EU Study Competitiveness and Benchmarking in the Field of Marine Equipment (ETD/98/502029)

Public Report

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Annex 3

Process and Technology Portfolios

Content:

Explanation

This Annex describes the key factors (including their dependencies) for Marine Supply Chain Management. These key factors are the marine supply products, marine business processes, marine supply management strategies as well as the communication and information technology and the relations between these factors. The strategic purchasing portfolio for **marine supply products (Annex 5-A)** has been described. Seven **maritime supply business process (Annex 5-B)** have been selected and defined, but marketing, purchasing, engineering and design are the business processes on which the European maritime suppliers should be focused to improve their competitiveness. Beside the products and processes the supporting measures and technologies like **supply chain management strategies (Annex 5-C)** and **communication and information technology (Annex 5-D)** are important to optimise the inter-organisational business processes.

	Marine Supply Products	Marine Supply Business Processes	Supply Chain Management Strategies	Communication and Information Technology
Marine Supply Products				
Marine Supply Business Processes	in general business processes are product independent			
Supply Chain Management Strategies	ANNEX 5-F	ANNEX 5-E		
Communication and Information Technology	in general information technologies are product independent	**ANNEX 5-H**	ANNEX 5-G	

By combining the four key factors additional possibilities for improvements are shown in **Annex 5-E (strategies related to business processes)**, **Annex 5-F (products related to management methods)** and **Annex 5-G (management methods related to information technology)**. But the most important combination in the context of this study is **Annex 5-H (business processes related to information technology)** which describes the challenges and risks of electronic commerce for the European maritime supplier industry.

ANNEX 5-A: Marine Supply Products

Discussions with shipyards as the main customer for marine equipment manufacturers and the analysis of available background materials lead to the definition of a strategic purchasing portfolio for marine equipment products. This was possible due to the fact that in the last five to ten years European shipyards have very much improved the knowledge about their supplier base. Before it was very often an unstructured and not maintained set of data which was almost not used for strategic planning or to develop broad knowledge on the supplier base. Since the awareness about the profit impact of bought-in-items has increased and subcontracting became a subject of increasing importance this has changed. Shipyards started internal projects to learn more about their supplier structure, average purchase values, purchasing efforts, geographical location etc. On this basis it was possible to classify suppliers in a structured way and to develop a strategic purchasing portfolio according to an approach applied also by other industrial branches (Figure 1). This is used to assign marine equipment respectively the shipyards subcontractors and suppliers into the different portfolio sectors.

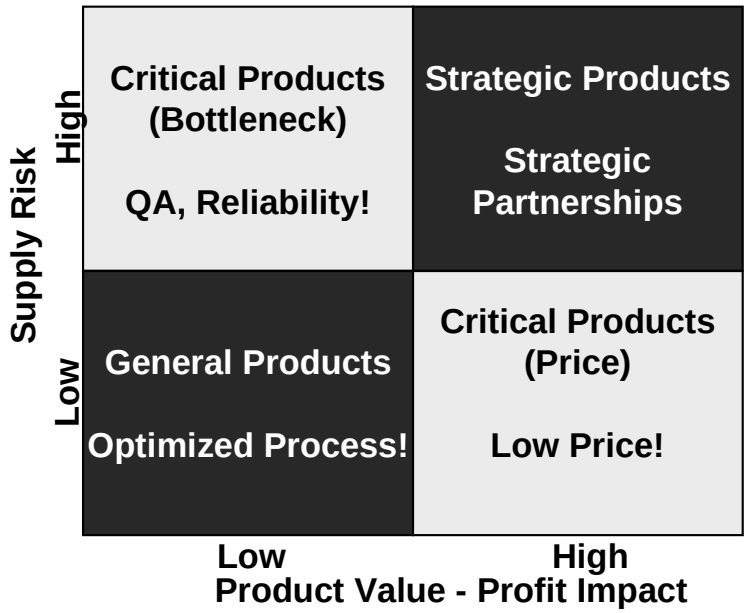


Figure 1: Strategic purchasing portfolio

The portfolio structure has been used to define performance indicators for marine equipment products respectively suppliers assigned to the four portfolio sectors. According to the four segments of the portfolio the following characteristics have been defined:

Strategic Products

Examples: turn-key supplies, system-supplies, main engines, integrated bridge equipment, products which may give a differential advantage to the end-product

Critical Factors: cost are high, impact to the quality of the final product is high, few manufacturers, long term sourcing, delivery lead time is critical

Management Approach: strategic alliances, increase liability of suppliers, accelerate early availability of specifications, co-operative design, long-term contractual agreements apart from single contracts.

Performance Indicators: technological leadership, co-operative engineering, reasonable price

General Products
Examples: Of the shelf (catalogue, standard) products, no special-to-type specification, may come in large quantities, e.g. pumps
Critical Factors: cost of acquisition and ordering process
Management Approach: standardise products, reduces number of suppliers, formalise/simplify/improve purchasing process, volume frame contracts, internal maker/supplier list
Performance Indicators: low price, quick market response, sustainable quality, ability to integrate processes, quick delivery

Critical Products (Bottleneck)
Examples: products of relatively low value, but critical for the final product, e.g. propeller, fire doors
Critical Factors: delivery in time, sustainable product quality, good co-operation during engineering, failure may either increase process cost or jeopardise timely delivery.
Management Approach: application of quality assurance mechansims, strong auditing of suppliers, standardise (simplify) products to decrease risks, develop alternatives, long term partnerships but contract per product relations.
Performance Indicators: reliability in products and processes, good quality record, experienced team-workers, flexibility, timely delivery, reasonable price

Critical Products (Price)
Examples: products which are of relatively high value, but maybe not critical for the performance of the end-product, standard catalogue products, e.g. diesel-generators sets, deckcranes
Critical Factors: price
Management Approach: internal makers list, reduce number of suppliers, supplier audits, individual negotiations
Performance Indicators: low price, sustainable product quality

All products with a **high supply risk** (upper row of the metrics) needs a more closer co-operation between the yards and the suppliers/sub-contractors than products with a **low supply risk** (lower row of the metrics) which results in different process chains (Figure 1).

ANNEX 5-B: Maritime Supply Business Processes

Elements of the maritime supply chain can be found in almost all processes of ship newbuilding, repair, maintenance and operation. The respective work and effects cannot be limited to the work of the purchasing department, but has to be considered as an integrated element in almost all functions throughout the shipbuilding process. It already starts with the suppliers seeking for markets and acceptance of their products and it continuous after the ship delivery through life cycle supporting functions in the area of maintenance and repair. Besides the shipyards and the suppliers maritime supply chains involve many external partners directly and indirectly and require an extensive communication process including specially applied management procedures. More specifically the maritime supply chains may be distinguished in the following seven business processes which will be integrated at least on a common information base:

Marine Equipment Type Approval

The Type Approval process is structured into three steps. The supplier has to submit the application information (e.g. copies of applicable drawings and datasheets; test results; sufficient data to verify compliance with stated standards; additional specified information related to the application). After application information reception the Classification Society executes the design evaluation, prototype testing, management assessment (performed by local surveyors using standardised checklists) and production assessment (performed by local surveyor using standardised check-sheets for guidance). All this class tasks include step 2 of the Type Approval Process. The production surveillance has to be conducted on an annual basis. New products or changes to existing products may necessitate additional design reviews. As the final step (step 3) the certificate is issued to the supplier. In general it is valid for five years. The Class Society puts the product on the list for Type approved products (Remark: Some Classification Societies make this list public on their Web site) and the manufacturer can market the product as type approved by classification society.

Marketing Process

Not only to present the innovation ability suppliers have to make public their new products and developments. The goal is to sell new products to customers, to keep customers informed and to find customers. Nowadays marketing is done via exhibitions, mailing, personal visits/contacts, workshops etc. This ways will also be used in the future. But new communication technologies allow improved methods to get in contact with new customers respectively to get customers in touch with new products.

The distribution of e-mail (group mailing) is one way to distribute product and company information. This methods nowadays are used very often in the computer industry. It is much more person oriented than “group faxes” because e-mails normally are delivered to persons while fax-machines are group oriented (relate to departments, teams, etc.). The disadvantage is that the potential customer could be nervous after getting too much marketing mails. This is also the case with Call-Centres. Customers which are disturbed too often by Call-Centres will get a negative impression from the advertising company.

CD-ROM catalogues as well as World Wide Web (WWW) presentations open sophisticated possibilities for marketing actions. Many companies use both in parallel which is possible with the same technology. WWW information are much more actual because the information update will be closer to the actual situation. It allows daily price updates and the demonstration of the delivery ability by publishing the actual stock lists. Therefore, interfaces to the in-house system is quite useful to transfer product information directly from the in-house system into the WWW. Additional new ways for the selection of suppliers are possible, like calls for tenders by using the WWW.

Ship Engineering and Design Process

One of the first phases of the production life cycle of a ship is the **preliminary design phase** which is initiated by the inquiry of an owner. During this phase the rough product specification is done between the future ship owner and the leading yard. The yard has to calculate the product price, based on their experiences (price per ton steel) and some first supplier/sub-contractor information. In this phase, mainly non-structured information have to be exchanged between the owner, the yard and some chosen suppliers/sub-contractor.

After signing the contract with the owner, the purchasing process starts with the selection of chosen products, suppliers and sub-contractors. Orders are placed after finishing the first **functional specifications**. These processes start with less structured information, but the degree of structuring increases over the time.

High supply risk items are products, which can nor be bought off the shelf, but are specially built or adapted to the special needs or requirements of the yard. For this product typically a design refinement is needed along the development of the project.

Refinement cannot be separated from the design process and has a strong relation to the product. Therefore the refinement process starts when the first specification is being sent by shipyard to the sub-contractor and after having received the first technical proposal from the sub-contractor, which should include scope of supply, main technical data about the performance, installation drawings, description of interfaces etc. or at least every information required to asses the suitability and the consequences to install the equipment. The process terminates at the end of ship commissioning. The design refinement process does not necessarily mean changes but also further specialisation of a proposal.

It can happen due to the change of important boundary conditions, as for example the performance of the component has to be changed for various reasons. This also includes changes in the scope of supply, which could be increased or decreased by demand on the yard. In this case it may be necessary to change properties of the equipment, which may also make financial adjustments and negotiations necessary. Other reasons for necessary design refinement are, that the equipment is at the time of the signing the contract not defined in all its details. These details must be clarified in a discussion between sub-contractors and yard during the development of the project. If there are serious changes, it could be necessary to ask the class for an approval of the modifications. By this process the quality of information is increased, starting with rough and outline information and ending up with exact information about the equipment.

Purchasing Process

The purchasing process at the yard has to be distributed into two sub-processes. The pre-order process includes the selection of possible suppliers and product groups to create a list of authorised suppliers for the yard. All these tasks are handled independent form a dedicated vessel order. In opposite to the pre-order process the order process relates to concrete requirement related to a special vessel at the yard.

- **Pre-order processing**

In some companies a special department is responsible for pre-order processes. These people visit international and national exhibitions, study magazines and organise meetings with potential suppliers and sub-contractors. The goal of this group is to find new suppliers which deliver innovative high quality products on a low cost respectively low price basis.

Today pre-order processes are initiated by the customers. In many cases the costs for the order process are the multiple of the supply product value. Therefor different supply chain management strategies have to be adapted to reduce the costs.

In the maritime industry low supply risk items were ordered by call-offs. That means, the yards have contracts with dedicated suppliers for these kind of products. The discussion on the contract were made once or twice a year. Two different kind of contracts can be distinguished:

Commercial agreement: Deal with a supplier fixing the trade conditions and unit prices over a defined period (year/ship) for all the components of this bargain (reference, technical description, wrapping) based on estimated quantities. Then the purchase requisitions refer to this contract.

General agreement: A long time transaction deals with supplier and fixing the general trade conditions (discount, payment terms, rebate). Order details are not included in such kind of a contracts but only heading information. Then the purchase requisition refers to the general agreement.

In the pre-order phase **benchmarking of supply chains** will get more important in the future. The only reason for using this method not very often is the less availability of benchmarking data for logistic chains in the maritime industry. But some yards have defined their own benchmarking parameters to evaluate their suppliers and sub-contractors. The **purchase consolidation** of yards seems to be a big dangerous for many suppliers. Yards try to consolidate their supply base of like or similar items and also multiple purchases of different items from one supplier into a single master purchase agreement. This means for the purchasing process to reduce the internal cost, fewer purchase orders, lower prices, better delivery performance and better consideration of customer needs. This requires a close relationship between customer and supplier which is not possible with a large number of suppliers.

Suppliers and sub-contractors have to be prepared for purchase consolidation by organisational measures. The intensive communication between customer and supplier can only be handled by using modern information technology. To get an master purchase agreement requires the delivery of different supply items through one supplier. Therefor this supplier needs not only close connections to his customer but also to other suppliers (create supplier consortiums).

Supplier have to carry out their special advantages. This could not only be product price and quality. Special services or strategies to optimise the logistic processes are one point to be different from competing suppliers. E.g. supplier companies are known which offer KANBAN methods by using EDI technology. That means that the customer needs no effort to manage his stock.

- **Order Processing**

A purchase requisition is a group of refinements depending on supply sources in order to get a quantity of some items for a delivery date. It can be created:

- automatically from a list of requirements in the technical BoM (Bill of Material),
- automatically when stock warning,
- manually for all other products by technical agents.

Purchase requisition creating process is the same whatever being origin and product:

- bill of material
- ask for price if necessary with some suppliers (not for orders based on a commercial or general agreement)
- trade conditions recovering in the data base if the product refers to an agreement.

Technical documents or notes may accompany the purchase requisition.

For low supply risk items the purchase expanse is partly reduced by the pre-order processes. High supply risk products requires more expanse as mentioned in the previous chapter The amount of high supply risk items depends on the kind of ship and the yard. One European yard has defined approximately 80 high supply risk items needed for a ship and another one has estimates that 40% of their supply products are belonging to this group. Nevertheless these products require a lot of processing work. The purchasing process for high supply risk items starts in the preliminary design phase.

Along the whole order process there is a regular exchange of information with the design refinement process. This means that the design could be altered during a long period and is only considered to be frozen when the AFC (Approval For Construction) is sent by the shipbuilder to the supplier. Also, the ship owner and the classification society could influence the ordering process at various stages depending on conditions stated in the contract with the ship-builder.

For supply articles with a low risk the purchasing processes can be structured. This could lead to the application of structured logistic methods like KANBAN. For optimisation this method has to be supported by EDI.

The purchasing of high risk supply parts is connected to the design process and requires unstructured information exchange technologies (e-mail, video conference, etc.) at the beginning of the process. Getting to the end of this phase the information exchange will be more and more well structured (EDI, ExtraNet, etc.). For an optimise information exchange the supplier has to support several technologies for the communication with his customer.

Delivery Process

For several yards the delivery process starts with the supply control chain. It is needed to assure the quality and the delivery in time. Therefore the production schedule of the supplier was checked by the yard. This was done by visits or by telephone calls.

Delivery of goods are checked in general warehouse or on stocking places. Dispatch note are recorded and checked with orders (quantity, description...) and technical controls are made to assure the conformity with the specifications.

After the delivery the payment process is started more or less immediately. To improve the data exchange the use of EDI, Workflow Management, etc. would be useful. Within the delivery process the information of the article and the article have to be connected. Therefor technologies like BARCODE, Transponder etc. are available. which would reduce the delivery expanse and speed up the information flow. Suppliers should be aware of this technology.

Assembly Process, Testing, Approval

In former times yards have ordered supplier products and assembled. Today the yards which ordered complete installed systems are increasing. Therefor the subcontractor has to assemble and test his products at the yard respectively on ship. After the system was approved on board the payment process is released by the yard.

These requirements need the integration of the sub-contractor into the scheduling system of the yard**. Integrated Product Teams** have to be established together with yard employees. For the assembly preparation the sub-contractor needs a close connection to the yard which should be optimise by information technology.

Guarantee, After Sales Services, Maintenance, Repair

A world wide After-Sales-Service gets more important. Suppliers and sub-contractors have to support planned repairs (e.g. maintenance) as well as unplanned repairs (e.g. guarantee). Therefor actual information of the sub-contractor products are requested at every point and every time over the whole product life cycle. Nowadays it is a problem to collect the latest information from the suppliers, subcontractors and sub-suppliers. Flying squads are travelling around the world to support ship crews to repair on-board systems.

Pilot projects have shown that multimedia technology support can reduce the maintenance cost drastically. The close connection to all co-operation partners of the yard improves the maintenance process by reducing the repair time and costs.

ANNEX 5-C: Management Strategies for Marine Equipment Supply Chains

Analysis and discussions with European yards and suppliers have shown some trends and strategies to improve the supply chains. Theses strategies are similar to other branches but there is no strategy of the maritime industry which is used by all or a bigger group of companies. Nevertheless only a clear strategy led to efficient supply chains. But therefor the suppliers and the yards need very close co-operations across company boundaries.

Supply chain strategies effect the inter-organisational co-operation structure and also the applied information and communication technology and vice versa. The following 13 strategies have been found sporadically in the maritime industry but with increasing tendency. Interviews have shown that many yards are thinking, planning and working on the application of these strategies.

Customer/Supplier Strategy	**Description of the strategy**	**Expected achievements**	**Main initiator**	**Name of the strategy (examples)**
Benchmarking of supply chains	Comparison of best practise supply chains (of the competitors) by using predefined parameters (e.g. process price, product price, quality, etc.)	Discover improvement potentials	Customer or supplier	Benchmarking
Segmentation of the manufacturing process	Customers structure their manufacturing processes in clear self-contained workpackages to reduce the production management expanse: Clearly arranged manufacturing processes	Reduce management expanse within the company. Precondition for outsourcing	Customer	Manufacturing Segmentation
Standardisation, various variant definition and grouping of supplier items	Customers try to standardise or at a minimum try to define various group variants of their supply items which lead to the reduction of the number of suppliers and orders Increasing order amounts	Reduce process costs. Discounts based on order amounts	Customer	Purchase Consolidation
Reduction of manufacturing penetration	Focussing on the company essentials at the customers	Reduce the product costs. Improve the quality	Customer	Outsourcing
Integrated customer/supplier teams	Customers production is also related to supplier items. To solve production problems common teams (customer/supplier) are settled within this strategy: Solving problems immediately	Improve the processes and quality continuously. Reduce costs for product and process changes	Customer or supplier	e.g. Kaizen, Teamwork, TM (Total Quality Management)
Lowest total cost selection	Supplier selection bases on the lowest total cost (includes costs for supplier selection, supplier management,	Find supplier products with high quality and lowest cost over the life cycle	Customer	Total Cost Evaluation

Customer/Supplier Strategy	Description of the strategy	Expected achievements	Main initiator	Name of the strategy (examples)
	receipt and installation of supplier's product, after sales service, etc.) not on the lowest purchase price			
Qualification	Customers train suppliers or suppliers train customers to get more efficient products and processes	Better understanding of customer's and supplier's processes and products	Customer or supplier	Customer Training or Supplier Training
Continuous improvement	For long term contracts a plan is defined with improvement goals for every time slot (e.g. 2% price reduction per time slot, on-time delivery rate from 99,2% (1st slot) to 99,8 % (3rd slot). A time slot could be half a year or one year.	Improve the product and process quality, reduce the price, improve the service	Customer or supplier	Continuous Improvement
Develop new suppliers	Foundation of new companies or create joined ventures together with suppliers	Reach customer requirements, develop new suppliers in low cost countries to produce cheap high-quality supplier items	Customer	Supplier Establishment
Inventory managed by the supplier	Customer's inventory is managed by suppliers. The supplier guarantees a minimal stock level without individual orders	Reduce inventory costs, Optimise supplier's production because of better statistical data, close co-operation between customer and supplier	Customer or supplier	KANBAN Zero Buffer Principle
System component suppliers	Supplier installs a complete production/system related to one customer. The production could be on the customer's estate	Optimise the customer/ supplier co-operation.	Customer	Turnkey Supply
Integration of planning and scheduling of customer and supplier	Supplier get scheduling data from the customer or has access to these data	Reduce inventory at the customer, reduce inventory cost	Customer	Just-In-Time – JIT: Production synchronous delivery
Integrated product data environment	Integrated product data system is used for different applications at customer and supplier sites	avoid multiple data bases and data management tasks. Reduce data management costs	Customer	Integrated Product Teams, Inter-organisational Project Management

Figure 6.4: Supply chain strategies

The different management strategies and methods can be used to optimise the intra- and inter-organisational business processes. In many cases the processes can not be distinguished between this two categories (inter- and intra). The strategies could be used by the customers (yards) or the suppliers/sub-contractors because in general suppliers are also customers of their suppliers.

ANNEX 5-D: Communication and Information Technology

Communication and information technology is the most important key technology for managing supply chains. Nowadays mail and fax is used frequently for the support of supply chains. But more sophisticated strategies require modern communication and information technology. In this chapter an overview of ready-to-use technologies for supply chains is described. In practise a combination of these technologies should be used to optimise the chains.

E-mail - Electronic mail: Electronic Mail (E-mail) enables information exchange between people and speeds up the inter-organisational co-operation processes by substitution of fax and telephone in some cases. The big advantage of this technology is the time-independent information exchange, which means that the communication partners have not to use the system at the same time.

CD-ROM – Compact Disc Read Only Memory (Electronic Catalogues): Information can be stored on the discs once and read several times. Suppliers can substitute the traditional paper catalogues by using CD-ROMs which includes product descriptions, prices, company descriptions, etc. to. This improves the customer service and can optimise the product selection process at the yard.

Internet: The global network of computer networks that use the Internet Protocol Suite (IP) to provide communications and other distributed services. The Internet provides connectivity and communication to tens of millions of businesses and individuals world-wide.

WWW - World Wide Web: Currently the fastest-growing aspect of the Internet, it allows information to be accessed by subject matter regardless of its location - a real advantage in a network as vast and complex as the Internet. Users can move automatically from site of interest to another using 'hyperlinks'. The WWW can act as a gateway for business-to-business and business-to-consumer commerce, based on its widespread acceptance, ease of use, and ready integration into other business systems. The business applications in the WWW can be distinguished very roughly into three groups. One group is the ***presentation*** of e.g. companies and administrations. Another group are the ***data bases*** where users can get information like train schedules, market statistics etc. and the third group are the ***market places*** respectively malls and shops where users can buy items like computer equipment etc. But also request for offers can be placed on this market places.

ExtraNet: A community of trading partners running over a Virtual Private Network using Internet communication protocols and Web browser technology. ExtraNets are run on a "community controlled" basis. ExtraNets give a community of businesses Internet-like connectivity, but isolation from general Internet users and traffic.

EDI - Electronic Data Interchange: EDI is the computer-application-to-computer-application exchange of business documents in a structured and standardised format via data networks. Within the context of this study EDI bases on international standards (open communication) and means not the data exchange based on bilateral defined formats. EDI is used most commonly for purchasing and distribution of administrative data (orders, confirmations, shipping papers and invoices). In this cases an international standard EDIFACT (Electronic Data Interchange for Administration, Commerce and Transport) is used as the standard EDI format. For the exchange of technical data (geometry, product models, bill of material, etc) the STEP standard (STandard for the Exchange of Product Model Data) is used more and more as a neutral format. Translation software aids in the exchange by converting data extracted from the application data base into standard EDI format for transmission to one or more trading or design partners. The avoidance of media breaks and additional administration work reduces costs and process time.

Workflow Management: The result of automating a business process by managing the sequence of activities in the process is referenced as Workflow. The Workflow Management Coalition (WfMC) has defining Workflow as „The computerised facilitation or automation of a business process, in whole or part“. Workflow Management Systems, which are more or less under development, will optimise the information flow for intra-organisational as well as for inter-organisational process chains in the future.

Groupware: Groupware is technology designed to facilitate the work of groups. This technology may be used to communicate, co-operate, co-ordinate, solve problems, compete, or negotiate. While traditional technologies such as the telephone qualify as groupware, the term is ordinarily used to refer to a specific class of technologies relying on modern computer networks, such as email, newsgroups, videophones, multimedia applications or chat. Groupware technologies are typically categorised along two primary dimensions:

- whether users of the groupware are working together at the same time ("realtime" or "synchronous" groupware) or different times ("asynchronous" groupware), and
- whether users are working together in the same place ("co-located" or "face-to-face") or in different places ("non-co-located" or "distance").

Groupware provides an interface to a shared environment and allows groups to work simultaneously within companies and via company boundaries.

VT - Virtual Technologies: VT includes applications by using virtual reality.

VR - Virtual Reality: VR represents computer interface technology that is designed to leverage natural human capabilities. Today's familiar interfaces (keyboard, mouse, monitor, etc.) requires to working within tight, unnatural, two-dimensional constraints. VR technologies allows to interact with real-time 3D graphics in a more intuitive, natural manner. This approach enhances the ability to understand, analyse, create and communicate. VR system interfaces allows the user to look and move around inside a virtual model or environment, drive through it, lift items, hear things, feel things, and in other ways experience graphical objects and scenes much as it might experience objects and places in the physical world.

Video Conferencing: Video conferencing systems support communication between local distributed people by using multimedia (video, audio, data) applications.

Call Centres: Call centres are the one-stop-shop for customers to get in personal contact to the supplier.

Several other application systems (e.g. PDM - Product Data Management Systems, DMS Document management Systems) which are particularly interesting for the conversion from the paper-based into the electronic-based information environment will not be in the focus of this study because these systems are mainly intra-organisational oriented.

ANNEX 5-E: Management Strategies related to the Process Elements of Marine Supply Chains

Seven process elements (1st row of the following table) have been defined to reflect the complete Marine Supply Chains. The relation between the management strategies and the different elements are shown in the following table.

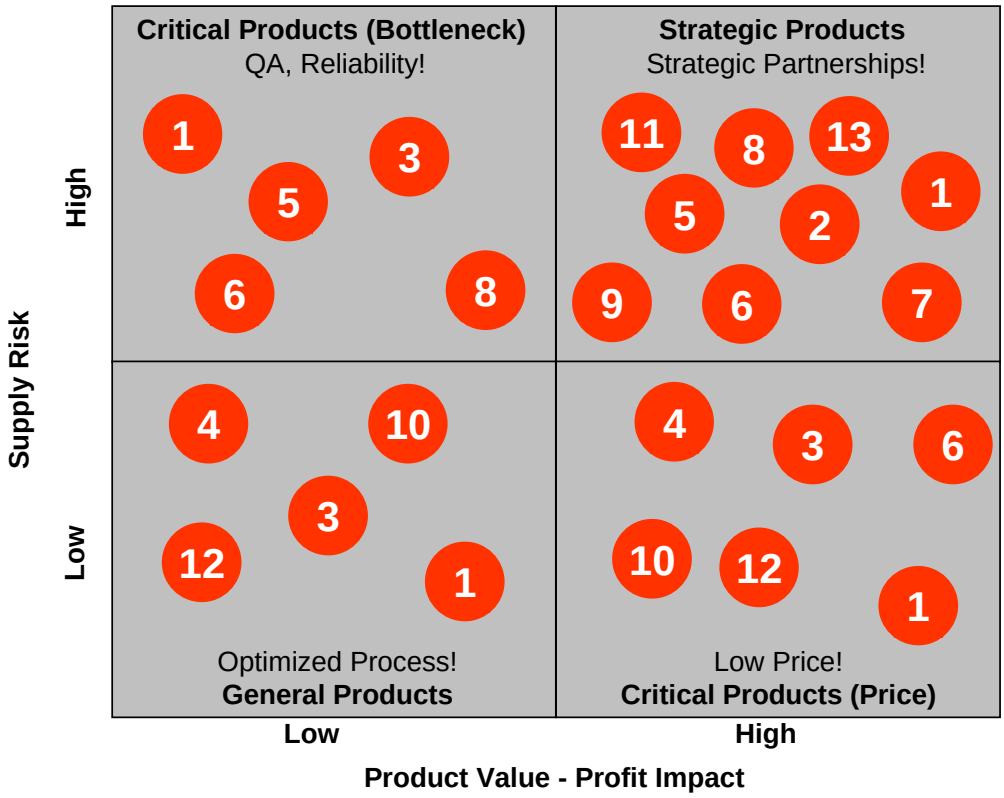
Process Elements **Name of the strategy**	Marine Equipment Type Approval Process	Marketing Process	Pre-Selection of Equipment and Material (Ship Engineering and Design Process)	Purchasing Process	Delivery Process	One Site Assembly, Functional Testing, Approval	Guarantee, After Sales Service, Maintenance, Repair
Benchmarking			●	●	●	●	●
Manufacturing Segmentation				●	●	●	
Purchase Consolidation				●			
Outsourcing				●	●		
KAIZEN, Teamwork	●		●			●	
Total Cost Evaluation				●			
Customer / Supplier Training	●		●			●	
Continuous Improvement			●	●		●	
Supplier Establishment			●		●	●	
KANBAN				●	●		
Turnkey Supply			●		●		
Just-In-Time					●		
Integrated Product Teams	●		●			●	

Figure 6.6: Assignment of Business Process Strategies to Marine Business Process

The table shows which strategies are applicable for which business processes. Nowadays examples can not find for every relation in the maritime industry but this can change in the future. Indications therefore have been seen within several interviews.

ANNEX 5-F: Marine Supply Products related to Management Methods

The different management methods can be used for all of the different supply product categories. In general some methods should be selected by a company, because the implementation of to many different supply chain management strategies leads to a compensation of the positive effects. The following picture gives only a rough estimation for the application of the different methods, but at the end the decision and application for a specific method depends on the specific company requirements.



The requirements of the different product groups have been described in a separate chapter. The advantages and disadvantages of the following strategies (numbers relate to the picture above) have been considered in a special chapter of this Annex:

1. Benchmarking
2. Manufacturing Segmentation
3. Purchase Consolidation
4. Outsourcing
5. Kaizen, Teamwork, TQM (Total Quality Management)
6. Total Cost Evaluation
7. Customer or Supplier Training
8. Continuous Improvement
9. Supplier Establishment
10. KANBAN – Zero Buffer Principle
11. Turnkey Supply
12. Production Synchronous Delivery (JIT)
13. Integrated Product Teams

The picture shows that the several methods are useful for different product groups. Many management methods are available for the category “high supply risk/high product value”. This group promises a high potential for improvements. Nowadays only very few companies are known which use these strategies in the maritime business.

ANNEX 5-G: Management Trends related to the Information Technology

The relations between the different supply chain management strategies can only be indicated. The varieties of implementing the strategies are very comprehensive. The following table shows the information technology which is used today in other branches to support the mentioned strategies. It has to be considered that the management strategy can be optimised by the supported of information technology but the strategy is not depending on the technology in most of the cases.

ICT Solutions / Management Strategies	E-Mail	CD-ROM	Internet / WWW			ExtraNet	EDI	Workflow Mgmt	Groupware	Virtual Technol.	Video Conferences	Call Centre
			presentation	databases	electronic market place							
Benchmarking				**++**								
Manufacturing Segmentation	**++**					**++**	**++**	**++**				
Purchase Consolidation						**++**	**++**					
Outsourcing	**++**					**++**	**++**	**++**	**++**	**++**	**++**	
Kaizen, Teamwork	**++**							**++**	**++**		**++**	
Total Cost Evaluation					**++**	**(+)**						
Customer/Supplier Training									**++**	**++**	**++**	
Continuous Improvement						**++**	**++**					
Supplier Establishment						**++**	**++**	**++**	**++**		**++**	
KANBAN						**++**	**++**					
Turnkey Supply	**++**											
Production Synchronous Delivery (JIT)						**++**	**++**					
Integrated Product Teams	**++**							**++**	**++**	**++**	**++**	

-- unsuitable **(+)** partly suitable **++** suitable **no mark:** can not be estimated

In general the management supporting information technology could be grouped into four groups:

- support of personal connections (e-mail)
- information collection support (INTERNET)
- bi-directional connections (ExtraNet, EDI)
- co-operation supporting technologies (Workflow, GroupWare, Virtual technologies, Video conferencing)

Depending on the requirements of the management strategy the information technology has to be selected. The strategies are only used in individual cases in the maritime industry. The expansion of the different information applications are described in a separate chapter of this Annex.

ANNEX 5-H:Supply Chain Processes related to the Information Technology

The most important key technology for supply chain management is the information and communication technology. These technologies have been reflected to the different supply chain processes. The technology penetration in the European Maritime industry, which includes (yards, suppliers, class societies, etc.) has been estimated by the collection of different branch expert assessments, evaluation of questionnaires related to former European IT projects and experiences from different industrial projects. Nevertheless the results can only show snapshots and tendencies, because IT implementations changes fast.

IDEF-0 Methodology

The processes described in this chapter have been developed using the IDEF0 methods and tools, which support the structured analysis of processes. This section gives a short overview of the notation.

IDEF0 models are hierarchically organised as top-down structures. Each activity node is symbolised by one box which is identified by the name of the parent box. The activities on the same levels are distinguished by numbers. The top-level activity is named „A0“, the next level „A1“, „A2“ etc. Boxes below „A2“ are named „A21“, „A22“ etc.

Note:
The process descriptions following in this document represent Level A0 including Activity Boxes A1 to A4. Since there is no further break down of the activities into more detailed levels the boxes are not numbered.

The boxes are connected by arrows, describing the data exchanged between different activities. Depending on the position of the connection at the box, the arrows have different meanings:

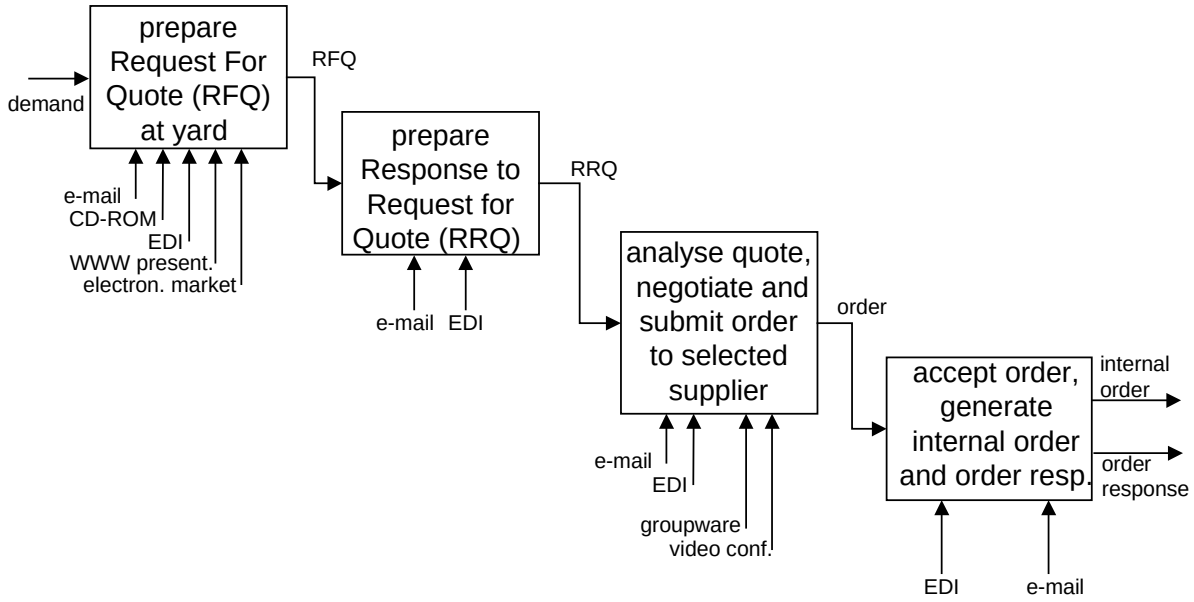
- Arrows that point to the left side of the box are **Inputs** which are transformed by the activity into ...
- ... **Outputs** which leave the boxes on the right.
- Arrows pointing to the top of the box are **Controls** that govern the way the transformation is done.
- **Mechanisms or Supports** for the activity point to the bottom of the boxes and can either be persons, machines or processes.

The arrow structure represents the constraint relationships between the boxes, not sequence or control flow. Unconnected arrows represent connections to the parent diagrams. If the parent does not contain this data the item is enclosed in brackets. The type of each information depends on the activities. The output of one box may be the control or input of another one etc.

As an example for a process portfolio, the following section describes the “purchasing process”.

Process Portfolio – Example: Purchasing Process

Process Description:
Often in parallel, sometimes in a sequential order or even before the detailed design process has started, purchasing activities begin with inquiries in the market by requesting quotations from suppliers. This is not necessary for those products where the shipyards have negotiated framework contracts with the suppliers including fixed price structures (low risk supplier parts). The bidding process is followed by the order process including sending the formal orders and receiving respective order responses including confirmations respectively changes to the order. Since shipbuilding is a very dynamic process with highly concurrent engineering processes order changes are frequently necessary. In some special cases the purchasing process will be handled through trading houses, which may receive better prices than single shipyards through some special framework contracts and access to different markets.



Technology Selection:

E-mail	Electronic Cata-logues	Internet / WWW			ExtraNet	EDI	Workflow Mgmt	Group ware	Virtual Technol.	Video Confe-rences	Call Centre
		presentation	databases	electronic market place							
++	**++**	**++**	**--**	**++**	**--**	**++**	**--**	**(+)**	**--**	**++**	**--**

-- unsuitable **(+)** partly suitable **++** suitable

Specific Technology Discussion: Purchasing Process

Recommended Technology	Process Part	Application/Benefit	Problems/Risks	Penetration in the European Maritime industry today (estimations)
E-mail	all processes related to the purchasing process	Effective communication by e-mail • reduces transmission and decision time • increases flexibility • reduces development time • ensures higher actuality of design data • established contacts independent from time and location	Electronic mail • has not probative weight • increases the danger for infiltrate viruses into internal networks • enables uncontrolled information exchange between people (danger of spying)	yards: approx. 50% suppliers and class societies: approx. 60% (see MARVELOUS Final Report)
Electronic Cata-logues	prepare Request For Quote (RFQ) at yard	The future perspectives of suppliers require the application of these technologies, because customers will • search product information electronically to reduce the search expense • request more detailed product information to evaluate products in advanced • request product information with high actuality • try to compare product parameters (e.g. prices, technical data) automatically by analysing all available data sources for product information • agents could be reduced	• availability of electronic product information allows the customer analysis (of all product parameters incl. prices) in short time. • supplier market becomes more transparency for the customers because analysis will be easier by getting all information electronically • the large amount of information could possibly not be handle by the customers (remark: this could be a chance for those suppliers who can route their customers through the information jungle) • many agents will lose their jobs because of direct contact and purchase between manufacturer and customer	less than 2 %
WWW-Presen tation	prepare Request For Quote (RFQ) at yard			less than 60 %
Electro nic market place	prepare Request For Quote (RFQ) at yard			less than 1 %
EDI	prepare Request For Quote (RFQ) at yard	Supplier's product data from Electronic Catalogues, WWW-presentation or the electronic market place can be used to generate RFQs which • effects clear defined product descriptions (reduces amount of call backs) • avoids manual input failures • reduces administration overhead for data integration at the supplier	• high investments for application interfaces • organisational adaptations/changes are necessary • less penetration in the maritime industry	less than 2%
	prepare Response to Request For Quote (RRQ)	• reduction of administration overhead for data handling at customer and supplier • automatic integration into the application systems at suppliers and customers avoids manual input failures • speeding up information exchange		
	analyse quote, negotiate and submit order to selected supplier			
	accept order, generate internal order and order response			

Recommended Technology	**Process Part**	**Application/Benefit**	**Problems/Risks**	**Penetration in the European Maritime industry today (estimations)**
Group ware	analyse quote, negotiate and submit order to selected supplier	Support of quote analysis and negotiation processes • reduces travel expense • enables ad hoc meetings	• several available systems are incompatible • less real life experiences with heterogeneous groupware systems are available • systems with high quality video applications are expensive • communication costs increases for high data volumes (e.g. high quality video)	less than 10%
Video Conferences	analyse quote, negotiate and submit order to selected supplier		• video conference equipment is normally not available at the working place (only in a separate conference room) which makes support of daily work difficult • penetration of video conference technology is low	less than 5%