. A total of seven main supply process chains have been identified and analysed. On this basis the chances for productivity improvements within these processes have been discussed by means of available advanced IT solutions (eCommerce, EDI, Internet etc.) and suitable management principles. As a result the authors have identified a

great potential for business improvements and conclude on generic recommendations for information technology applications related to the seven supply chain processes.

In spite of the high potential identified, it has to be ascertained that the actual level of information technology applications for co-operative working in maritime supply chains is less advanced than in other industries. The high potential of the available technology has not been sufficiently recognised to a great extend in the industry. This is true for both, the shipyards and the suppliers, especially for SME's with very few key persons, which are basically product oriented. Of course, there are exceptions and some companies within the supply chain are frontrunners in the adaptation of new technology. But, since the application of these new technologies depend very much on (not yet existing) understanding of co-operative working and organisational integration across company borders even those frontrunners have difficulties to justify respective investments in due time. Regarding the high potential for cost-savings and process improvements, it would be therefore beneficial for European shipyards and their suppliers to build comprehensive and powerful co-operative networks supported by new technologies. This could lead to sustainable productivity improvements, which cannot easily be copied by competing regions.

As an example for a different approach to the same challenge of new technology application to co-operative processes, the authors have identified projects in competing maritime regions (USA, Japan, South Korea). Actually there are no comparable European projects with maritime industry participation, which are targeted to build industry wide infrastructures. European R&D projects are targeted more towards single technologies and processes and the industry tries to ensure know how transfer and R&D co-ordination by means of networking activities. The European maritime industry, especially shipyards, has been comparably early in launching R&D projects with respect to co-operative working. However, this has slown down in the moment and the authors see the danger that the European maritime industry falls behind their competing regions.

As a consequence from these findings, the authors are encouraged to recommend the following two actions:

Action 7:
In order to increase awareness and motivation to apply advanced technology to the various processes of the supply chain it should be a pre-dominant task for the industry organisations to organise know how transfer-activities for their member companies. This may include the generation of demonstrator applications in order to prove economic potentials. Respective activities may be supported by the Commissions supporting programmes, e.g. the Innovation Programme, or by similar national programmes.

Action 8:
Careful consideration of actions taken by major competing regions (Korea, Japan, USA) to build, adapt and maintain information technology infrastructures for marine supply chain applications and co-operative working. As a consequence the industry (shipyards jointly with suppliers) should develop proposals for subsequent measures on a European level to be launched in the context of the European 5th Framework Programme for R&D. The necessary moderation to develop co-operative understandings between shipyards and suppliers should be a natural task for CESA/COREDES and EMEC, respectively by the similar national pairings.

1 Module 1 - Marine Equipment Industry Structure and Statistical Evaluation

1.1 Objectives and approach

It is the objective of this working module to give a detailed overview of the marine equipment industry in all Member States of the EU covering basic economic and company characteristics, including available products and services. Further it is the objective to propose a structure on which basis future databases, e.g. with companies' products and services, could be prepared. The overview and the structure should help to support policy instruments for the industrial sector or sub-sectors.

As a basis for the work the authors propose a definition for suppliers and sub-contractors and the basic characteristics of maritime supply chains. On top of this the authors build a harmonised structure for systems, equipment components, materials and services which provide the basis for statistical analysis and evaluation.

Major sources for the collection of information and data are statistical bodies (OECD, Eurostat, national statistical sources), suppliers, industrial associations, customers and the classification societies. Since no one of the single datasources alone will allow to create comprehensive and reliable results, these different approaches to collect data are applied in parallel. In combination all data collected and interpreted provides the basis for initial analysis to obtain a detailed overview on the Marine Equipment Industry in the EU Member States. The result are combined in so called National Portfolios for the EU Member States and Norway, respectively have been aggregated into one European Portfolio (EU 15).

The different product groups identified in the structural view have been mapped into the NACE structure (Nomenclature of Economic Activities in Europe), which is the mandatory industry nomenclature for official statistical analysis in Europe. This allows the study to make use of average statistical data for industrial groups available in different Eurostat databases.

On the basis of the proposed industry structure it has been proposed in which way a harmonised database for common use by the Commission to support policy instruments and by the industrial associations to support associations' work must be structured and set up. It will be further discussed in which way such a database in combination with a market forecast following the same structure can be used to derive statistical data on a continuous basis.

1.2 Structure of the Industry

The following definitions have been made to distinguish marine suppliers and subcontractors:

A. Marine suppliers are characterised by the fact that they develop functions or systems according to their own patents and techniques and they operate by respecting the specifications and terms of references defined by the customer for complete products or subassemblies.
   Marine suppliers are distinguished in "system suppliers", "component suppliers" (to be seen as a subgroup of system suppliers) and "material suppliers"
B. Marine subcontracting exists whenever the customer participates in the conception of the product, even partially providing specifications to the manufacturer ranging from detailed technical plans to looser specifications.
   Marine subcontractors are subdivided in those offering services for "manufacturing and assembly" and those offering services in the areas of "engineering, design and consulting"

These definitions follow in principle those made by other studies for the European Commission and Eurostat to analyse "New industrial subcontracting in Europe" for four industrial sectors:

(automobile, electronics industry, textile and clothing industry, aeronautics). It is obvious that basically all industries including shipbuilding have the same problem to clearly identify the amount of subcontracting and equipment supply, respectively related figures for number of companies involved, employment, geographical distribution, relative value of products and services for different industrial groups etc. Therefore all future measures to improve the statistical system and the way data is gathered and analysed are most welcome. It is essential for the marine industry to be considered in this context and to actively contribute to the analytical discussions. This study may provide a starting point for that.

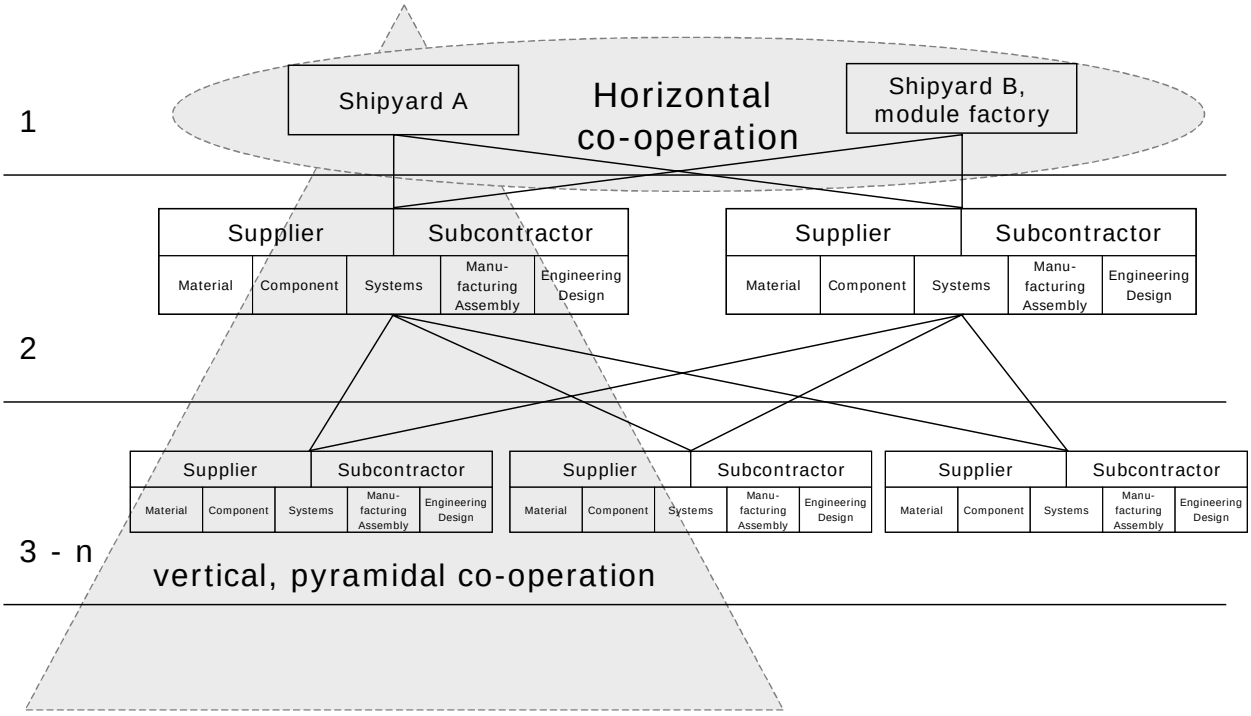


Figure 1.1: Horizontal and vertical co-operation

Two forms of co-operation (horizontal and vertical) in the form of supplies and subcontracting coexist in the shipbuilding/marine industry sector. Vertical co-operation according to the fragmented complexity of products and subproducts. Horizontal co-operation between shipyards (or comparable manufacturers of turn-key modules) themselves due to capacity or delivery reasons (Figure 1.1).

Horizontal co-operation by shipyards amongst themselves

Horizontal co-operation in the sector is carried out by shipyards more than in other industries. There exists in shipbuilding important flows of subcontracts amongst the main contractors themselves. Hence, a main contractor, after having obtained an important contract, will entrust to other main contractors part of the work on the contract which his own production capacity cannot meet.

The activity of the sector is in fact characterised by long development phases and long manufacturing cycles (for example 12 – 24 months for merchant vessels, 24 – 36 months for passenger vessels). This means an alteration of periods where the factories operate at full capacity with others where they appear to have, on the contrary, spare capacities. The exchange of subcontracts among shipyards also improves the management of manufacturing personnel in terms of levelling temporary over- or undercapacity.

Vertical co-operation

> The vertical characteristic enables easy demarcation of the boundary between shipyards and major system suppliers (e.g. engine manufacturers) which make up the population of main contractors at the 2nd level and the other parties on the following levels. However, among the other parties, the distinction is not always easy to establish. Especially, the distinction between equipment suppliers (components and systems) and subcontractors is sometimes difficult. If the existence of a technical (existence of a research and development activity) or commercial (capacity to fix breakdowns and repair) responsibility with regard to products or components can be identified in a company it may be better to classify a supplier in the category of component manufacturers rather than in the category of subcontractors.

Equipment manufacturers are therefore characterised by the fact that they develop functions or systems according to their own patents and techniques, and they operate by respecting the specifications and terms of references defined by the manufacturers for complete functions or subassemblies: separators, propellers, radar, navigational equipment etc. These companies in most cases also work for customers from different industrial sectors.

The equipment manufacturers evolve at almost the same rhythm as the shipyards themselves. When a reduction in orders occurs, they are equally affected, requiring the setting-up of plans to adept, a decrease in investment and a reduction in subcontracting. But their size, their final capacity and their relative autonomy may classify them as partners of shipyards.

Discussing the differences between the supply chain structure of the shipbuilding/marine industry with that of other industries, it must be said that the pyramidal significance of the structure shows major differences. A first major difference lies in the number of final producers. Whereas, there are still more than 50 European shipyards with 500+ employees and more than 150 in total, the situation in automotive (~15 manufacturers) and aerospace industry (< 5 manufacturers) is significantly different. Further, the other industries are continuously involved in major industrial consolidation moves. With the exception of the HDW/Kockums merger in shipbuilding this is hard to identify. On the contrary the shipbuilding conglomerate of Kvaerner most likely is falling apart leading again to a more fragmented situation.

In the area of 1st tier suppliers and subcontractors the situation is comparable. Whereas in automotive and aerospace industry the manufacturers more and more concentrate on “platform suppliers” with less than 500 suppliers on that level (Japan 200) the shipyards still work with a high number of suppliers and subcontractors directly. This leads to 1000 – 2500 names in the purchasing database depending on company size and ship types. Of course, products and industry specific requirement are different and supply chains for serial products are more deterministic than for shipbuilding. But, possibilities to develop major system suppliers have just recently been started in the industry.

Appearing as a very heterogeneous industry, it must be stated that there is no formal structure available which classifies marine supply into dedicated categories. All parties which try to find a suitable categorisation find different solutions which serve more or less their own interests. Therefore, all information about marine equipment and materials provided for example by national associations, classification societies trade fairs etc. is structured differently and therefore difficult to compare. Names of products and services are chosen differently, higher aggregated groupings are assembled differently and also the assignment of individual companies maybe seen differently by the interested parties.

Therefore, this study proposes a harmonised structure which is basically following the functional or system oriented view of the customers (shipyards, owners). With some amendments and aggregations especially for materials and the different areas of subcontracting a total of 16

groups for systems including 67 subgroups for equipment, 10 groups for materials and 16 groups for subcontracting have been identified.

In addition to this, the “General Industrial Classification of Economic Activities within the European Communities” (NACE) has been used to assign the different product groups to the suitable NACE sectors, groups and classes. This provides a logical link between the product groups in the newly defined structure for the marine supply industry and the NACE definition (figure 2.2). This new structure and NACE assignment of the industry brings a new quality in the possibility of industrial sector analysis and allows using statistical data of companies and industrial sectors available for these different NACE classes from national or European databases for analysis and mapping in the marine supply sector. The full list of the proposed harmonised structure for the marine supply industry including the NACE assignments is attached as Annex 1 to this report.

Marine Equipment Group "Systems"		Marine Equipment Subgroup "Component"		Description		NACE Revision 1 4 digits		Description
4	**Instrumentation, Control and Navigation Systems** **1 - Integrated Bridge Systems** **2 - Shipmanagement & Automation Systems** **3 - Cargo Control Systems**	**41**	Control and alarm systems	Maneuvre consoles, main consoles		3162	Manufacture of other electrical equipment n.e.c.	Electrical apparatus for sound or visual signalling
				Common automation systems				Signal generators
				Alarm/safety systems components				Indicator panels
				Automation equipment for main and aux. Engines				Electrical machines and apparatus having individual functions
		42	Navigation and measurement systems	Navigation & searching equipment		3320	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment	Radar apparatus
				Radar plants				Instruments and apparatus for navigation n.e.c.
				Decca, Loran, Omega etc.				Other instruments, appliances and machines for measuring or checking
				Cargo Control				
				Gyroplants, Autocompasses				Regulating ...instruments and apparatus, hydraulic or pneumatic
				Clinometers, Trim Indicators,				
				Hydraulic or pneumatic control and display systems				Indstruments and apparatus, regulating or controlling n.e.c.

Figure 1.2: Marine Equipment Industry Structure (Example, Full List in Annex1)

1.2.1 A harmonised European Marine Equipment Database

In order to achieve a better view on the marine equipment industry in Europe in the long term, it is proposed by the study to build a Europe wide database on the industry structure proposed above. As a first step the proposals need to be discussed and approved by the national and international associations of the industry. On this basis a distributed database concept can be developed and implemented.

A principle proposal for a (national) distributed database which can be consolidated on a European level is described in figure 1.3. The general idea is to agree on a common database structure which is basically following the industry structure described above. The database contains different kind of data, which start from basic information on companies and products and stretches to information about markets and company internal performances. The building of the database then is a national task which can be started on the basis of the data already existing in today’s databases. It will remain a national task to maintain the database even beyond the members of the associations and to decide how part of the data can be presented to the public as part of the association’s marketing activities (either through websites or CD-ROMs). It has to be agreed between the national associations and the European association which data (raw data or already processed data) should be made available frequently to allow a consolidation on a European level. This approach once established on a European scale would allow a frequently updated view on the industry with a possibility to derive results like the national and European industry portfolios described in the following.

The technical framework cost for building such a database are comparably low (PC, basic database software, Internet homepages etc.). However, the concept, software development and implementation as well as the first tasks to fill the database and to find and edit available data may require considerable efforts. The concept is that way that the companies themselves are encouraged to provide and frequently update their data through an internet based front-end (inputscreens). In fact these can be incorporated into the existing webpages of the associations. The project team has developed a set of inputscreens which take into account the product and company structure as described above (figures 1.4, 1.5). The companies are asked to provide basic company data, a classification of their company and their products and finally to provide structural data asking for markets, market shares etc. In return, all participating companies may have access to aggregated and anonymous neutralised data on the industry, markets and competition.

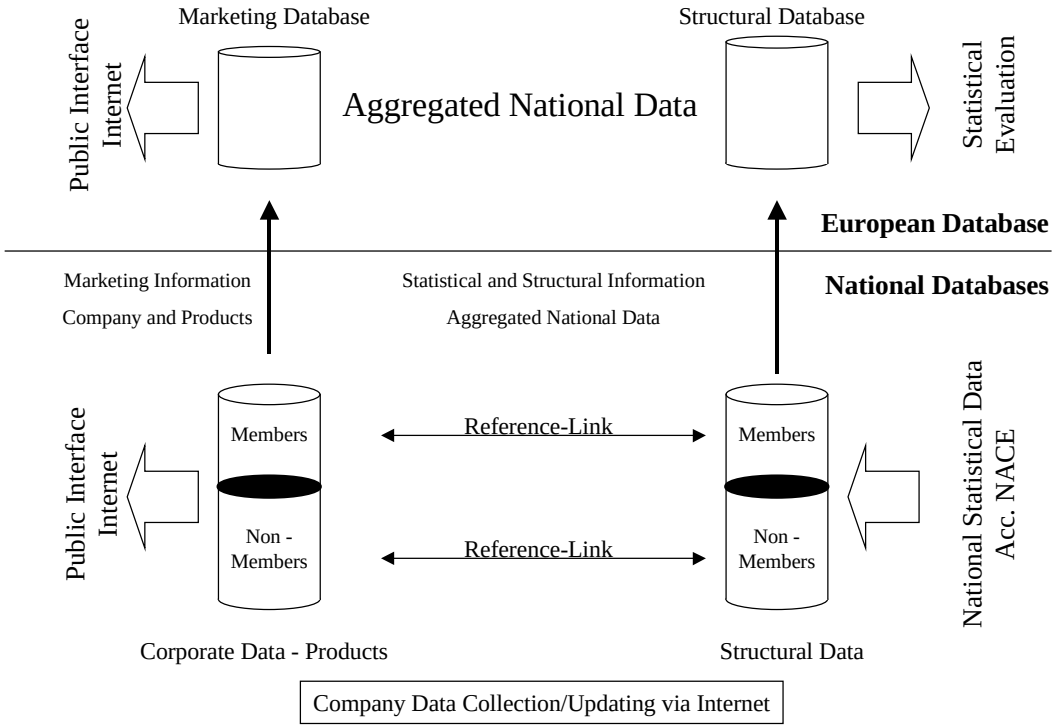


Figure 1.3: Distributed Database Concept

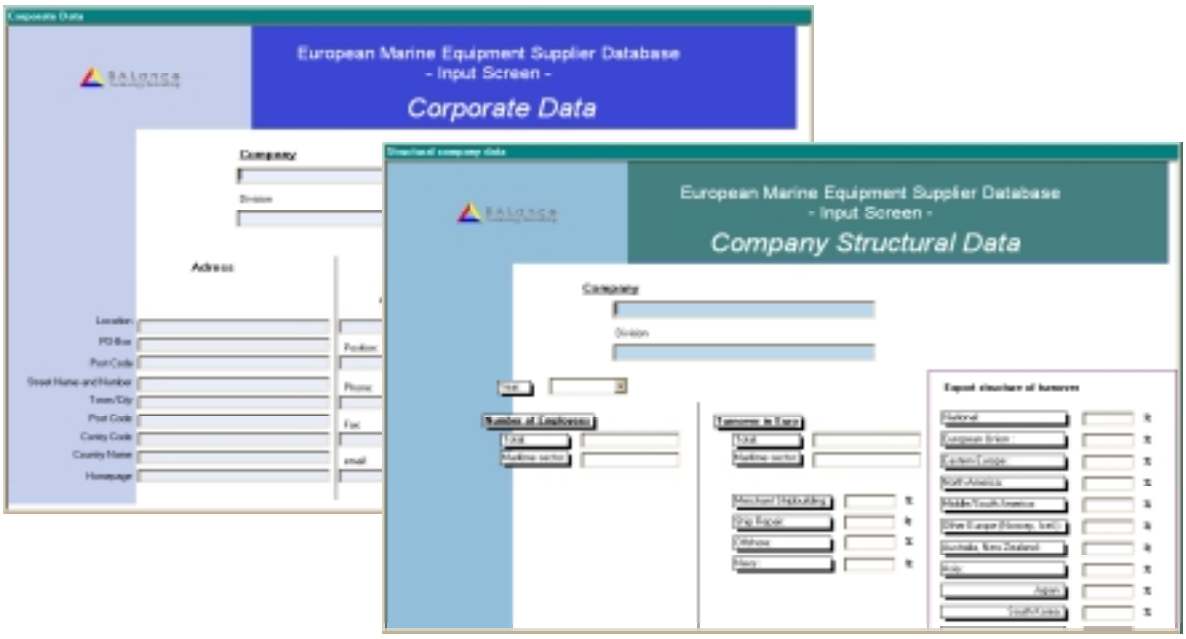


Figure 1.4: Input Screens "Corporate Data", "Structural Data"

Figure 1.5: Input Screens "Company Classification", Product Classification"

1.3 The Size of the Industry - Statistical Analysis

An estimation on the total size of the marine industry and some additional analysis has been made on the basis of available statistical information. The top-down (statistical) approach has been discussed taking into account existing studies and analysis from some national sources. Where necessary the project team has made appropriate assumptions and suitable inter- and extrapolations.
The main statistical datasources have been:

- Eurostat NEW CRONOS 1999 Database
  - SBS – Structural Business Statistics
  - COMPET Competitiveness Indicators
  - SME Small and Medium Sized Enterprises
- OECD STAN Database 1998
- Input/Output Tables from National Statistical Bodies

The official statistics provide data on the “Total Production Value” for “shipbuilding” containing shipnewbuilding, repair, naval shipbuilding, boatbuilding, offshore vessels and platforms, and ship scrapping. The statistics further provide a value for the “Value Added” by the shipyards. The difference between “Total Production Value” and “Value Added” provide us with the “Bought-in-Value”. This “Bought-in Value” must be further discussed in order to generate the national values of the Marine Supplies Markets. At first the value has been corrected for “Shipyard and Energy Cost” including e.g. fees for lease and rent, licenses, agents, transport cost etc. A further correction has been made for “Bought-in-Values” by other customers than shipyards. Whereas the newbuilding cost for ships, naval vessels and offshore platforms are contained in the statistical value given above, those for maintenance and repair directly performed by the marine equipment industry and the shipping and offshore companies themselves are not covered. Therefore a correction has been made for direct “Bought-in-Values” of Shipping Companies and carefully also for Offshore Companies. A further correction for the direct purchases by the Navy would be necessary, but appropriate data has not been found on a European level to date. Since these figures would increase the total size of the market, but are relatively small in effect, this takes the analysis to the conservative side.

By applying this approach on a global scale to define the total size of the marine equipment market appropriate data has been found for the OECD countries. A correction has been made for the rest of the world by increasing the “Total Production Value” by the percentage of shipnewbuilding performed in the rest of the world.

According to this basic evaluation, the size of the world market for marine supplies is estimated to be 61 billion Euro. This contain ~45 billion Euro “bought-in-value” from shipyards and corrections of ~8 billion Euro each for the shipping sector and the offshore sector. Both corrections are considered to be conservative. The major demands split into Engines and Mechanical Engineering (~26%), Subcontracting (~20%), Electrical Engineering and Electronics (~18%) and Steel Products (~15%) (figure 1.6). An estimation on the national distribution of the world market for marine supplies is shown in figure 1.7.

Compared with the world wide distribution of the market for merchant shipbuilding it can be clearly seen that other major markets are also included in this analysis. The very high market values of the USA, Norway and UK are predominantly caused by navy and offshore markets. In spite of this Japan, Korea and Germany are dominated by merchant shipbuilding. However, since many companies offer products for all three dominant markets this overall estimation of the world market provides a fair idea on the size. The market analysis carried out for merchant shipbuilding in module 2 of the study will show that the respective share of the total market is ~30%.

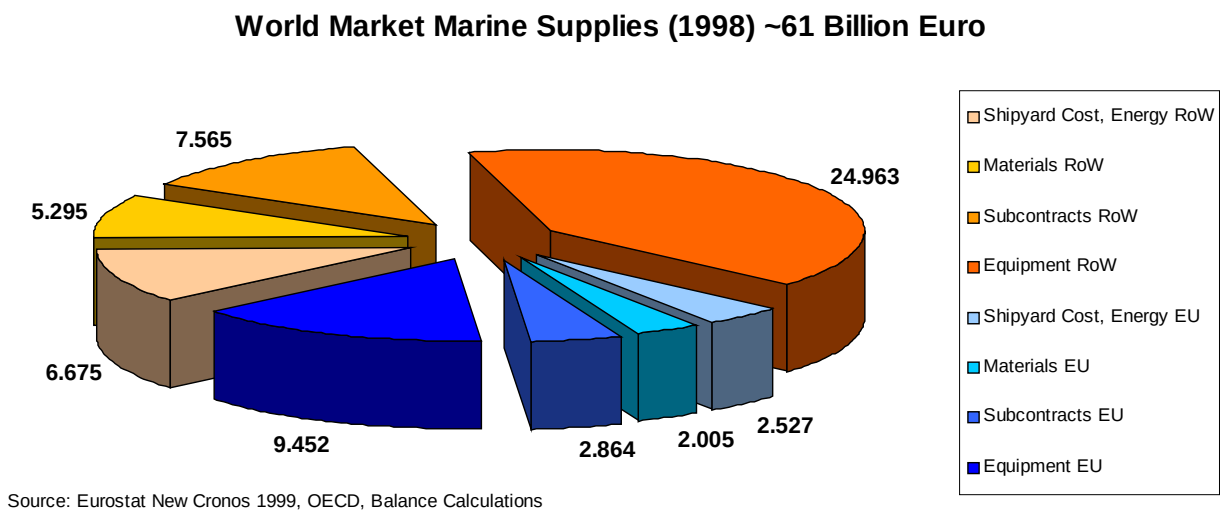


Figure 1.6: World Market for Marine Supplies by Sector

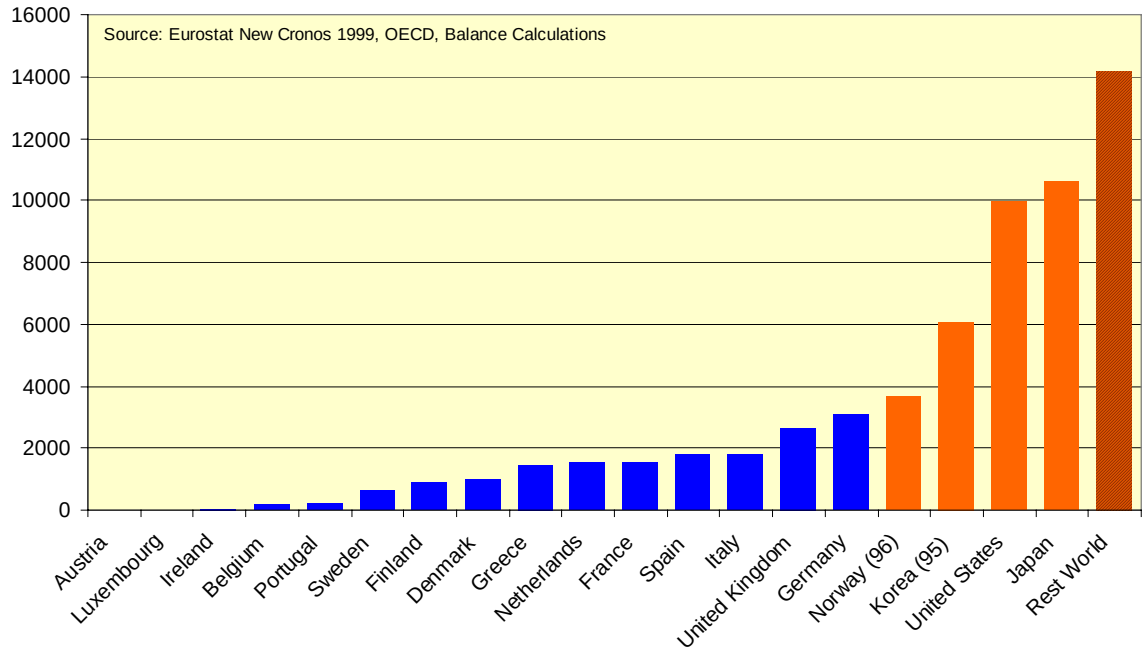


Figure 1.7: National Distribution of the World Market for Marine Supplies [Mio Euro]

1.3.1 National Portfolios

The value of the domestic markets for marine supplies does not necessarily represent the size of the marine supplies industry in the respective countries. For this the figures have been further discussed by means of import/export analysis for the individual countries. Respective information has been taken from the statistical import/export ratios becoming available from Eurostat or national statistical offices. Further information was taken from national studies performed for some of the EU Member States. Altogether this led to the development of so called “national portfolios” (figure 1.8). In addition to the evaluation of the total production value of the marine supply industry in the individual Member States the National Portfolios contain estimates on the number of persons employed by the industry and the number of enterprises working in the field of marine supplying. Both calculations have been performed by using statistical figures available from Eurostat for the average turnover/employee and the average number of employees per enterprise. It has been assumed that on average companies are

having a 30% share of marine related production value. All calculations distinguish between the following 8 categories of marine supplies:

- Subcontracts
- Material – Steel and Non-Ferro Materials
- Material – Coatings
- Goods – Steel Products
- Goods – Engines
- Goods – Mechanical Engineering
- Goods – Electrical Engineering, Electronics
- Goods - Others

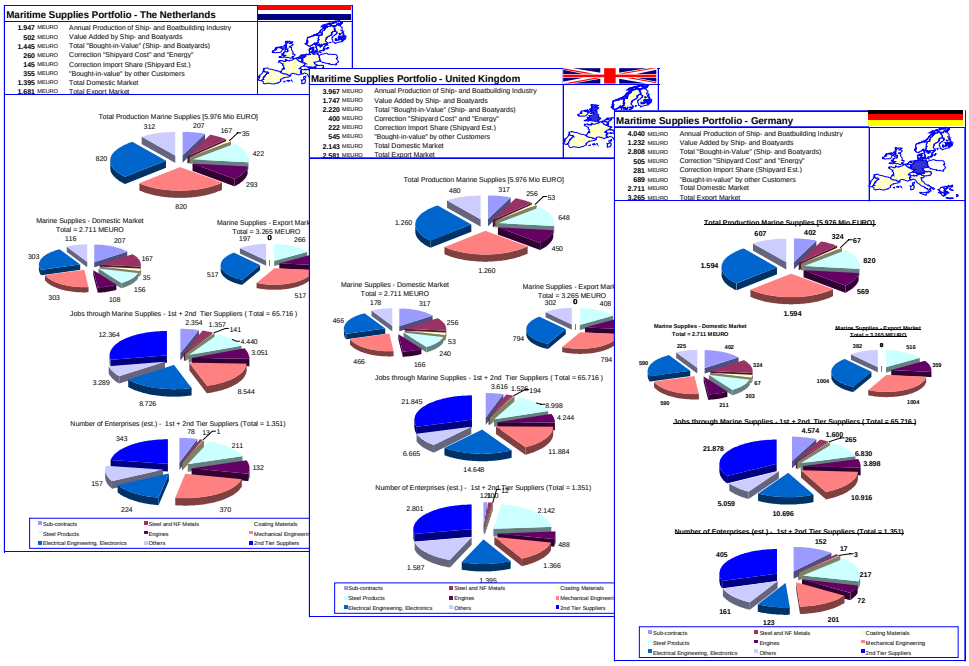


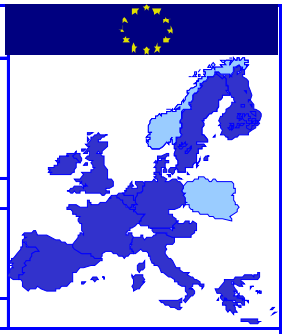
Figure 1.8: National Portfolios

It must be noted that due to the given variances of statistical calculations, the accuracy for the National Portfolios is most likely better for those countries with bigger production values than for those which have marginal production values, e.g. Austria, Luxembourg, Ireland. Further variances may occur through corrections for other markets than the purchasing market of shipyards. Corrections have been made for purchasing by shipping companies and offshore companies directly, which are not include in production values of the shipyards. Further corrections would have been necessary for direct purchasing of the Navy, but could not be performed due to a lack of data. However, this takes the calculation to the safe side.

1.3.2 European Aggregation

The results of the national statistical analysis have been aggregated to an overall European (EU 15) Portfolio (figure 1.9). According to this the overall size of the industry is ~19,2 billion Euro per annum. The major shares is taken by the production value for Mechanical Engineering including Engines (26%), closely followed by Subcontracting (20%) and Electrical engineering/electronics (18%) and Steel Products (~15%). The trade balance for Europe is estimated to be ~4,5 billion Euro representing ~25% of the total production value.

Maritime Supplies Portfolio - Europe



13.776 MEURO	Total Domestic "Bought-in-Value" (Ship- and Boatyards)
2.162 MEURO	Correction "Shipyard Cost" and "Energy"
2.533 MEURO	Correction Direct Domestic Shipping Purchases (+)
542 MEURO	Correction Direct Domestic Offshore Purchases (+)
14.689 MEURO	Total Domestic Market
4.363 MEURO	Correction Import Share (-)
10.326 MEURO	Domestic Market - Share of National Suppliers
8.907 MEURO	Export Production of National Supplies
19.233 MEURO	Total Marine Supplier Production

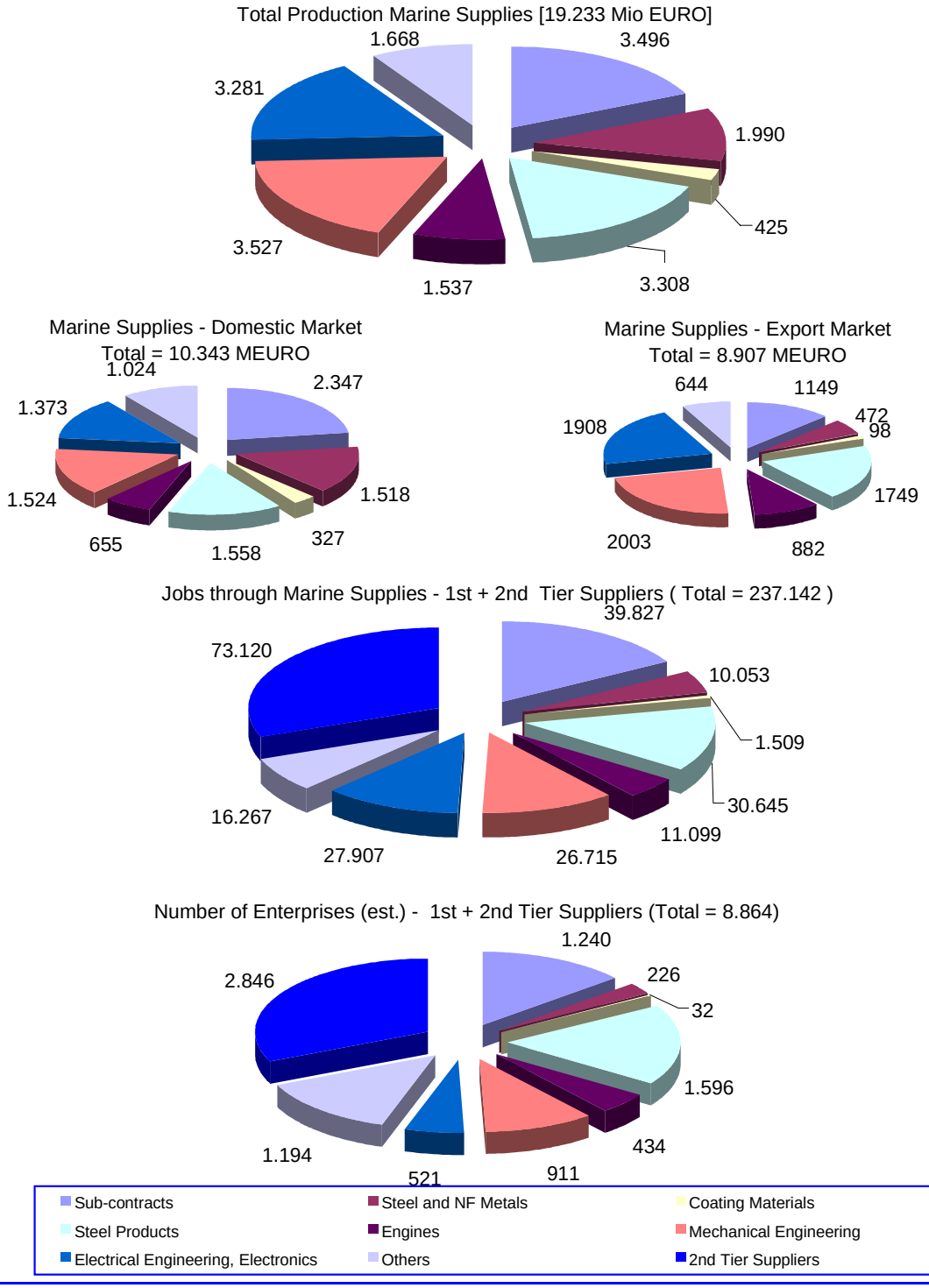


Figure 1.9: Aggregated European Portfolio

Taking into account the 1st and 2nd tier suppliers it is estimated that the industry employs about 240.000 persons in more than 9.000 companies. This includes some very small companies with a 100% coverage of marine products and some very large companies with a minor share in marine products. Some further analyses on the distribution of these overall figures over the Member States are presented in figures 1.10 to 1.13.

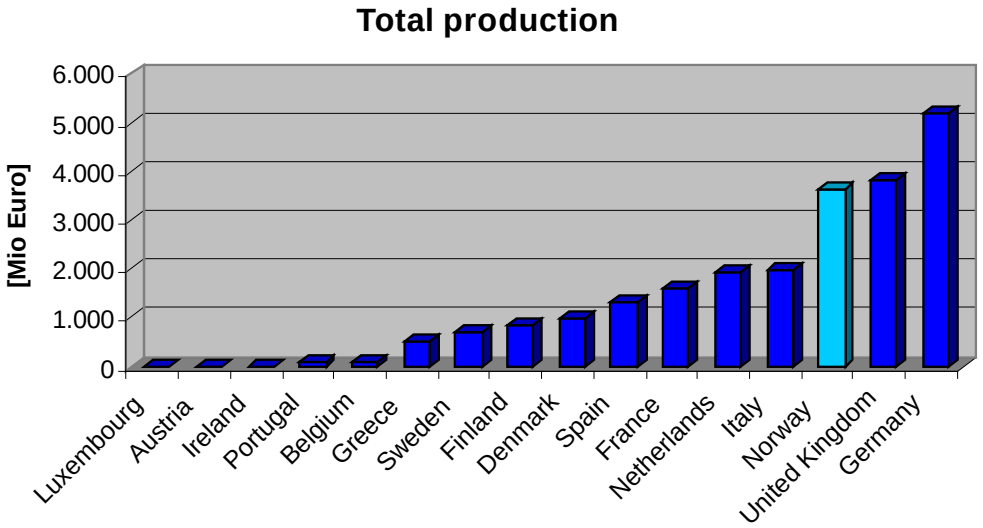


Figure 1.10

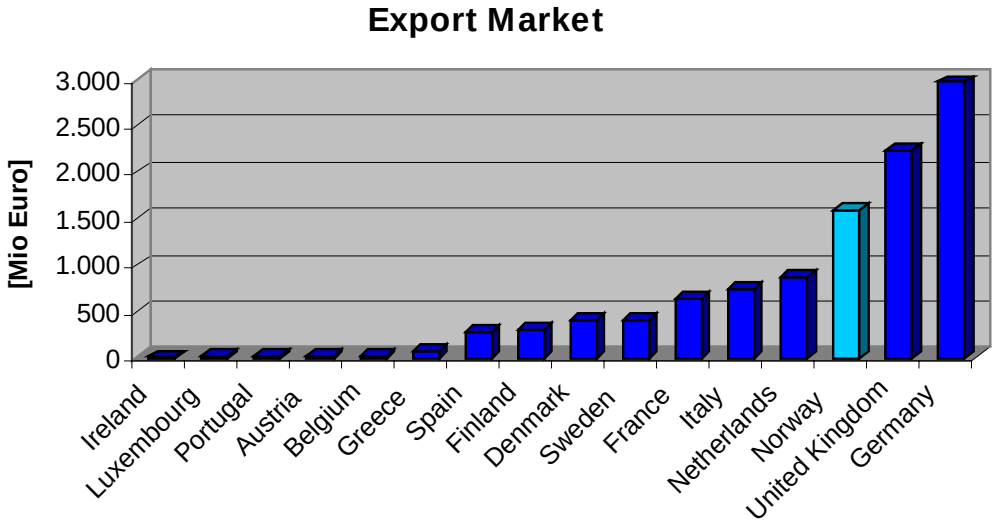


Figure 1.11

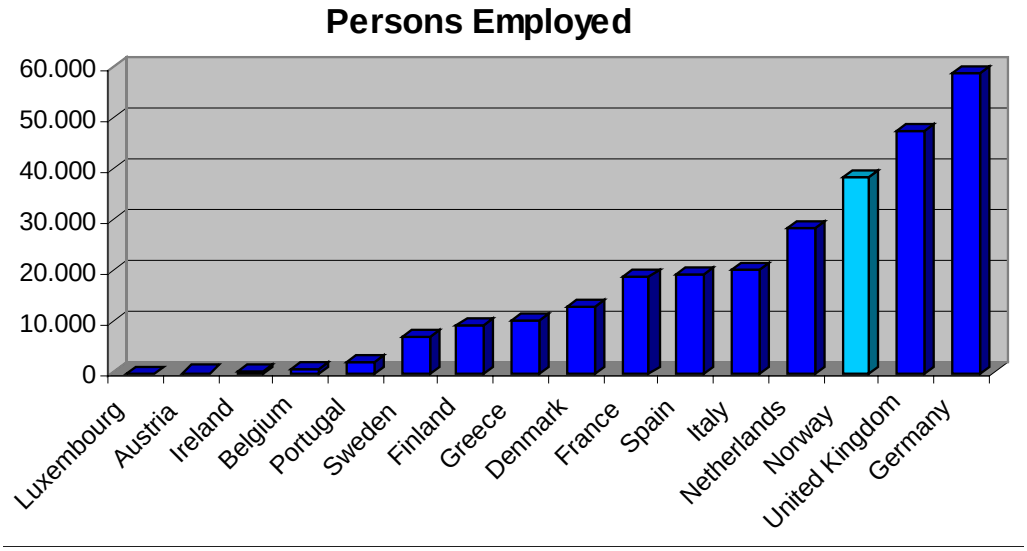


Figure 1.12

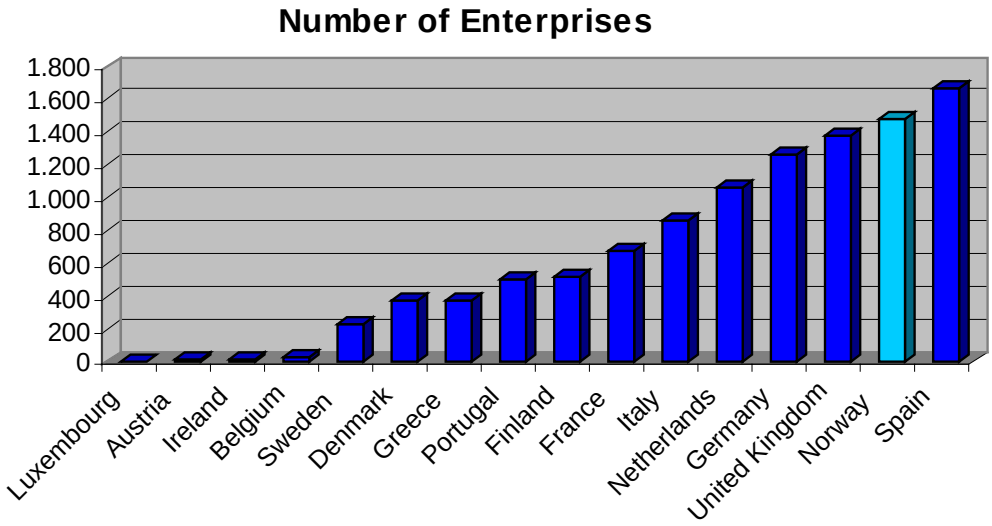


Figure 1.13

1.3.3 Additional Bottom-Up Analysis and Data Verification

To learn more about the industry and as a benchmark for these statistically derived figures the project team has performed some bottom-up analysis. The basis for this was the information available from the associations, classification societies and other public sources, e.g. catalogues and databases from fairs and conferences. The process of collecting and verifying data of this nature is very time consuming and it is difficult to keep the overall data consistent. However, from the analysis made on this basis, the project team is convinced that the statistical analysis has some significance which can be accepted within some variance of tolerance. Some specific results from the bottom-up analysis are explained in the following.

A total of 10.200 companies of which 6.400 belong to EU 15 have been identified through the available information sources. Taking into account that these companies represent basically the manufacturers the estimated overall figure of ~10.000 companies seems to be not unrealistic. Most of the small companies, which are involved in subcontracting, mechanical engineering and steel products manufacturing and which are located in the direct environment of shipyard cannot be identified this way. Further, a high number of trading companies without manufacturing functions but possibly engineering functions must be considered in the context. So far about 7.300 companies could be assigned to the product structure as explained above.

As a result from the analysis of all companies, the highest numbers belong to the categories “materials” (~1.400 companies) and “safety/life saving equipment” (~1.200 companies). This is followed by the three groups “instrumentation and navigation”, “auxiliary engines and equipment”, “electrical plants”, with 600-800 companies each. Another triple block with in average 400 companies each contain “accommodation”, “subcontractors for engineering services“ and “propulsion systems”. The rest is distributed over the other 11 groups (compare figure 1.14).

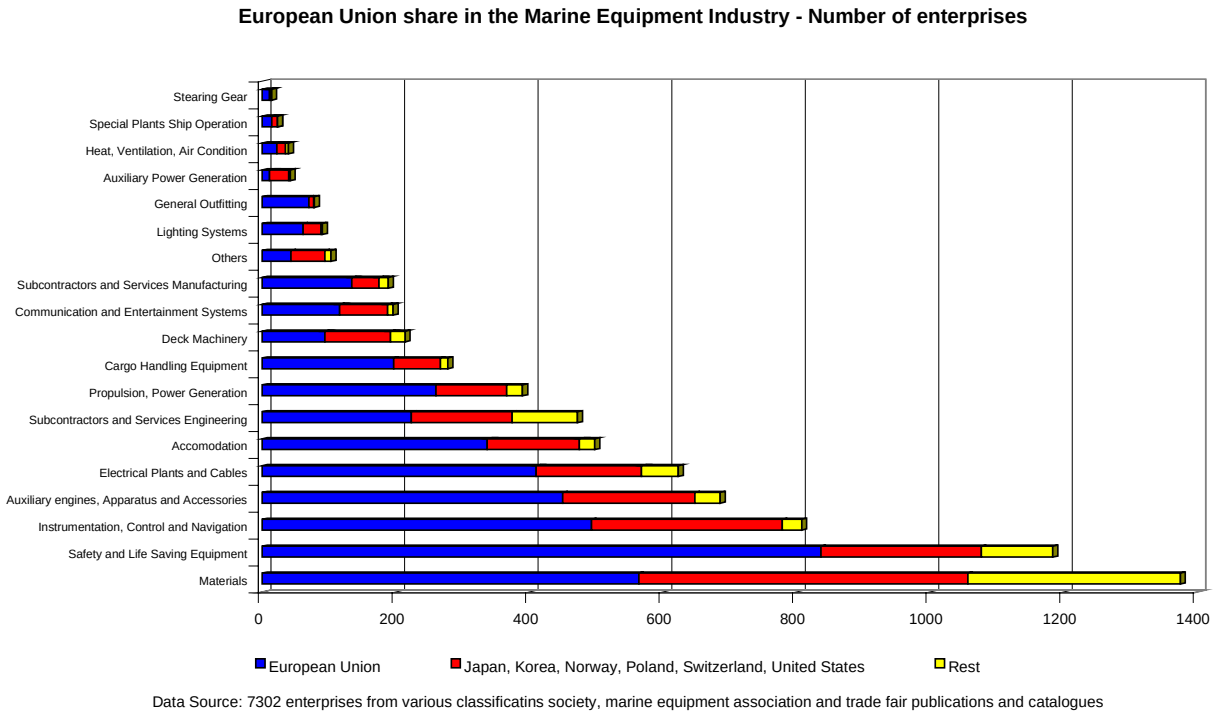
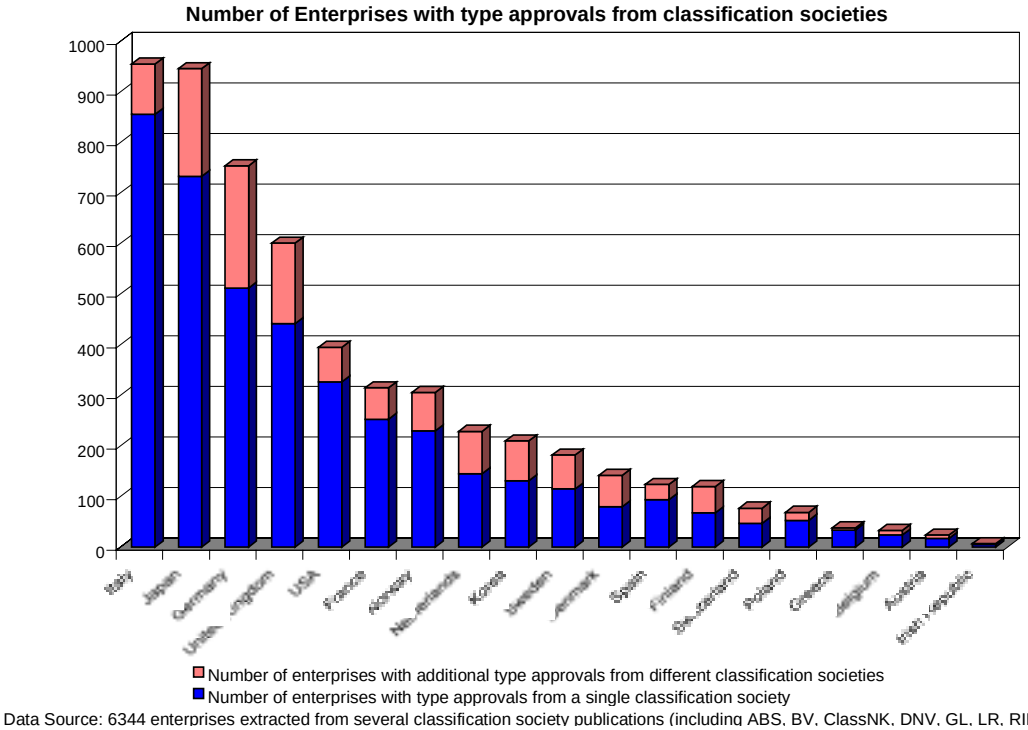


Figure 1.14

The analysis has been continued especially in the field of type approvals since the information available from the classification industry is quite comprehensive and accurate. After analysing data from seven major classification societies the number of assignments of companies with type approvals to classification societies per country has been identified (figure 1.15). It comes as a surprise to find Italy and the USA with such high figures in the ranking. As a clarification it seems logical that Italy has so many companies with type approvals because typically many small companies are in the business. The high number of companies from the USA can be explained because of a high number of companies registered in the Japanese classification society and of course are having type approvals from ABS.

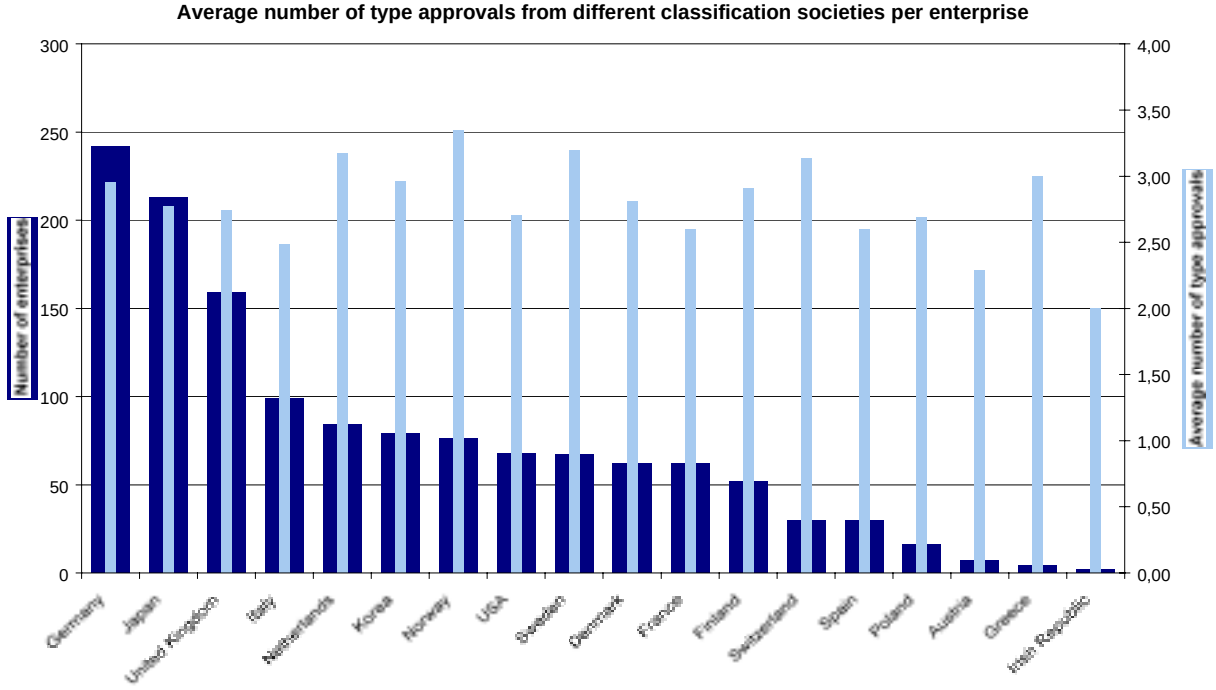
Another astonishing finding is the relative low number of secondary type approvals from other classification societies. Far less than 20% of the companies have a secondary type approval for their products. A few others like Japanese, German and British companies have higher shares. However, those who have type approvals from more than one classification society have an average of 2,5 (figure 1.16).

The project team was assuming that there is a correlation between the number of secondary (or higher) type approvals and the overall export values, which have been calculated before and are contained in the National Portfolios. A respective regression analysis has been performed which confirms the assumption with an astonishing degree of significance (figure 1.17). It can be said that there is a direct correlation between the number of type approvals with international classification societies and the export volume of the industry.



Data Source: 6344 enterprises extracted from several classification society publications (including ABS, BV, ClassNK, DNV, GL, LR, RINA)

Figure 1.15



Data Source: 6344 enterprises extracted from several classification society publications (including ABS, BV, ClassNK, DNV, GL, LR, RINA)

Figure 1.16

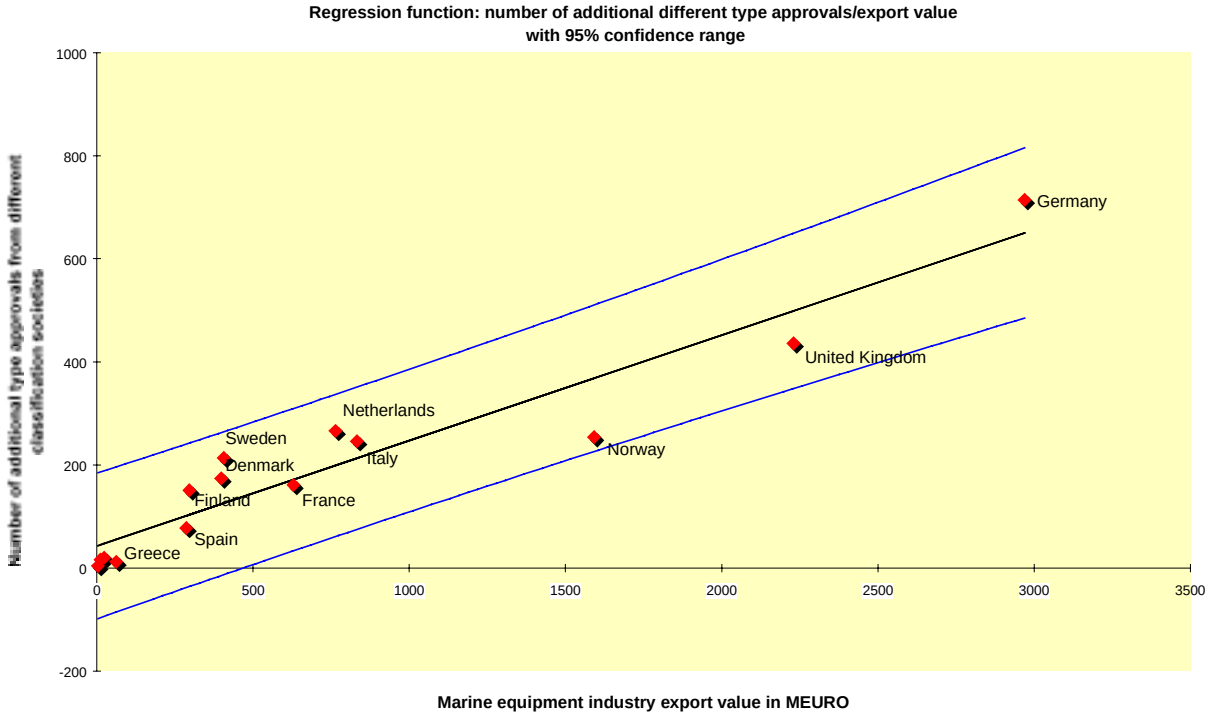


Figure 1.17: Regression Analysis "Export Value to Type Approval Significance"

A final evaluation on the identified companies has been made on the geographical distribution. This has been done on the basis of the company listings available from the associations and public databases a preliminary analysis of the major locations of the marine equipment industry has been performed. This analysis has been made on the basis of the telephone area codes. After all the result is not very surprising since the major concentrations of the industry are around the major shipbuilding places in Europe or in the main industrial centres. However, there maybe a difference if we would not assign the number of companies, but the size respectively the production values of the companies. Most likely the biggest number of companies will be close to the shipbuilding places, In spite of that the companies with higher turnovers may be located in the industrial centres of the individual Member States. Figure 1.18 gives a rough impression on the distribution of the marine equipment industry in Europe.

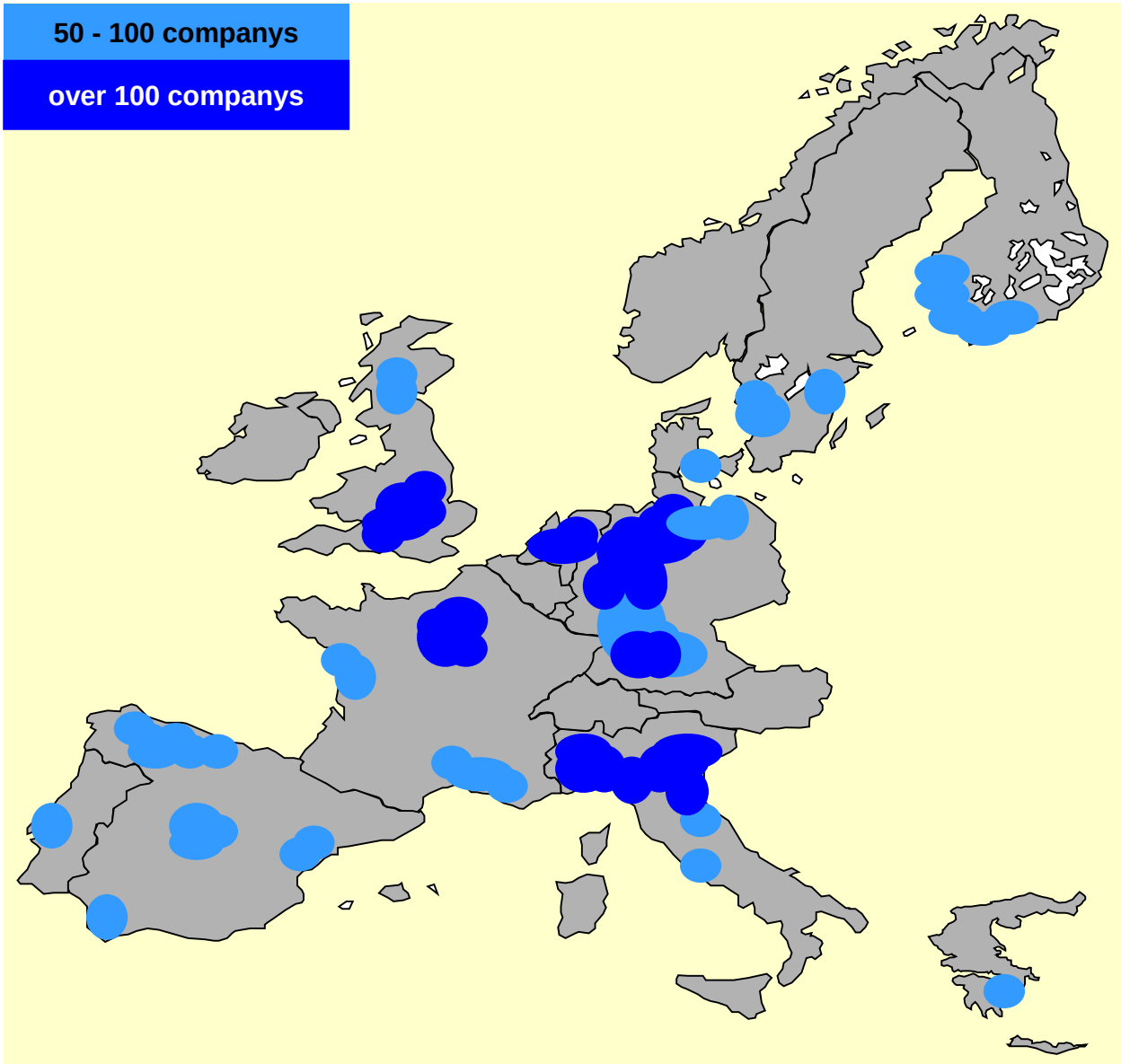


Figure 1.18: Geographical distribution of marine supply companies

1.4 Recommendations

As a result from the work in module 1 of the study the authors would like to recommend the following activities:

Action 1:
Discussion and agreement of the proposed structure for marine supplies as proposed above by EMEC and its Member Associations. This includes agreement on the proposed industry classification according to the European NACE index used by Eurostat.

Action 2:
On the basis of the harmonised industry structure, building or adaptation of national industry databases to a common format through the national associations and suitable for a consolidation on a European scale. Since this would be a non-profit activity, but may create a basis for easier evaluation of the industry and unified search opportunities for customers, the authors propose this task to be considered for supporting measures of the European Commission.

Action 3:
The authors propose to enter into a continuous maintenance and improvement of the national market evaluation, i.e. maintaining the national industry portfolios as developed in this study as a basis for a consolidation on a European level. In order to increase the quality of the national portfolios, especially the calculation of the demand split into the different industry sectors, the availability and the quality of the national industrial input/output analysis need to be improved. Those should further be harmonised according to the rules of Eurostat as a basis for future analysis. It is recommended to the national associations to enter into respective discussions with their national statistical bodies.

Action 4:
As a bottom-up justification of the statistical analysis data from a European database as proposed under Action 2 may be used. However, it may contribute to the quality and the comprehensiveness of the data, if the shipyards would be prepared to perform an analysis of their supplier base. This could help to identify and justify more supply firms acting only regionally and could answer questions on the origin of supplying companies. The aggregated result of this analysis might be of interest for both, the shipyards and the suppliers. Therefore it is recommended to launch respective discussions between EMEC and CESA to prepare the ground for such an analysis. Since the result would be of general interest and contribute to a better evaluation of the industry, the authors propose a respective study to be supported by the European Commission.

2 Module 2 – Marine Equipment Market Analysis for Merchant Shipbuilding 2000–2005

2.1 Objectives and approach

It is the objective of this working module to analyse the current market situation for marine equipment products for merchant shipbuilding, to establish market forecasts on a world level up to the year 2005, discussion of the European share and to state problems and difficulties concerning the market for marine equipment in general.

The Market Study section final report of the EU Competitiveness and Benchmarking in the Field of Marine Equipment Study therefore covers:

- the size of the marine Equipment Market,
- a discussion of European share and opportunities,
- a discussion of historical trends,
- strategies for the future.

2.1.1 Approach Newbuilding

The size of the Marine equipment Market has been estimated, the calculation is complex and uses the data that is available from two primary sources:

- AWES for the forecast in GT for ships to be built In the forecast period, 2000 to 2005. This forecast was published in May 1999.
- Fairplay Encyclopaedia data for mid 1999. This data source was used for the historical analysis of fleet structures and for price data. Price data is difficult to obtain, particularly for the smaller ship size ranges, however it believed that the data provides sufficient coverage to deliver a reasonable estimate of the overall value of the Marine Equipment market.

Data from these two primary sources has been supplemented by data available from the internal sources of the project team members. These data have been collected from a wide variety of sources over a period of time and therefore provide valuable corroboration of data from the primary sources.

At the outset of the study the objective was to synthesise the equipment values using a bottom up approach, taking data from shipyards on the subdivision of equipment costs across main and sub equipment groups. This needed input from yards on the details of the equipment cost breakdown. A limited number of positive responses have been received from yards. This is because:

- A great deal of data was requested, a great deal is needed. The data requested was kept to the minimum requirement.
- The work involved in collating the data by the yard would therefore be considerable.
- The yards saw the data being requested as commercially confidential.

Having said that, it was still possible to obtain a more detailed subdivision of the equipment market across ship types and size ranges than has been available before. The calculations have been based on available cost-structures for more than 10 different ships, built in the last ten years. Missing data were amended from the project-teams own database. The project team is convinced that the result achieved represent a reasonable level of accuracy. However, the quality of the result could be improved, if more cost-structure data on ships would become available from the shipyards.

2.1.2 Approach Shiprepair

An analysis has been carried out for the Marine Equipment Market for Shiprepair. Shiprepair is more difficult than for Newbuilding, the cost structures are not so clear cut, having said that it has been possible to develop an estimate of the market using industry data. In order to estimate the Marine equipment that is generated by ship repair work broad industry norms have been used, for example 3-5% of the first cost of a ship is spent annually on maintenance, 15% of repair costs area accounted for by materials. These norms have been applied to an estimate of the total cost of replacing the current world fleet.

2.2 The Size of the Marine Equipment Market

2.2.1 Newbuilding Forecast

The forecast for the Marine Equipment Market generated from Newbuilding work over the forecast period 2000 to 2005 is as shown in Figures 2.1, Figure 2.2 and more detailed in Table 2.1. These summarising figures show the division of the market across the primary ship cost elements and ship types. According to this the total market value for marine equipment dedicated to cargo carrying vessels represent a value of ~110 billion Euro (115,788 million USD) for the five year period, ~22 billion Euro/a (~23 billion USD/a). Over the forecast period of five years, 2000 - 2005, this includes a value for shiprepair of approximately ~5,6 million Euro (USD 5,920 million) per year. The results per shiptype shows the expected ranking also for the marine equipment value. This result together with information on countries where these shiptypes predominately have been built and will be built and information on the major owner/operator per shiptypes give some indication on the effects and market perspectives on regional marine equipment markets.

According to the statistical analysis from Module 1 of the study, the total size of the world market for marine equipment has been evaluated to be ~ 61 billion Euro. The share of marine supplies for shipnewbuilding within this total market as given above represent ~ 36% (~22 billion Euro/a).

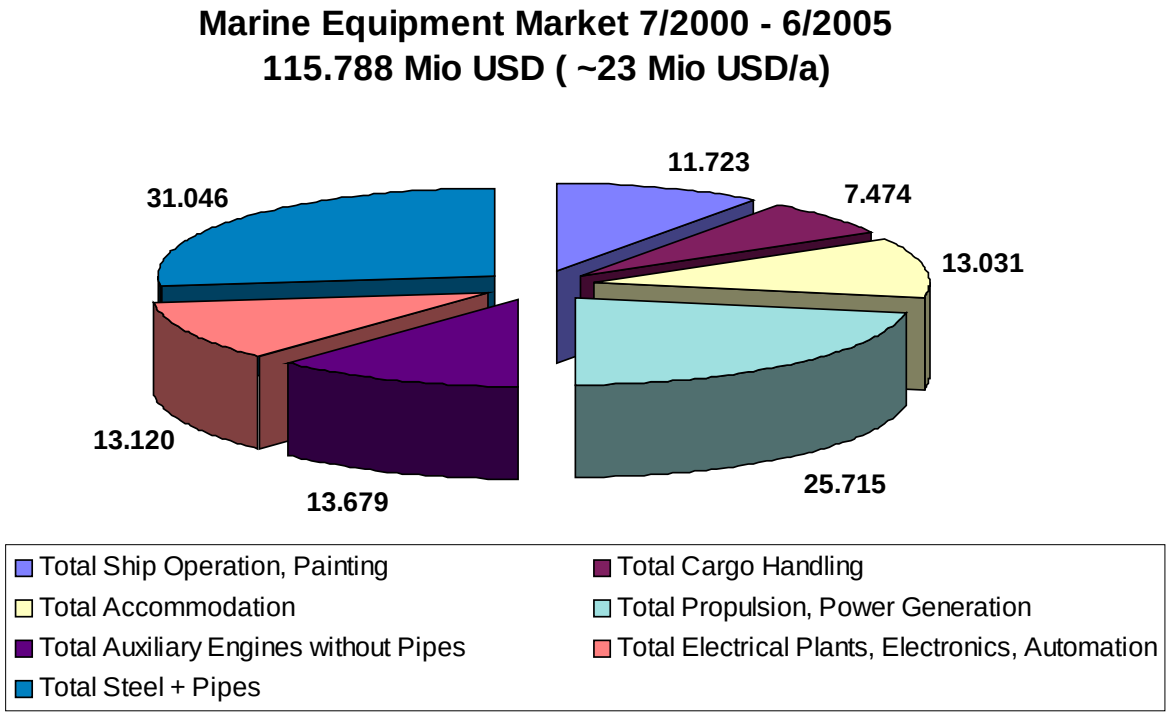


Figure 2.1: Marine Equipment Market per Product Group

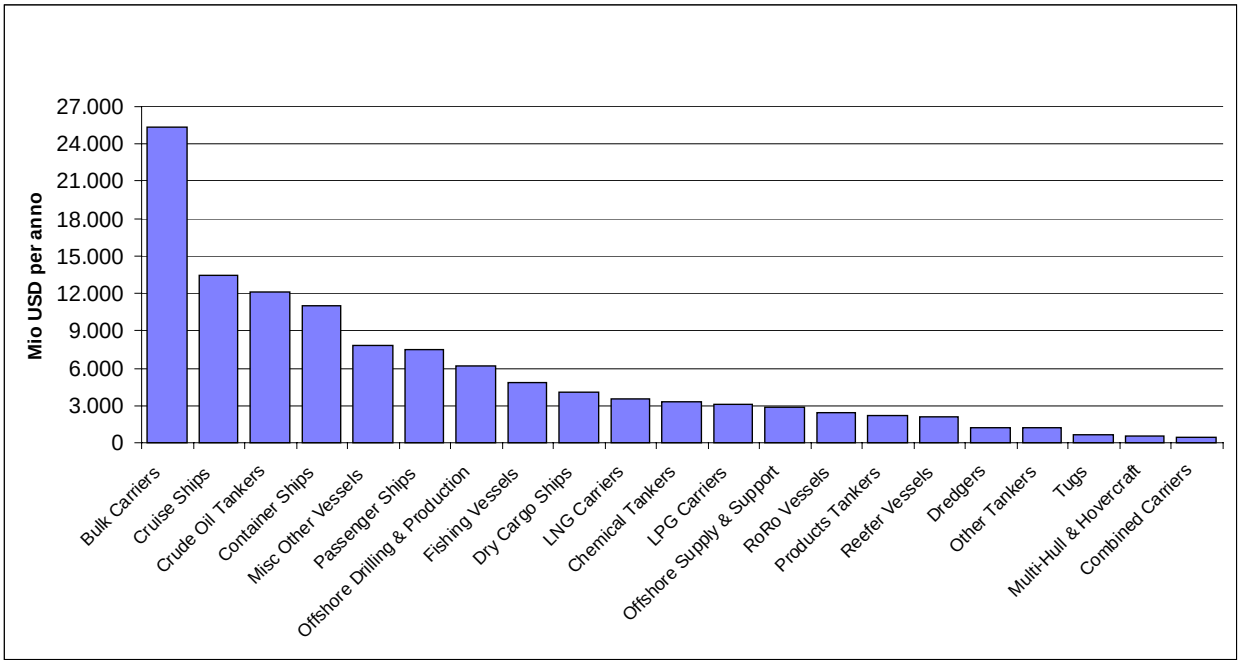


Figure 2.2: Marine Equipment Market per Shiptype

Table 2.1 : Newbuilding Marine Equipment Market - Summary (mio USD)

Ship Type	*Group Name*							
Ship Type	*Total Ship Operation, Painting*	*Total Cargo Handling*	*Total Accommo-dation*	*Total Propulsion, Power Generation*	*Total Auxiliary Engines without Pipes*	*Total Electrical Plans, Electronics, Automation*	*Total Steel + Pipes*	*Total Purchasing Value*
Crude Oil Tankers	1,284	1,220	734	3,476	1,378	728	3,272	**12,092**
Products Tankers	258	23	133	445	352	264	719	**2,195**
Chemical Tankers	388	34	200	670	530	397	1,083	**3,303**
LNG Carriers	315	53	158	591	724	564	1,101	**3,507**
LPG Carriers	292	46	138	587	560	467	984	**3,074**
Other Tankers	127	121	73	288	136	132	324	**1,201**
Bulk Carriers	2,689	1,001	1,536	7,113	2,378	2,863	7,816	**25,396**
Combined Carriers	44	41	25	111	34	46	111	**413**
Container Ships	1,276	1,213	729	2,750	987	1,359	2,701	**11,015**
Dry Cargo Ships	450	528	310	879	384	454	1,127	**4,133**
Reefer Vessels	103	427	67	407	345	186	505	**2,039**
RoRo Vessels	356	358	213	528	167	264	502	**2,388**
Cruise Ships	753	0	4,707	1,883	2,071	1,479	2,555	**13,449**
Passenger Ships	414	0	2,336	1,206	1,093	754	1,733	**7,536**
Multi-Hull & Hovercraft	61	0	142	99	62	72	116	**553**
Offshore Supply & Support	295	323	112	562	422	365	731	**2,811**
Offshore Drilling & Production	983	430	492	922	614	922	1,782	**6,144**
Dredgers	131	145	73	242	160	121	339	**1,210**
Tugs	65	18	21	166	74	86	184	**615**
Fishing Vessels	583	486	243	1,117	632	583	1,215	**4,858**
Misc Other Vessels	856	1,006	589	1,673	573	1,013	2,145	**7,856**
Total (mio USD)	***11,723***	***7,474***	***13,031***	***25,715***	***13,679***	***13,120***	***31,046***	***115,788***

2.3 EU Share and Opportunities

2.3.1 Introduction

The marine market is a truly Global Market. It is difficult or impossible to say with any degree of confidence that any proportion of the market can be considered as an 'EU share'. EU suppliers will have to compete in all sectors of the world market, there are no safe havens either by virtue of EU ownership or build of ships. While there may be natural tendencies to source from the EU for both owners and builders, the final decision is technical - does the equipment have the required specification and technical characteristics?; commercial - is the product at the right price? On this basis there are opportunities for EU suppliers in markets that may seem to be closed, as is discussed below.

2.3.2 Operator and Builder Analysis

There are two main decision makers in the Marine Equipment sourcing decision:

- the shipbuilder,
- the owner.

While it may seem that for ships built in the EU there should a high European content, many of the purchasing decisions made by the owner will reflect a number of factors, including his own country of origin and the equipment that is fitted to other ships in his fleet. Clearly an owner will want to reduce variety in the equipment operated in his fleet therefore if the fleet is predominantly fitted with say, Japanese equipment, the probability is that this trend will continue.

Having said that it is worth looking at the dominant players in terms of operator and build countries. Figure 2.3 shows the dominant operator countries for each of the ship types considered in this report. As can be seen Japan is the leading operator of eight of the twenty ship type categories. If Europe is extended to include Scandinavia, then Europe leads in six of the twenty ship type categories.

Figure 2.4 shows the European share in each of the same ship type categories, again Europe is extended to include Scandinavia. The European share of the current fleet is over 30% in three categories only, if combined carriers are excluded as the category is very small. Overall the European share is around 25% of the total fleet.

Looking at where ships are built as shown in Figure 2.5 it is clear that again Japan is the dominant nation with a leading position in the majority of ship type categories. This position ins unlikely to change over the period of the forecast, i.e. 2000 to 2005. There have been forecasts that would see the Japanese share reduce as Japan moves progressively out of shipbuilding, however even if a progressive move such as this were to take place, Japan will still dominate for many years to come. Current view from Japan indicate that they themselves see a continuation of major shipbuilding for at least ten years. The most significant ship type category in which Japan is not in the dominant position is in Cruise vessel construction. Far eastern yards are working very hard to penetrate this market and have had some success although they have lost orders because owners would rather deal with yards experienced with this ship type.

Figure 2.6 shows the European share by ship type. The European share is over 30% in only five of the twenty categories, the seventy four percent share in the Cruise ship market is something that is being attacked strongly from the far east as mentioned above. As for ownership, about 25% of the world fleet is built in Europe and Scandinavia.

Ship Type	***Japan***	***Germany***	***Greece***	***Hong Kong***	***Netherlands***	***Russia***	***UK***	***USA***
Crude Oil	-	-	20	-	-	-	-	-
Products	17	-	-	-	-	-	-	-
Chemical	20	-	-	-	-	-	-	-
LNG/LPG	26	-	-	-	-	-	-	-
Other Tankers	25	-	-	-	-	-	-	-
Bulk Carrier	-	-	16	-	-	-	-	-
Combined	-	-	-	-	-	22	-	-
Container	-	21	-	-	-	-	-	-
Dry Cargo	11	11	-	-	-	-	-	-
Reefer	-	-	-	-	-	19	-	-
Ro Ro	21	-	-	-	-	-	-	-
Tug	-	-	-	-	-	-	11	-
Fishing	39	-	-	-	-	-	-	-
Dredger	-	-	-	-	12	-	-	-
Passenger	13	-	-	-	-	-	-	-
Cruise	-	-	-	-	-	-	-	40
Multi Hull/Hover	-	-	-	13	-	-	-	-
Offshore Supply/Support	-	-	-	-	-	-	-	22
Offshore Drilling/Production	-	-	-	-	-	-	-	42
Misc Various	-	-	-	-	-	-	-	16

Figure 2.3 : Top Operator Country Matrix, % Total Fleet by Number of Ships

Ship Type	***%***
Crude Oil	38
Products	20
Chemical	20
LNG/LPG	26
Other Tankers	6
Bulk Carrier	20
Combined	44
Container	21
Dry Cargo	23
Reefer	19
Ro Ro	21
Tug	21
Fishing	20
Dredger	30
Passenger	38
Cruise	25
Multi Hull/Hover	12
Offshore Supply/Support	20
Offshore Drilling/Production	25
Misc Various	16

Figure 2.4 : 28/11/1999 EU Operator Market Share, % Total Fleet by Number of Ships

Ship Type	***Australia***	***Finland***	***Germany***	***Japan***	***Korea***	***Netherlands***	***Norway***	***Russia***	***UK***	***USA***
Crude Oil	-	-	-	50	-	-	-	-	-	-
Products	-	-	-	43	-	-	-	-	-	-
Chemical	-	-	-	41	-	-	-	-	-	-
LNG/LPG	-	-	-	49	-	-	-	-	-	-
Other Tankers	-	-	-	52	-	-	-	-	-	-
Bulk Carrier	-	-	-	52	-	-	-	-	-	-
Combined	-	-	-	-	21	-	-	-	-	-
Container	-	-	-	27	-	-	-	-	-	-
Dry Cargo	-	-	-	23	-	-	-	-	-	-
Reefer	-	-	-	33	-	-	-	-	-	-
Ro Ro	-	-	-	36	-	-	-	-	-	-
Tug	-	-	-	-	-	11	-	-	11	11
Fishing	-	-	-	41	-	-	-	-	-	-
Dredger	-	-	-	-	-	32	-	-	-	-
Passenger	-	-	-	21	-	-	-	-	-	-
Cruise	-	-	19	-	-	-	-	-	-	-
Multi Hull/Hover	-	-	-	-	-	-	-	-	-	21
Offshore Supply/Support	-	-	-	-	-	-	-	-	-	25
Offshore Drilling/Production	-	12	-	12	-	-	-	-	-	12
Misc Various	-	-	-	-	-	-	-	-	-	-

Figure 2.5 : Top Builder Country Matrix, % Total Fleet by Number of Ships

Ship Type	***%***
Crude Oil	3
Products	32
Chemical	28
LNG/LPG	27
Other Tankers	7
Bulk Carrier	10
Combined	17
Container	23
Dry Cargo	33
Reefer	25
Ro Ro	27
Tug	29
Fishing	29
Dredger	64
Passenger	45
Cruise	74
Multi Hull/Hover	28
Offshore Supply/Support	30
Offshore Drilling/Production	11
Misc Various	27

Figure 2.6: EU Builder Market Share, % Total Fleet by Number of Ships

2.4 Trends in Operator and Builder location

2.4.1 Crude Oil Tankers

Greece has been the dominant operator over recent years, before that Japan held the number one position from 1985 to 1995. Norway has featured consistently in the top three operator countries.

Japan has been the dominant crude oil tanker builder since 1970, Korea has been the consistent number two builder for much of the same period. Historically Sweden was a major player in tanker building but moved out of shipbuilding many years ago.

2.4.2 Chemical Tankers

Japan has been the dominant operator since the mid 1980's, before that Norway was the leading operator.

The leading builder of Chemical tankers since 1975 has been Japan. Overall, Japan has built 41% of the fleet with Germany second with 8%.

2.4.3 Products Tankers

Greece has been the leading operator with between 40% and 59% of the fleet since 1969, the USA briefly held a leading position in the period 1985 to 1989

Japan has been the leading builder since 1970, on the basis of orders taken since 1995 Korea is in the lead at the moment.

2.4.4 LPG/LNG

Japan has been the leading operator since 1980 and the leading builder since 1969. Other nations with significant shares of this market include Norway and Germany.

2.4.5 Other Tankers

Japan is the dominant operator and builder of this class of vessel and has been since 1969.

2.4.6 Bulk Carriers

Greece and Japan have shared the leading operator slot since 1969, other major players include China and Hong Kong.

Japan is the leading builder and has held this position since 1969.

2.4.7 Combined Carriers

This is a very small fleet, the dominant operators have included UK, Norway, Russia and Greece.

Korea has been the dominant builder over recent years with Sweden holding this position in the period 1980 to 1984.

2.4.8 Container Ships

The dominant operator since 1985 has been Germany. Before that Japan, Taiwan and Greece.

The leading builders have been Japan, Korea and Germany since 1970 with Japan and Korea dominating since 1970.

2.4.9 Dry Cargo Ships

Japan and Germany have been the leading operators over recent years, overall it has been Germany as the leading operator although Japan has held this position since 1990.

A similar situation is found in the builder statistics with Japan and Germany being the dominant players since 1969.

2.4.10 Reefer Ships

Russia has been the dominant operator of reefer ships since 1969. Ships ordered since 1995 shows Japan moving into the dominant position.

Japan has been the leading builder since 1970.

2.4.11 RoRo Ships

Japan has been the leading operator since 1970 with the USA in the leading position before that.

Japan has been the leading builder since 1980, before that Norway and the USA.

2.4.12 Cruise Ships

The USA is the dominant operator country and has been so since 1970. With regard to builders, the lead is shared by a group of European builders in Germany, Italy, France and Finland.

2.4.13 Passenger Ships

Japan has been the leading operator since 1985, before that Italy, Norway and Greece were the leading operators.

Japan has been the dominant builder of passenger ships since 1980.

2.4.14 Multi-Hulls and Hovercraft

Hong Kong has been the leading operator for much of the last 25 years both Norway and China have had significant fleets.

Australia has been the dominant builder since 1990 with Norway and the USA playing leading roles before that.

2.4.15 Offshore Supply and Support Vessels

Norway has been the dominant operator since 1990. India, the USA and the UK have held this position in preceding years.

Overall the leading builder has been the USA, however since 1990 Norway has been the dominant builder of these ships.

2.4.16 Offshore Drilling and Production

Overall the USA is the leading operator, however since 1985 the position has been held by Venezuela and Norway.

Overall the leading build country is also the USA. However currently the leading builder is Korea, before that USA and Japan. The USA had the leading role from 1969 to 1979.

2.4.17 Dredgers

Overall The Netherlands has been the leading operator and the leading builder of this ship type.

2.4.18 Tugs

Overall the UK has been the leading operator country, currently this position is held by Singapore.

Currently the leading tug building nation is The Netherlands, from 1985 to 1994 the UK was in this position.

2.4.19 Fishing Vessels

Japan and Norway have been the leading operators and builders of fishing vessels since 1969.

2.4.20 Other Miscellaneous Ships

The USA is the leading operator in this sector, from 1975 to 1989 Russia was in this position. Many ships in this category are quasi military or Coast Guard.

The leading builder is currently Japan with the USA and Finland occupying this position in the years since 1975.

2.5 EU Share

On the basis of the figures presented in the previous section it would seem that the EU should be able to pick up at least 25% of the market. Around 25% of ships are operated by European based companies and 25% of the fleet has been built in European yards, again where Europe is the broader definition including Scandinavia.

However, the Marine equipment market is a global market and the European supplies need to develop strategies for the development and marketing of products to the world market. Some are doing this, a far greater number are not. A great many companies are small and do not see the possibility for selling to many of the more distant markets. As will be discussed in the following section new ways have to be found for these companies to penetrate these markets, if they are to survive.

A brief review of activity in the market in the Far East indicates that Japan has relationships with marine equipment manufacturers in both Korea and China. In China the co-operation is related to low technology items such as minor steel work components. In Korea the co-operation is in connection with higher technologies.

On the one hand the Far East can be seen as a potential market, this is undoubtedly true, however the Japanese and other are looking to he west for new markets for themselves. The Far East industry therefore represents a major threat to European Marine Equipment suppliers.

2.6 The Way Forward

The fundamental messages from people working with European companies to help them penetrate the Japanese and other Far Eastern markets can be summarised as follows:

- products must be high technology, there can be no future in low technology products with for example, former eastern block countries, SE Asian countries able to produce high volume low technology products at a fraction of a European cost. This has been known for some time, however local manufacturing carried out in close proximity to the shipyards has enabled some lower technology producers to survive, this cannot continue.

- To achieve high technology status will require research and development, this R&D itself being based on market research into the needs and future tends of the Marine Equipment industry.

- Government and European funding can be provided for R&D but this should only reinforce work being carried out by the companies themselves. This means hat the companies have to be of sufficient size and strength to be able to fund major R&D programmes n their own right. A great many of the Marine Equipment supplies are either small or subdivisions of larger companies for whom the Marine equipment market is a minor part of their overall business.

- Companies need to co-operate in Joint Ventures or by more formal relationships, mergers and/or acquisitions. Size will be a factor. A small company with a unique product may be able to survive for a while but for how long will the product remain unique, and for how long can the company sustain the R&D effort needed to take the product forward to the next generation?

- As has been mentioned in the previous section Japanese industry is working with both Korean and Chinese marine equipment suppliers. A way forward would be for European companies to form links with far eastern companies for both technology transfer and marketing tie ups. This would be a true reflection of the global nature of the market. If links are not made then far eastern companies remain competitors only. There can be no doubt that they will be formidable competitors in the marine equipment market as they are in other, non marine, markets.

- Companies with high technology products will have to commit major resources to marketing their product in the far eastern markets. The analyses carried out and illustrated in the figures above show that to be successful companies will have to be global and that means being effective in the far east - Japan, Korea and China for example. Experience shows that if the product is right it can be sold into these markets. Experience also shows that getting to first contracts takes time effort and money. Several visits will have to be made, there will have to the involvement of people who speak Japanese, Korean or Chinese and know the culture. These people will also know how to approach companies and to stay in touch, such that opportunities develop rather than disappear. Conventional European marketing attitudes and marketing methods are very often not acceptable in this part of the world, a bullish western style marketing pitch is unlikely to succeed and indeed may kill any chance for long term business in the region.

- In summary it would be easy for European manufacturers to assume that they have little or no chance in the Far eastern markets and on this basis to avoid making the commitment to research and marketing. This short term attitude would be a disaster for the European industry. The industry has to restructure by forming alliances and/or larger groupings, it needs to share technology and R&D effort. Finally a major ongoing marketing effort has to

be out in place over the long term. The marketing effort must either involve Europeans who know and understand the culture and speak the language, or committed local people.

- The selection of local representatives will require time and effort. Finding the right individual or company will be critical. Supporting the local person or company will also be critical if the relationship is to deliver mutual benefit. Neither side can assume short term gains, progress will be slow and require investment in time and money. The European companies must provide support of all kinds to their selected representatives if they are to stay with the project for the long term.

2.7 Recommendations

As a frequent forecasting for marine supplies does not exist, the authors wuld like to conclude the work in module 2 with the following recommendation:

Action 5:
Maintenance of the shiptype portfolios in order to discuss and evaluate the marine equipment market forecast for shipnewbuilding on a continuous level. This includes the continuous evaluation of available fleet data and shipbuilding forecasts. On this basis the extended forecast for marine supplies can be build on a regular basis by using the approach used for this study. A permanent and “automated” link could be established with the AWES forecast. This can be an issue to be discussed between EMEC and AWES, which can perform this work by themselves or alternatively can be produced by the involvement of commercial consultants

Further improvements on the reliability of the forecast can be obtained, if more actual cost structures for different shiptypes would become available. To improve the quality of the calculation schemas it would be essential to encourage shipyards to contribute respective cost structures for future activities according to the industry structure as proposed in Module 1. This can be an activity to be discussed between EMEC and CESA.

3 Module 3 - Benchmarking Methods and Tools for the Maritime Sector

3.1 Objectives, Approach and Methodology

It is the objective of this working module to develop industry-specific indicators for performance and competitiveness and to develop or propose a benchmarking methodology. This includes a calibration of the specific indicators by performing a limited study on European level with interested companies.

Starting with the classification of marine equipment products according to the strategic purchasing view of shipyards, indicators have been defined measuring the competitiveness and the performance of marine suppliers. The methodology for the approach has been taken from the European Network of Advanced Performance Systems (ENAPS)[1]. From there specific indicators were selected and derived for the specific needs of the maritime industry.

The working group, the Commission and EMEC to carry out the benchmarking field test, has chosen the following three representative products. The different products are listed according to the Marine Equipment Structure as defined in Module 1of this report.

- **Maritime Equipment Group 1: Propulsion, Power generation**

A typical example is propellers. The production typology is mainly engineering-to-order-production with suppliers serving the shipbuilding industry almost exclusively. Company structures and sizes most probably are comparable.
NACE Group 28 – Manufacture of fabricated metal products (not machinery and equipment)

- **Maritime Equipment Group 4: Instrumentation, Control and Navigation**

A typical example is navigation systems. The production typology is mainly engineering or assembly-to-order product with high-tech and high-value content. Different company structures and sizes are identifiable, e.g. just assembly functions or also component manufacturer.
NACE Group 31/33 – Manufacture of electrical machinery and apparatus/precision instruments

- **Maritime Equipment Group 12: Auxiliary engines, Apparatus and Accessories**

A typical example is standard pumps, which is classified by the shipyards as ”generic product” with suppliers most often serving a wide range of different industries. Pump manufacturers represent a wide range of different company structures and sizes. Specialists and generalists can be found.
NACE Group 29 – Manufacture of machinery and equipment
(NACE = European Industrial Nomenclature for Statistical Measures)

3.2 Final Results

197 companies were contacted out of the address lists of the national branch associations and the addresses we got out of the EMEC catalogue. We received 15 agreements to participate in the maritime benchmarking analysis up to November 99. But then coming to the final deadline we received further refusals from the companies. Main reasons are here that the indicators are not available in the companies and that it does take them much time to collect them. The main refusals were due to the fact that they are not able to deliver the data in the required time.

Therefore the final result is that only 8 companies have delivered the required information out of 197. The agreements could be realised in Germany, United Kingdom, Belgium, Finland, Italy

[1] For more details see Annex 2 – Benchmarking Company Result Clarification

and Sweden. For the countries Austria, Denmark, France, Greece, Japan, Netherlands, Norway, Poland, Portugal and Spain we could not convince companies to join the analysis.

The following table 3.1 shows result of the activities to attract companies to participate.

	Total of companies	No. Of Agreement	No. Of Refusal
Austria	6	0	6
Belgium	8	1	7
Germany	31	2	29
Denmark	2	0	2
Spain	10	0	10
Finland	18	1	17
France	4	0	4
Greece	9	0	9
Italy	7	1	6
Japan	1	0	1
Netherlands	13	0	13
Norway	17	0	17
Poland	2	0	2
Portugal	4	0	4
Sweden	30	1	29
United Kingdom	35	2	33
Total	197	8	189

Table 3.1: Result to attract companies to participate

In order to understand the reasons of companies better that decided not to participate, we were asking the following questions to the contact persons of the regretting companies.

- Have you understood the principals of the benchmarking approach?
- Do you think that benchmarking is of benefit for companies?
- Can you not participate because of time constraints/limited resources and would you like to participate in the next year?
- Does your company belong into the categories we defined for the analysis?
- Are the maritime ENAPS benchmarking indicators in your company available?
- If not, do you think that the information to define the indicators is available in your company?
- Do you carry out product benchmarking?
- Do you carry out benchmarking with own defined qualitative or quantitative indicators?

Table 3.2 depicts the outcome out of the inquiry

	No of Refusal	Concept of Benchmarking not understood	Benchmarking is not of benefit for companies	Would like to participate next year	Does not belong into the category	Indicators are not available and no capacity to gather the information together	Company breakdown or wrong address	Carry out Product bench-arking or own benchmarking with other indicators	Carry out Reorganisation takeovers therefore no time but interested	Companies which agreed to participate but can not deliver information in time
Austria	6	0			2	2		1		1
Belgium	7	0	1		1	4		1		
Germany	29	0	1	5	2	13	1	3		4
Denmark	2					2				
Spain	10	1	1		3	3		1		1
Finland	17		1	1	4	5	2	4		
France	4					1	2			1
Greece	9				2	4	2	1		
Italy	6		2		2	2				
Japan	1					1				
Netherland	13			1	1	8		2	1	
Norway	17		1	1	2	6	1	4	2	
Polland	2					2				
Portugal	4			1	1	2				
Sweden	29		1	5	7	11	1	4		
United Kingdom	33		1	3	8	12	1	8		
	189	**1**	**9**	**17**	**35**	**78**	**10**	**29**	**3**	**7**

Table 3.2 Reasons to decide not to participate in the benchmarking analysis

The result shows that nearly all contacted companies have understood the concept of benchmarking. We asked this question regarding the general definition of the method[2] and regarding the concept of the ENAPS approach[3]. Nine contact persons from the contacted companies decided that benchmarking in general does not provide any benefit because even when companies have found a benchmarking partner via the matching of process indicators the concepts behind can not be transferred. But asking them that the main principle of benchmarking is to derive from a best practice case an ideal solution for the company to improve their low performance, they agreed that this occasionally might be possible.

Twenty (17+3) companies raised interest to participate in the benchmarking analysis next year or even later because of capacity problems or because of reorganisation or reengineering activities due to take-overs. 35 companies said that they do not belong into the specific categories we defined for the benchmarking analysis. These were companies, which produce

[2] **Company Benchmarking** is the continuous improvement of management processes in companies. ” To define processes to be improved, to identify world-wide best practices for these processes, to assess gaps in performance in comparison with these best practices and to understand the underlying reasons for this situation.”[2] Out of: Introduction and main principles applied to company benchmarking, Quality Series nr.7, Antonio Silva Mendes, Directorate General III/B/4, Quality Policy, Certification and Conformity marking, January 1998, page 5

[3] For more details see Anne2 – Approach and Methodology

life saving west, roller blind etc. Ten companies could not be contacted because of company break down or wrong addresses.

Thirty-one companies reported that they carry out on a continuing basis product benchmarking or do internal benchmarking with other indicators or external benchmarking with one well-known partner. These indicators were to a great extend financial indicators. Process related indicators were not available.

Eighty-four companies said that the ENAPS indicators besides the financial indicators were only to a small extend available in the companies. They said that they did not have the capacity to define them within the duration of the benchmarking study. Here a decision from the upper management level would be needed and this would take to long time. They all agreed that the information to define the ENAPS indicators is available in their company.

Seven out of 15 participating companies brought in a refusal on the very last state. These companies ticked on a list of indicators the ones, which are of interest to them and received a measure list to fill in the data on this basis. Then they apologised that they are not able to deliver the data in time for the analysis.

The 8 benchmarking companies out of the 15 that delivered the data can be grouped into the following product types (table 3.3).

	No. Of Agreement	**Engineering-to-order products (typical example: propellers)**	**Engineering/assembly-to-order systems (typical example: Navigation systems)**
Austria	0		
Belgium	1		1
Germany	2	1	1
Denmark	0		
Spain	0		
Finland	1	1	0
France	0		
Greece	0		
Italy	1		1
Japan	0		
Netherlands	0		
Norway	0		
Polen	0		
Portugal	0		
Sweden	1		1
United Kingdom	2		2
Total	**8**	**2**	**6**

Table 3.3: Product types of participating companies

For the product group pumps no company could be attract to participate. 2 companies are grouped into the engineering to order production type as typical example propellers. 6 companies are grouped into the production type of engineering/assembly to order systems with a typical example as navigation systems.

The return rate of the contacted companies and the agreement to participate is 4%. The inhibiting factors to carry out a benchmarking analysis can be listed as follows:

- Indicators on process level are often not available
- Effort to gather process indicators is often over estimated and the benefits under estimated
- The need to extend their internal performance indicators by process indicators has been agreed as useful but no capacity
- A habit can be identified to know more about competitors in a general way, ignoring the benefits of learning from each other during a benchmarking analysis.
- Focus on product benchmarking, ignoring the innovation ability and the benefits of process benchmarking
- Rejection to give internal data to other organisations
- Some companies did not belong in the category because of divers product range, sales less than 1 % in the maritime sector, or being pure service provider
- NACE does cause difficulties to group single products.
- The management decision to participate or not does take a long time.
- After sending the benchmarking information material it is necessary to discuss the subject in a personal way.
- Benchmarking is a new item to a lot of companies. To set up contact and to establish a confidential relationship by means of fax and phone is very difficult.
- To find the right contact person for data collection in the companies does take a lot of time.
- Predefined sets of indicators are always hard to get because companies measure with their own, mainly financial indicators. The ENAPS indicators are very often only as information available, which needs to be gathered to define the indicators.

3.3 Benchmarking Field Test

Due to the small feedback of participating companies the field test is not representative to derive valid conclusions for the specific product groups or their marine equipment classification as proposed in Module 1. Nevertheless it shows as an example the performance of marine companies. Furthermore it outlines:

- What kind of indicators are available in companies grouped into specific Marine Equipment classification group
- The performance and the efficiency of single marine companies in compare with selected companies grouped according to NACE classification out of the ENAPS database and its counterpart the maritime equipment group as proposed in Module 1.
- The provision of a snap shot of the current performance of maritime suppliers
- The provision of an idea how hard it is to define Best Practice, because some indicators which are very high/ or low but which need to be in the long run more balanced according to the trends within their branch.
- It makes it obvious that benchmarking need to be carried out in a continuous way.

The evaluation of indicators is difficult if only figures on a one year basis are available and the interpretation of the results needs to be done with limited information about the companies. The definition of a Best Practice Case needs always to consider the typical branch trends and the continuous monitoring of logical and economic indicator chains.

For this field test the Best Practice case is defined by means of the best value per indicator reached within the benchmarking matches carried out. The Low Practice is defined by means of the lowest performance value reached per indicator in the benchmarking match. The average value is defined by means of the average value reached from all participating companies in the Maritime Benchmarking approach and companies out of the ENAPS database.

3.3.1 Benchmarking Match against Marine Equipment Group 1 (Propulsion, Power generation)

According to the interest of the participating companies the following indicator list (table 3.4) has been defined. This list has been the comparable ground for the 2 companies, which are matched against selected companies out of the ENAPS database.

No.	Business process	Performance Indicator (PI)	Unit	Description
PI 1	Sales	Average Order Value	%	The average order value shows how large order generally is
PI 2	Sales	Customer Visits	%	The total number of customer visits compared with the number of active customers in a given period. Visits include the total number of times that personnel from the enterprise visited a customer site or that customer visited the enterprise during the period
PI 3	Sales	New Customer Return Ratio	%	Sales to new customers compared to the total amount of net sales in a given period. New customer means that a new customer account has been opened. New customer should not be promoted at the expenses of existing customers
PI 4	Sales	Tendering hit ratio	%	Tendering hit ratio is the percentage of tenders that resulted into a customer order. A tender is an offer to a customer, to do some activity for a customer (e.g. produce products or deliver a service), against a price
PI 5	Order fulfilment	Order fulfilment lead time	Days	The average time across all products for fulfilling an order
PI 6	Order fulfilment	Outgoing delivery timeliness	%	The part of customer orders that are delivered ”on-time” (according to the Logistics Performance Indicator (LPI)).
PI 7	Production and/or Supply of Products'	Production Costs Ratio	%	The costs for the process ”production and/or supply of products” compared to sales

Table 3.4: Comparable Indicators

The indicator: Average Order Value measures the generic business process: Sales. Together with the indicator Customer Visits, New Customer Return Ratio and the Tendering Hit Ratio it provides the information whether the efforts done were successful or not. The indicator Customer Visits provides the information how close the supplier and the customer need to work together to define and/or produce the product. This indicator in conjunction with the indicator New Customer Return Ratio and the Tendering Hit Ratio define how successful the co-operation with new and currently active customers are. The indicator: Order Fulfilment Lead Time, Outgoing Delivery Timeliness and the Production Costs Ratio measure how fast the product can be delivered on time and to what costs to the customer.

The following figure 3.1 shows the results gained out of the analysis.

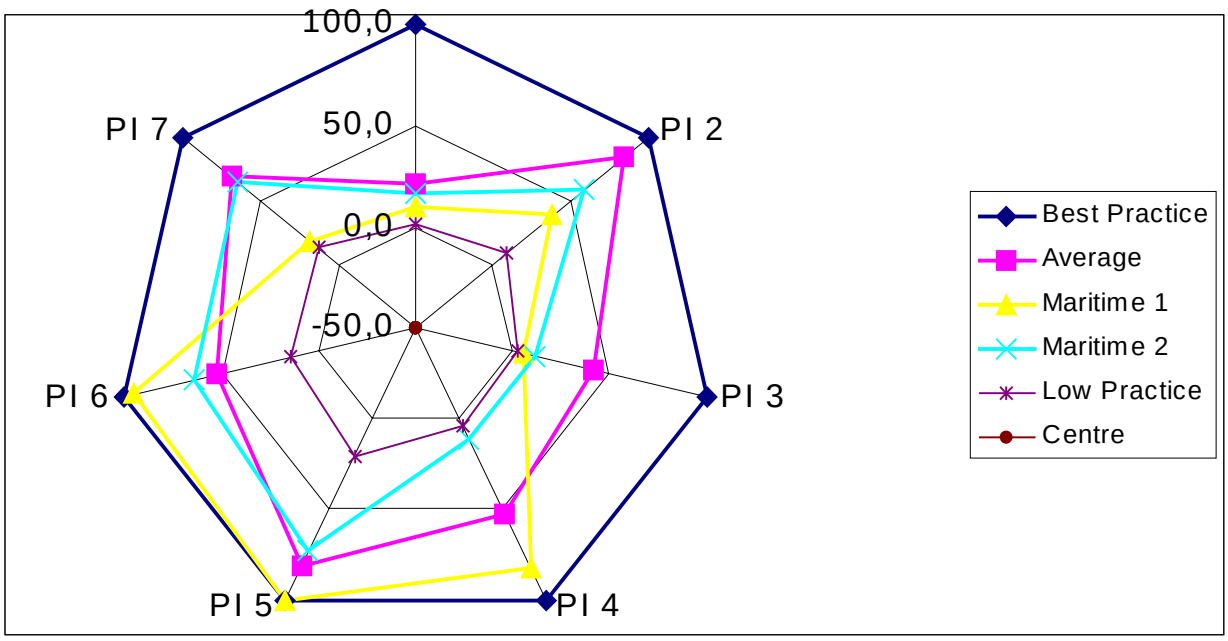


Figure 3.1: Result comparison against Marine Equipment Group 1

The company Maritime 1 has gained for the indicator Average Order Value a value, which lies under the average performance against the companies out of the ENAPS database. Also the Customer Visits and the New Customer Return Ratio is below the average performance. Tendering Hit Ratio is above the Average performance line. The combination of these indicators indicate that there must be competition around their potential customers and it seems that it is also a hard job to find new customers. The product is a module that is specific so that it has not a big attraction for other customers. The Tender Hit Ratio show that the company is close to the needs of these specified customers. Great efforts have been made in the supply chain of this company. Here the Outgoing Delivery Timeliness and the Order Fulfilment Lead Time define the Best Practise Case in this benchmarking match. So the company performance to understand the needs of their customers and to deliver the products very quickly seems to be very efficient. The low performance of the Production Cost Ratio is due to the engineer to order production type. The indicator Average Order Value does surprise because of the low performance. An explanation might be that because of high competition and/or bargaining power of customers they cannot yield a higher price.

The performance of company Maritime 2 for the indicator Customer Visits, New Customer Return Ratio and for the Tender Hit Ratio is placed below the Average performance. Maritime 2 has a production typology belonging to the engineer to order type. The indicator Order fulfilment, the Outgoing Delivery Timelines and the Production Cost Ratio lay on the Average performance line. The combination of the indicators provide the information that it seems that the company need to improve their relation with their customers. So that the indicator Customer Visits and Tender Hit Ratio show improvements. Improvements in this area might also provide positive impacts on the Customer Return Rate because identified needs can be offered to new customers. The Average Order Value is low but does still belong to the Average performance.

3.3.2 Benchmarking Match against Marine Equipment Group 4 (Instrumentation, Control, Navigation)

Within this group 6 companies could be grouped in. The following table 3.5 shows the common comparable indicators. Two of the companies have delivered not all of them.

No.	Business process	Performance Indicator (PI)	Unit	Description
PI 1	Obtain Customer Commitment	Obtain Customer Commitment Cost Ratio	%	The Obtaining Customer Commitment cost ratio is the cost of the Obtaining Customer Commitment process relative to the sales. The Obtaining Customer Commitment process consists of the marketing process, the sales process, which includes the tendering (quotation) process.
PI 2	Sales	Average Tender Preparation	Hours	To measure the time to prepare a tender in a given period
PI 3	Sales	Customer Base Growth	%	Number of new customers relative to all active customers in a given period.
PI 4	Sales	Customer Dependency	%	Number of customers accounting for 80% of sales/Number of active customers
PI 5	Sales	New Customer Return Ratio	%	Sales to new customers compared to the total amount of net sales in a given period. New customer means that a new customer account has been opened. New customer should not be promoted at the expenses of existing customers
PI 6	Sales	Tender Cost Ratio	%	Tender cost compared with the cost of the total net sales in a given period.
PI 7	Sales	Tendering hit ratio	%	Tendering hit ratio is the percentage of tenders that resulted into a customer order. A tender is an offer to a customer, to do some activity for a customer (e.g. produce products or deliver a service), against a price
PI 8	Order fulfilment	Order fulfilment lead time	Days	The average time across all products for fulfilling an order
PI 9	After sales	Average customer complaints handling time	Days	The average time taken from when a customer makes a complaint to when the customer is satisfied during the period

Table 3.5: Comparable Indicators

The first indicator PI 1: Obtain Customer Commitment Cost Ratio measures the generic business process Obtain Customer Commitment and provides information on how well a product is established or introduced into a given market. Furthermore it expresses how high the efforts are to sell a product. PI 2, PI3, PI4, PI5, PI6 and PI 7 measure the business process: Sales. Average Tender Preparation (PI2), Tender Cost Ratio (PI6) and Tendering Hit Ratio (PI7) measure the bid preparation procedure. Average Tender Preparation provides information on the complexity of a product. A long tender preparation combined with the production typology: engineer to order and high costs to produce the tender are due to a complex product. In return, low Tender Cost Ratio with a production typology: make to stock and a short tender preparation time is due to a standard product. The Tendering Hit Ratio provides information about the success rate of the tendering process. It indicates how well a company is informed about the requirements of their customers.

PI 3, PI4 and PI5 measure the relationship with customers. Customer Base Growth (PI3) informs about the fact whether a company is still in a growth phase. The evaluation of this performance indicator needs to be done on a year-to-year basis in order to define a best practice value for a specific branch. After years of high growth a consolidating phase needs to

be established. The indicator: New Customer Return Ratio shows whether the new customers gained can replace old active customers. There need to be a balance between new customer net sales and total sales of a company. This provides information about the life cycle of a product whether the product is still easy to sell to new customers also or not. If not then there is evidence that the product must be more on the end of its life cycle. Customer Dependency (PI4) provides information about how unique a product is. The advantage of a high dependency is that a company will get follow up tenders without problems. The risk is besides the financial dependency that a company has no bargaining power regarding price and quality efforts the one customer wants to see. The later is not always true as a role because it surely does depend on the complexity of the product and how high the effort is to replace a supplier for a customer.

The business process: Order fulfilment is measured by means of the indicator Order fulfilment lead-time. The time to fulfil an order measures the efficiency of a company. For the evaluation of this indicator further information as, e.g., the production typology, tendering costs and time, etc. needs to be taken into account.

The Average Customer Complaint Handling Time measures the business process: After Sales Service. The indicator illustrates how important is this service for the company, so low performance gives some evidence that the company has the service not identified as a market opportunity. The evaluation of this indicator should be seen in conjunction with the complexity of the product and its production typology.

The following figure 3.2 provides the final results out of the benchmarking match.

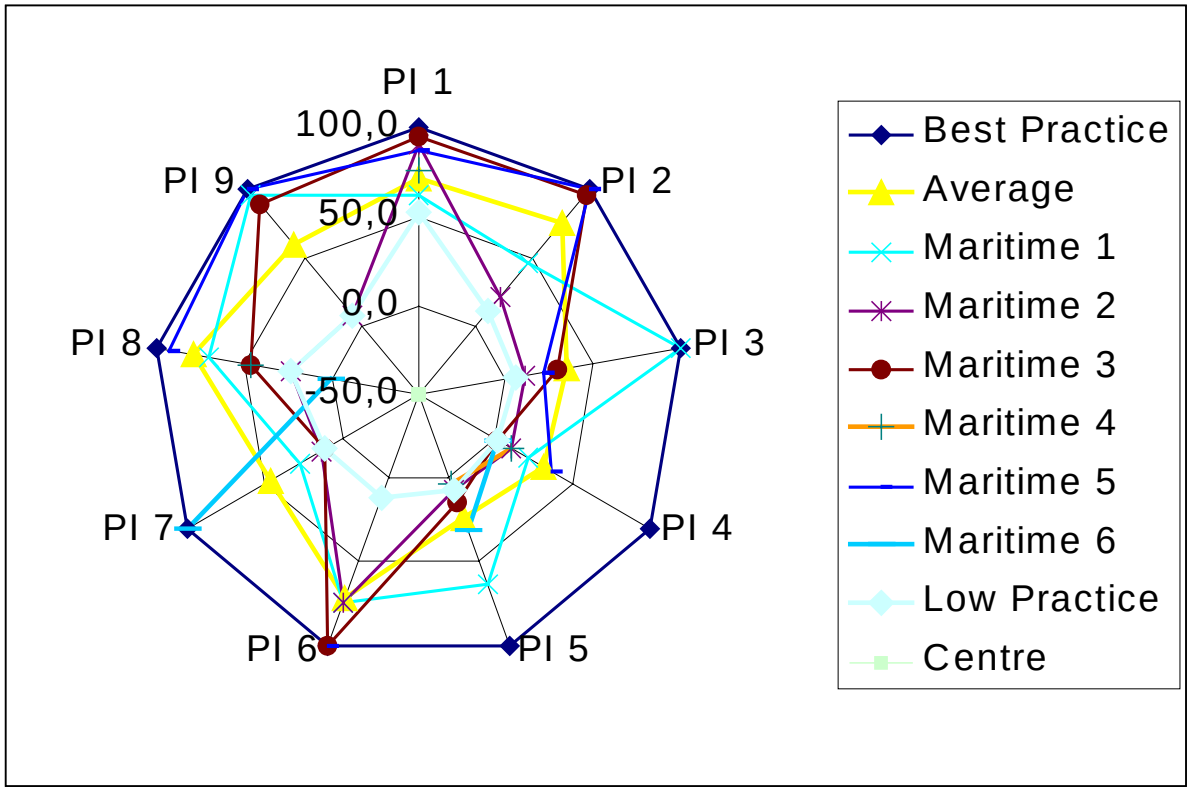


Figure 3.2: Result comparison against Marine Equipment Group 4

The spider net shows the comparison of 4 marine suppliers that are grouped into the marine equipment group 4. This group contains instrumentation, control systems and navigation system. The performance indicators of these companies are matched against selected companies out of the ENAPS database belonging to the NACE groups 31.20 and 33.20. These

NACE groups are related to the Marine Equipment Group 4 as defined in Module 1 of this report

The outer circle of the spider net defines the Best Practice case, which is the best value per indicator, reached within this match. The sky blue line represents the Low Practice that is the low performance value reached per indicator in this match. The Average yellow line indicates the average value reached out of all participating company figures out of the Maritime Benchmarking approach and the ENAPS database.

Maritime 1 represents a company example with the production typology: engineer to order. The indicator Customer Commitment and Tender preparation are below the average figure. The reason for this low performance might be that the high costs in marketing are due to a product, which is not jet established in the market. Evidence provides the performance indicator Customer Base Growth. Here Maritime 1 represents the best within this group. The Customer dependency is still on the level of the average figures. The indicator New Customer Return Ratio indicates that the number of new customers could be increased but that their sales volume is still rather low. The tender costs of the indicator Tender Preparation are close to the average figures and the Tender Hit Ratio is below the average figures. This might give further explanation for the low performance of the Customer Commitment Cost Ratio indicator. The Order Fulfilment Lead Time is close to the Average yellow line. So that here is room for further improvements. The indicator Average Customer Complaints Handling Time shows a very good performance. Maritime 1 has identified the after sales service as an opportunity. Summarising the findings the company Marine 1 is currently in a successful acquisition phase to extend their business, but improvements needs to be done on the production site (order fulfilment) and on the marketing site to understand the needs and wants of their potential customers.

The company Maritime 2 (violet line) has yield a good performance in the indicator Customer Commitment Cost Ratio. This means that their product must be well introduced in the market. The indicator Tender Preparation is close to the low practice performance. The reason for this is that the product is quite complex with an engineer to order production typology. This is in line with the indicator Tender Cost Ratio that lies on the average performance line. Furthermore the Customer Base Growth in conjunction with Customer Return Rate gained a low performance, which results in a high Customer Dependency. The Tendering Hit Ratio is surprisingly low. A reason might be that they try to find new customers but with very low marketing efforts/costs. Considering this relation to define Best Practice for the Customer Commitment Cost Ratio is hard to do. Further information on the indicators on a year-by-year basis need to be evaluated in order to recommend the right values for a Best Practice for the companies involved. Summarising the finding show that company Maritime 2 has problems in finding new customers. This might be due to a very specialised product and may be the wrong efforts to place their product. Furthermore improvements in Tender Preparation and Order fulfilment need to be carried out.

The company Maritime 3 (brown line) has yield a good performance for the indicator Customer Commitment, Tender Preparation, Tender Costs and Customer Complaint Handling Time. Maritime 3 has a production typology of assembly to order. Also the product is not very complex. The indicator Customer Commitment provides the information that the product must be established in the market. Tender Preparation and Tender Costs performance might be due to the fact that engineer's hours are not needed to make a bid. The low performance in Customer Dependency shows that the product must be specialised for specific customers. The indicator Customer Base Growth and the Customer Return Rate lay on the average performance line. The Tender Hit Ratio shows a low performance. This relationship provides some evidence that there is some competition even for customers with specialised needs. Therefore improvements are needed within these business processes. The indicator Order fulfilment is below the average performance, which might be due to problems in the supply chain. Summarising the outcome show that company Maritime 3 has problems to find new

customers and that there is competition around their traditional customers. Furthermore the supply chain needs to be improved.

The company Maritime 4 (orange line) shows a high Customer Dependency and a low Customer Return Rate. The Order fulfilment lies below the Average performance line and the Customer Commitment gained average performance. Unfortunately these are the only figures, which we received from them. The production typology is engineer to order, which goes in line with the high Customer Dependency value. The Customer Return Rate provides the information that they have only a few specialised customers, which allow them to life with a low performance in Order Fulfilment. Summarising the company Maritime 4 needs to improve at least their supply chain.

The company Maritime 5 (dark blue line) works with the production typology assembly to order. The Customer Commitment Cost Ratio, Tender Preparation Lead Time, Tender Cost Ratio, The Order Fulfilment and the Customer Complaint Ratio are close or define the Best Practice Case. The company has a product, which is well established, and they are close to the needs of their customers. Also the order fulfilment process seems to be well organised. The indicator Customer Base Growth and Customer Dependency show that they depend from specific customers and that a specialised product might be the reason for the low performance to find new customers.

The company Maritime 6 is an engineer to order production company. The indicator Customer Dependency shows that they are very depend on specific customers. The indicator New Customer Return Ratio is quite high in conjunction with the indicator Customer Dependency. That means that there are not that specialised but do still depend on a small number of customers. The Tendering Hit Ratio is here Best Practice, which means that they understand their market. Surprisingly low is the performance for the indicator Order Fulfilment Lead Time. This might be bad organisation but could also be due to a high technological product. Further information on Tender Preparation Lead Time and Tender Cost Ratio would provide here more information for the evaluation.

3.4 Benchmarking Match within the Maritime Equipment Group 4 without ENAPS data

This benchmarking match only consists out of the six companies, which could be grouped into the Marine Equipment Group 4. It compares the performance of these 6 selected companies. The indicator set is the same as above used.

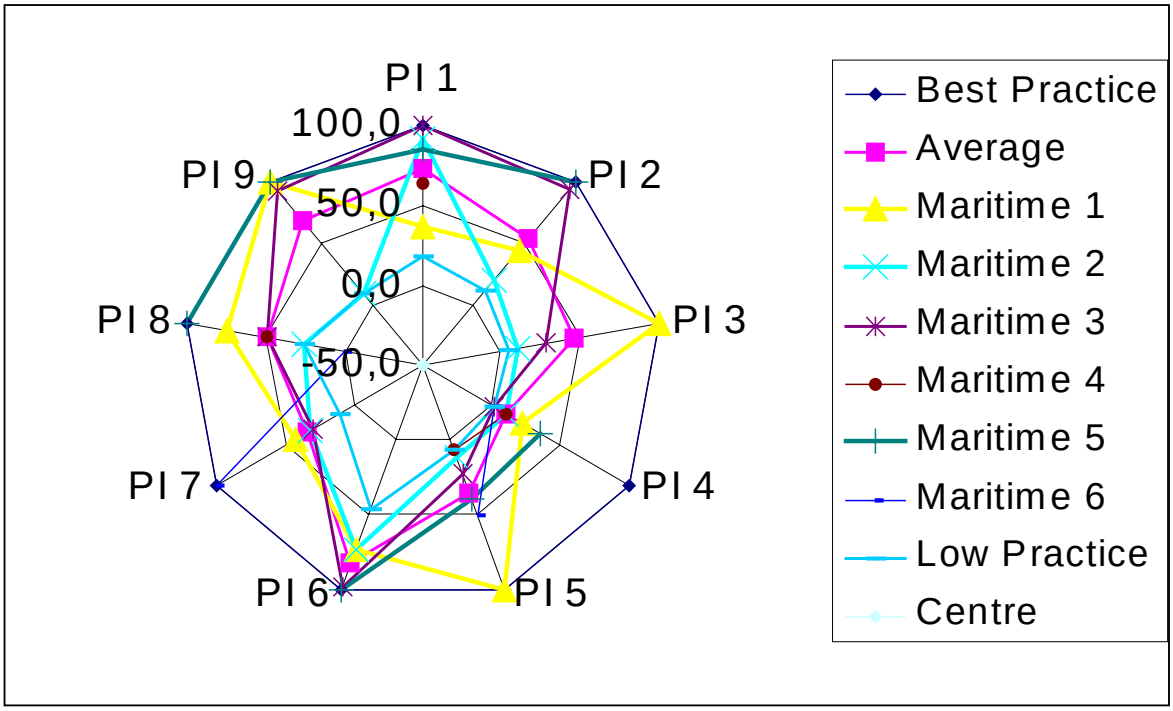


Figure 3.3: Result comparison between the 6 maritime companies

The comparison of the six companies (figure 3.3) shows that Maritime 3 has provided the best performance for the indicator Customer Commitment Cost Ratio. They have successful introduced their products into the market. Maritime 2 and Maritime 5 follow this performance. The lowest performance has yield Maritime 1. This relationship has therefore not changed against the benchmarking match against the selected companies out of the ENAPS database. The indicator Tender Preparation Lead Time could reach the highest points for the company Maritime 5. Company 3 follows this. The company 2 has reached here the lowest performance, which might be due to a high complex product. Company Maritime 1 leads the indicator Customer Base Growth. Furthermore they also lead the indicator Customer Return Ratio. Here the recommendation would be for the other companies to get in contact with Maritime 1 in order to find out which concepts are behind these performance indicators and to learn from them. The performance indicator Customer Dependency shows that all companies depend on specific customers up to 80 % of their sales. This might be due to the specifities of the Maritime sector. Within the match against the ENAPS database the average performance figures were closer to best practice. The New Customer Return Ratio shows a low or just average performance, which might be due to specialised products. The Tender Cost Ratio is within this match closer to best practice than within the match against the ENAPS database. This might be due to the fact that the 6 companies do their business in the same market. The Tendering Hit Ratio is led by company 6 which is due to a nearly 100 % dependency of specific customers. But still they might have a concept to understand the needs and wishes of their customer, which might be worth to learn from. Company 5 leads the Order Fulfilment Lead Time and the Customer Complaint Handling Time. This might be due to the production typology assembly to order. But still a contact to clear how they are organised might be of great value for the 5 companies.

3.5 Recommendation

The following recommendation should be recognised in order to attract companies to carry out benchmarking analysis to increase the efficiency and therefore the competitiveness of European companies.

- More dissemination activities are necessary
- Better co-operation with the national associations to promote Benchmarking
- Better illustration of the benefits of Benchmarking by means of success stories
- Better co-operation with national associations to motivate companies to participate
- Increase the awareness and motivation for Benchmarking in the industry
- Establish a permanent service for Benchmarking supported by the national associations
- Agree on harmonised company performance indicators gathered in a European database
- Ensure comparability between relevant performance data of marine equipment companies and relevant data from the general industry

According to above given recommendations the following post-project action is proposed:

Action 6:
The knowledge and the awareness about benchmarking and the potential benefits by applying respective approaches needs to be increased within the marine supplies industry. This action may include the building of permanent benchmarking services through offering a suitable tool, services and support through the national associations in a common European format. In this context, the European industrial associations should ask their members which indicators are of main interest to them for a European benchmarking analysis. Out of this list a common set of comparable European indicators should be derived and gathered in a European database.

A respective permanent benchmarking service could be combined with the building of a common European database for the industry as proposed in Action 2 (compare Module 1) and can be linked to WWW presentations of the European associations. The services can be jointly developed and offered with the support of external consultants. The authors further recommend to apply for support from the Commissions Services through the European Benchmarking Initiative.

4 Module 4 – Marine Supply Chain Management

4.1 Objectives

It is the objective of this working module to develop new approaches for a successful participation of the European marine equipment industry in advanced ship production environments with specific focus on integrated solutions and the application of new technologies, especially in the field of information and communication technologies, e.g. with regard to electronic commerce.

4.2 Summary

A total of seven main supply process chains have been identified for further discussion in the study. The most important chains are three out of the seven (marketing, ship engineering and design, purchasing), which should be specially focused by every maritime supplier. The chances of business improvements with respect to the supply chains have been analysed within this module in the following steps (figure 4.1):

- a marine supply product portfolio has been defined, the structure of the maritime process chains and the processes have been analysed
- management techniques and strategies have been analysed and compared
- information technology applications have been evaluated in respect to the process chains
- benefits and problems of selected information technology applications related to every supply chain process have been evaluated
- recommendations for using the chances of information technology has finalised the work

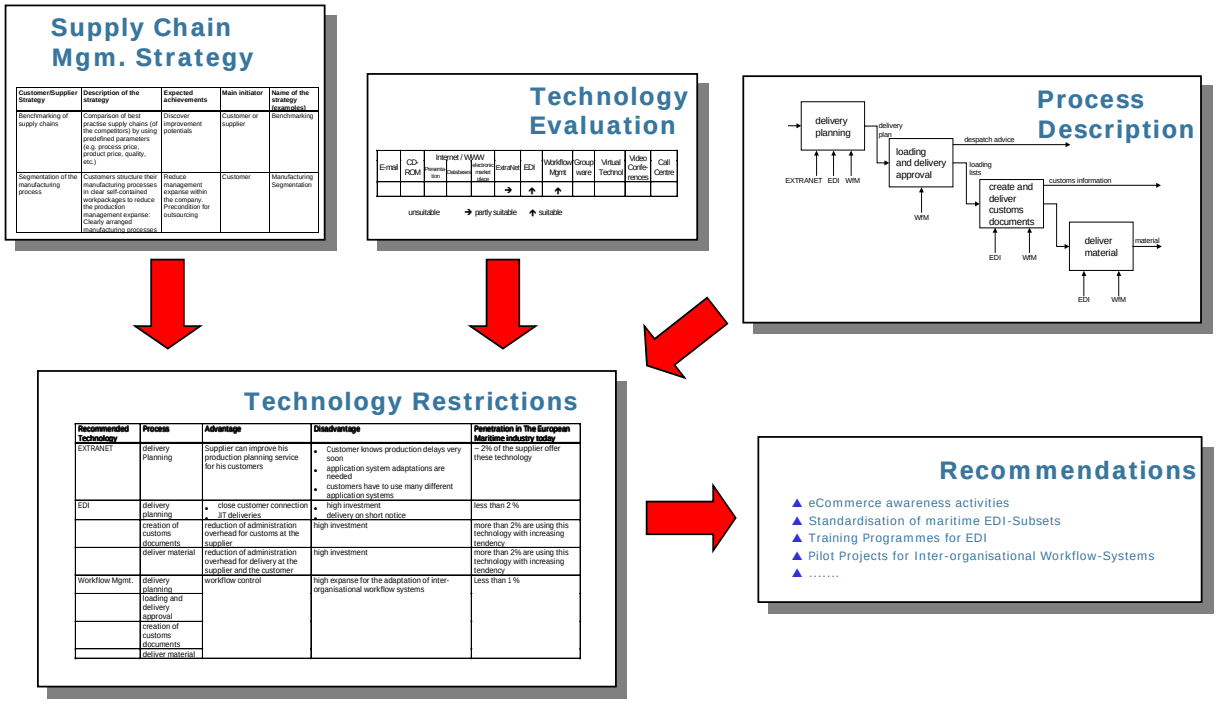


Figure 4.1: Approach to Recommendations

4.3 Approach

Basis for the discussion of new methods of work is the identification and discussion of the different processes of the maritime supply chain. Existing structured analysis of different

processes from supply chain R&D projects provides input knowledge for the work in this module.

Further, available knowledge towards the application of new methods of work to marine supply chains from the shipyards and shipping companies (and also from other industries) is used to evaluate the actual trends and strategies and to derive recommendations for the marine equipment industry.

The different available and proved management techniques and information/communication technology are discussed against the needs of the marine supply chain processes. In an iterative approach relevant strategies and techniques have been selected and assigned to the different marine supply chain processes. This will finally lead to recommendations for technology applications and new methods of work for marine supply chain applications.

On the basis of identified potentials to improve the competitiveness in marine supply chains the working group derives recommendations for potential actions to be taken by the Commission, the associations and the industry itself. This is to encourage a faster application of technologies and new methods of work.

4.4 General supply chain structure

The supply chain includes all tasks which are needed at the customer as well as at the supplier site to assure the delivery of supplier parts. In general the chain starts with the inquiry of the customer and ends up with the after sales service tasks of the supplier independent from company boundaries. Not only 1st-tier suppliers and subcontractors but also sub-suppliers and sub-subcontractors are part of the supply chains. The marine supply chain management within this study focuses mainly on the 1st tier customer supplier/sub-contractor relation to keep it simple. But it is sure that the statements are also valid for all the other supply chain participants.

The analysis of procurement chains at the different yards has shown that the relation to suppliers depends on the:

- Supply chain structure (amount of suppliers, project dependent supplier, etc.)
- Kind of co-operation partners (technology suppliers, standard part suppliers, engineering offices, classification societies, etc.)
- Kind of supplier products (standard parts, raw material, make-to-order-items)
- Type of final product of the yard (cruise liner, container vessel, etc.)

In general vessels have much more different supplier parts than other industrial products. That means maritime supply chains have to involve a high amount of suppliers/partners and in many cases these partners are only involved for a special project (kind of vessel). It could be, that such project independent partners are only active suppliers for one or two times in several years. The different supplier products and the different kind of co-operation partners leads to different requirements for maritime supply chains.

Nevertheless supply processes and products influence the final product price to a large extend. Therefor supply chain management strategies get more and more important for all yards. But such strategies can only be successful by close co-operations between suppliers and yards. Beside that the product suppliers have to focus more and more on their process chains in the future.

Optimisation of supply process chains is an central task for all partners involved. Supply chain management means the co-ordination of supply strategy/organisation and supporting information technology. The key factors of supply management are the supply products (definition see Annex 3-A) and the supply business processes (definition see Annex 3-B) as

well as the supporting management techniques (see supply chain management strategies in Annex 3-C) and technologies (see communication and information technology defined in Annex 3-D). A successful combination of these key factors leads to optimised supply processes. But the interrelations between the factors should not be underestimated. The implemented supply chain management strategies are depending e.g. on the product groups (see Annex 3-F). But under the cost/benefit view specific management strategies should be used for several product groups. Because the implementation of to many different strategies in a company could suspend the positive effects. The strategy influences the requirements for the supporting communication and information technology (see Annex 3-G) and vice versa. This is also valid for the supply business processes. There is are close dependencies between supply strategy and supply processes (see Annex 3-E). But the main focus of this study is the interrelationship between the marine supply business chains and the supporting communication and information technology (Annex 3-H), which is collected for inter-organisational processes under the synonym ‘Electronic Commerce’. The short description of the dependencies of the different key factors for supply chain management shows the complexity of supply processes and proofs that the improvement of supply chains is a continuous process.

4.5 Technology Discussions per Process

As a first step within this study seven different supply process chains have been defined. The process chains discussed are:

- marine equipment type approval
- marketing process
- ship engineering and design process
- purchasing process
- delivery process
- assembly process, testing and approval
- guarantee, after sales service, maintenance and repair

Based on these process chains (see box in figure: Process Description) the information technology applications used outside the maritime industry or under development at application oriented software vendors have been analysed. These technologies have been evaluated in respect to maritime supply chain requirements. The results (see box in figure: Technology Evaluation) have been described in detail in Annex 3-D. Additionally different management strategies (see box in figure: Supply Chain Management Strategy) related to the chains and proved in other branches have been reflected in the Annex 3-C.

Based on these results a structure of the seven process chains, which text description is part of Annex 3-B, has been defined (see box in figure: Process Description). The described structure of the supply chains is the result of many discussions with several yards, suppliers, class societies and owners within this study, respectively knowledge and experience gained through R&D and industry application projects. Every supply process chain is described by four sub-processes, which is still a very rough but sufficient description. A more detailed description would include too many company specific details, which goes far beyond the scope of the work in this study. Information technology applications have been associated to all described sub-processes, which could benefit from the application of the technology. The result are complete Process Portfolios including the brief process description, basic technology selections and specific technology discussions including potential benefits, disadvantages and a discussion on the penetration in the European Maritime Industry today. One example for a Process Portfolio (for the purchasing process) is attached in Annex 3-H.

The major work in this working module was the evaluation of technology restrictions by the project team. Therefore the technology (result of the technology evaluation), the supply management techniques (result of the evaluation of management techniques in different

branches) and the processes (result of the process description) have been combined (see figure above). The Technology Restriction tables (for details see example in Annex 3-H) show the chances and risks of the different applications for every process chain respectively every process. The lists of chances/problems is still an open list, because the high speed of new IT-developments add new points frequently. But the list supports the technology orientation for maritime supplier chain participants.

In general it has to be ascertained that the level of information technology applications within the maritime industry is very low compared to other branches. Additionally the process chain orientation is very low within the different companies. For the different processes the following can be concluded:

- Type approval process: A reduction of development and reaction time (higher flexibility) could be expected by a higher IT penetration.
- Marketing process: Closer customer contact and better feedback could be expected by using IT more intensively.
- Ship engineering and design process: There is a high potential for cost and refinement time reduction through closer customer/supplier connections, reduction of administration overhead and a higher information actuality.
- Purchasing process: The high administration overhead within this chain could be reduced drastically by IT.
- Delivery process: Information technology combined with logistic strategies could improve this process chain.
- Assembly process, testing and approval: A better support of supplier's fitters could lead to more effective assembly processes and open new chances for supplier (become a system supplier)
- Guarantee, after sales service, maintenance and repair: The improved support of on-board crews could reduce maintenance expense.

The detailed analysis results for the different process chains are part of Annex 3. From the technology point of view the table of Technology Restrictions (see Annex 3-H) leads to the following general conclusions (except of some individual cases) for the maritime supplier:

- The use of information technology for supply chain support is very low
- E-mail is the only technology which is applied in many maritime companies, but sometimes with low penetration (only access possibilities only for a small employers group)
- CD-ROM catalogues are offered by some suppliers. An increasing interest has been ascertained at different customers (yards and owners). The usefulness of CD-ROMs depends on the content (just information or data which can be used for different applications)
- INTERNET applications in the maritime supply industry are mainly focusing on low level company presentations. The chances as information sources (databases) and business platform (market places) haven't been recognised yet.
- ExtraNets are used in some cases for co-operations between suppliers and customers, but there is still a high potential for additional application fields.
- For EDI applications three groups have been identified:
  1. Suppliers who are using EDI (based on national or international standards) for customers outside the maritime branch but not for their maritime customers and
  2. ship owner who use EDI (based on national or international standards) for the connection between the ship and their office but not with their supplier and
  3. a very small supplier group who uses EDI technology with one or two customers based on bilateral formats, which makes the enlargement impossible because of the high management expense.

The high potential of this technology hasn't been recognised, because of a general lack of business process know-how at the suppliers. This is especially true for SME's with very few key persons, which are basically product oriented.

- Workflow management systems are available for well defined and structured business processes. Systems which will fulfil the high flexibility requirement of maritime business chains are still under development. There is a high risk to apply such system in the maritime industry today.
- In the maritime industry groupware systems are in use for some very close groups. One important handicap is the incompatibility of many systems which requires a high adaptation and management expanse.
- Virtual technology is still under development by some software vendors. Only pilot implementations are available.
- Video technology is available in some bigger yards but the use is very low because of the lack of communication partners (only a few supplier companies are equipped with this technology)
- No call centre activities have been found in he maritime industry. In many cases supplier's business bases on old business connections and personal contacts to yards and ship owners.

These conclusions draw a pretty difficult picture of the situation in the maritime industry. In general it seems that the take-up of advanced technologies to improve co-operative partnerships between shipyards and their suppliers is very slow compared to other industries. Even if the technology has not been applied in other industries as well to a full extend, the awareness and basic knowledge about the commercial potential seems to higher than in the maritime industry. This of course has its exceptions and therefore, some companies are also frontrunners in the technology application than others. But, since the application of these new technologies depend very much on (not yet existing) co-operative understandings and agreements across company borders even those companies cannot benefit fast enough from the application of the technology. Regarding the high potential for cost-savings and process improvements, especially with the view to international competition, it would be therefore beneficial if European shipyards and their suppliers would build comprehensive and powerful co-operative networks supported by new technologies. This could lead to sustainable productivity improvements which cannot easily be copied be competing regions. However, it is a long way to achieve these targets and may require several actions to improve the business of maritime suppliers in the future.

4.6 International R&D Activities

A number of activities in competing regions, i.e. Japan, Korea and the US have to be noticed in order to understand the development of the commercial environment, to evaluate the competitive position and to launch respective countermeasures. The following activities have been identified which cannot only be seen as projects with a competitiveness-relevance to companies, but with relevance to the competitiveness of regions. This is because they are targeted on building infrastructures and networks which can be used as a technology platform by the entire industry.

Japan

Three industry wide projects on information exchange among shipping, shipbuilding and marine machinery/ equipment companies can be identified:

The first project named as "Senpaku (Ship) CALS project" consists a series of experiments for the purpose of establishing core technology for electronic exchange of technical information for realising "sharing of technical information using computer network" especially among shipbuilders, ship owners and ship classification societies.

The second and the third projects, named as "Senpaku EC project" and "Zohaku Web project" (Shipyards and Marine parts suppliers) respectively, extend their scope of information exchange to technical data between shipbuilders and ship machinery/equipment suppliers. They cover recent information technology widely popularised as well as rapidly advanced such like PC and WWW which will realise better collaboration and co-operation in the near future among those parties involved in the projects. Further, many efforts are being directed towards the standardisation of various data to be exchanged.
Not very many technical details are known about these projects, but that there it is a comparable broad approach, covering major groups of the Japanese maritime industry. The Zohaku project for examples includes 21 Japanese shipyards and a total of 64 suppliers (!). So it can be seen as a project of strategic importance.

Figure 4.2: Japanese Maritime Web Project (Source: Project Manager)

Korea

The Koreans are building an “Industry-Wide Intranet for Ships and Ocean Engineering in the context of KSNET, the Korean Shipbuilders Network. The final solution will offer internet based services to the entire maritime industry in the areas of general communication support, information services, engineering services and education services. The project is scheduled to be finalised by the end of year 2000. Figure 4.2 shows the principal architecture.

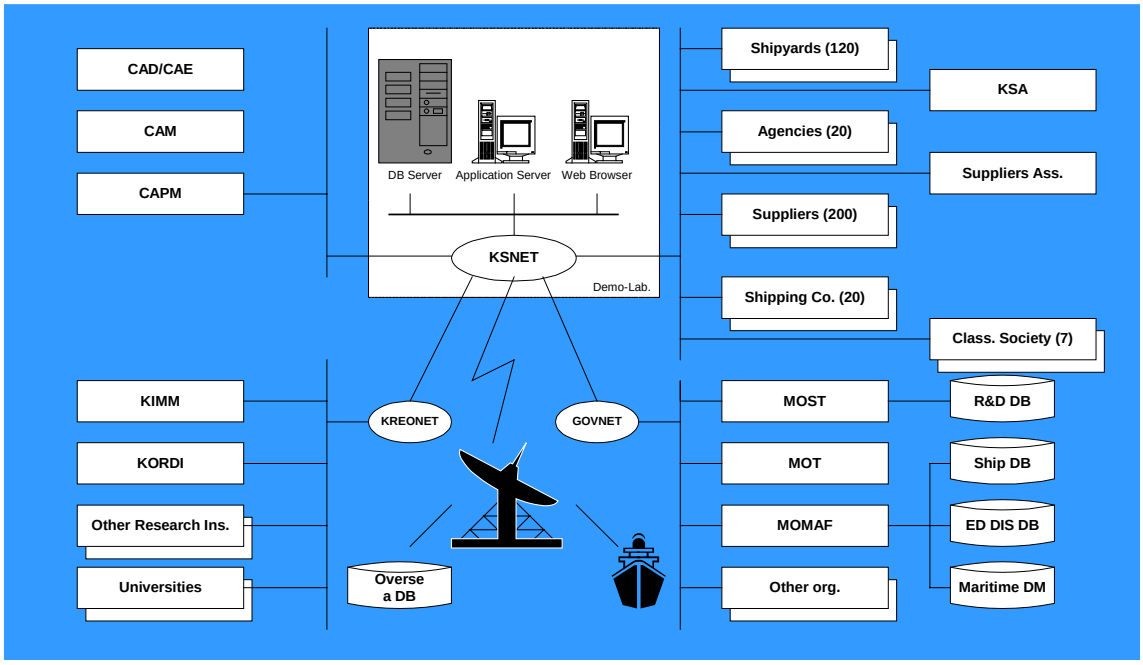


Figure 4.2: Korean Maritime Intranet Project (Source: KSNet Presentation)

USA

The USA is far more developed in terms of using advanced EDI and Electronic commerce technologies in general. Through a high governmental involvement for public procurement the direct support of companies to facilitate their access to the technology and to build respective infrastructures is on a very high level. There is for instance a large network of so called Electronic Commerce Resource Centres which directly support and educate companies to get used to the technology. Further, targeted R&D projects are performed and lead to real applications.

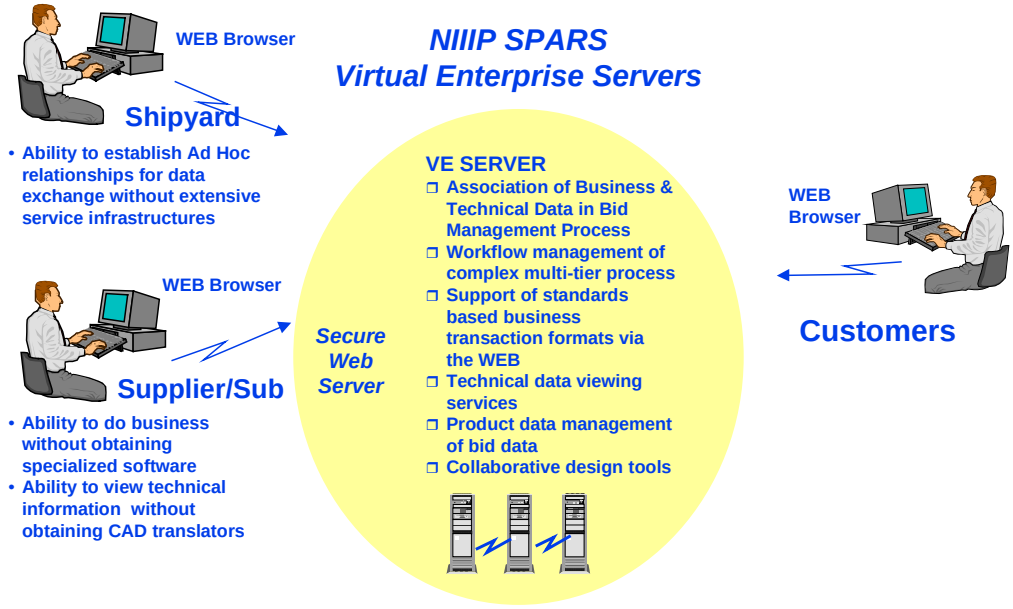


Figure 4.3: USA project NIIIP SPARS – High Level Architecture (Source NIIP Presentation)

As one example the NIIIP SPARS project can be mentioned (National Information Infrastructure Protocols for Shipbuilding Partners and Suppliers). Started in 1997 the project is building an industry wide infrastructure allowing digital co-operation between shipbuilding partners and beyond. This project involves big technology partners (IBM) as well as major shipyards and suppliers for prototype development and justification. The original project was scheduled to be finalised by the end of year 2000 and has recently been extended to 2001. Figure 4.3 illustrates some of the functionality to be realised in the project.

Europe

Actually there are no comparable European projects with maritime industry participation, which are targeted to build industry wide infrastructures. European R&D projects are targeted more towards single technologies and processes and the industry tries to ensure know how transfer and R&D co-ordination by means of networking activities. The European maritime industry, especially shipyards, has been comparably early in launching R&D projects with respect to co-operative working. However, this has slown down in the moment and the authors see the danger that the European maritime industry falls behind their competing regions.

4.7 Recommendations

The analyses of marine supply chains in Europe have shown a high potential for improvements in respect to management strategies and information technologies. The work for this study has shown that the awareness of management techniques and the awareness as well as the implementation of information technologies is low compared to other branches in Europe. The

motivation to improve supply business process could be and should be higher in the European maritime industry. The description of international activities has shown that many of the international competitors in the maritime industry are working much more intensive on the optimisation of their inter-organisational business processes. As a consequence of these results two actions are recommended by the authors of this study:

Action 7:
In order to increase awareness and motivation to apply advanced technology to the various processes of the supply chain it should be a pre-dominant task for the industry organisations to organise know how transfer-activities for their member companies. This may include the generation of demonstrator applications in order to prove economic potentials. Respective activities may be supported by the Commissions supporting programmes, e.g. the Innovation Programme, or by similar national programmes.

Action 8:
Careful consideration of actions taken by major competing regions (Korea, Japan, USA) to build, adapt and maintain information technology infrastructures for marine supply chain applications and co-operative working. As a consequence the industry (shipyards jointly with suppliers) should develop proposals for subsequent measures on a European level to be launched in the context of the European 5th Framework Programme for R&D. The necessary moderation to develop co-operative understandings between shipyards and suppliers should be a natural task for CESA/COREDES and EMEC, respectively by the similar national pairings.

Annex 1: Industry Structure and NACE Assignment

Annex 2: Company Benchmarking

Annex 3: Process Portfolios