Proceedings

of

Workshop on Electronic Data Exchange and Communication for Shipbuilding

in

Tokyo Japan
October 20-21, 1997

by

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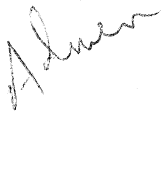
March 1998



036828

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.

4. Title and Subtitle	5. Report Date
Workshop on Electronic Data Exchange and Communication for Shipbuilding	March 1998
	6. Performing Organization Code: 5670
7. Author(s): H. Bruce Bongiorni	8. Performing Organization Report No.: UMTRI-98-10
9. Performing Organization Name and Address: The University of Michigan, Transportation Research Institute, 2901 Baxter Road, Ann Arbor, Michigan 48109-2150	10. Work Unit No. (TRAIS)
	11. Contract or Grant No.: N00014-97-0491
12. Sponsoring Agency Name and Address: Office of Naval Research, 800 Quincy St., Arlington, VA 22217-5660	13. Type of Report and Period Covered: Workshop Proceedings
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

The emerging network for electronic commerce in the shipbuilding industry is potentially large, complex, and crosses international borders. The business processes and the technical issues associated with an enabling infrastructure, forces a focus on international cooperation. Consequently, there is a need to identify the priorities of the international shipbuilding industry and its members. The topics that need to be discussed by the international industry are related to improving the institutional factors that may have an impact on the competitive goals of reducing costs, and shortening delivery time. The objective of the workshop is to:

- Describe experiences and activities currently underway relative to electronic digital data generation and transfer appropriate to the maritime supplier base;
- Share thoughts on the issues to be considered and dealt with;
- Share lessons-learned based on previous experience; and
- Suggest ideas on how to establish an international leadership forum dealing with electronic information exchange for the shipbuilding industry, particularly in the next five years.

17. Key Words	18. Distribution Statement
Electronic commerce, data exchange, shipbuilding, Japan, digital data transfer	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price

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Executive Summary

This report is documentation of the proceedings at the follow-on workshop to that which was held in London, England, on October 28, 1996, relating to electronic communications within the maritime industry, with special focus on the shipbuilding sector and its vendor base. This workshop was sponsored by the Office of Naval Research, Asia and the University of Michigan Transportation Research Institute, Marine Systems Division.

The Tokyo workshop proposed that the leadership of the international shipbuilding community establish a forum in which priorities, requirements, and practices are articulated to the community developing this technology and to those working to establish standards. The purpose of this workshop was, therefore, to (1) consider if a formal forum for cooperation is needed at this time, and (2) if so, what steps should be taken to establish this forum.

The following issues were explored at the workshop:

- System architecture of collaborative shipbuilding. Information exchange for common understanding. Avoiding premature standards. Protecting in-house data.
- What level of detail in data exchange should be aimed for?
- How to encourage adoption by small/medium sized suppliers. Who benefits from EDI?
- Maintenance and ship operations data, focused on ISM Code. Who maintains data of delivered ship and design changes after delivery? Who keeps the operations manuals updated?

The workshop was organized into four sessions. In the first session there were presentations by representatives from each of the three major world regions represented at the meeting: United States, Europe, and Japan. Each presentation was an overview of the major efforts underway and activities since the last workshop in that region to effect an electronics communication system, optimized to the needs of the shipyards and their vendors. The second session was configured into four eight-to-eleven person break-out groups. Each of these groups was asked to discuss a general topic. The third session was a presentation by the four break-out groups of their thoughts relative to the topics.

The final session was held at the conclusion of the break-out presentations when the floor was opened to general discussion for all of the participants. The workshop was concluded with a wrap-up synopsis by the workshop moderator.

Dr. Takeo Koyama from the University of Tokyo, who served as the panel moderator, noted the commonality on many of the areas discussed and summarized the consensus that workshop delegates go back to their own countries and consider the creation of a common vision. He further summarized that there should be a continued exchange of information and ideas, and that attendees should also promote continued cooperation in common information technologies in a natural way.

Attendees

US Delegation:

Bruce Bongiorni, UMTRI Marine Systems Division

Howard Bunch, Office of Naval Research Europe

Lou Chirillo, L. D. Chirillo & Associates

Andy Dallas, DARPA Maritech

Daniel Fernholz, General Dynamics Electric Boat Division

Marty Fritts, SAIC Marine Machinery Association

Jack Garvey, Office of Naval Research Asia

Dave Helgerson, Advance Marine Enterprises, Inc.

Christine Languedoc, General Dynamics Electric Boat Division

David Rossi, Office of Naval Research

Robert Schaffran, DARPA Maritech

Rick Steiner, Hughes

European Delegation:

Reinhard Ahlers, Balance Technology Consulting

Lars Bergqvist, Kochums Computer Systems

Joachim Brodda, Balance Technology Consulting

Jerry Goodwin, Lloyds Register

Hans E. W. Hoffmann, STN ATLAS Electronik

Kaj Johansson, Kochums Computer Systems

Alfred Mechsner, Howaldtswerke-Deutsche Werft AG

Uwe Rabien, Germanischer Lloyd

Captain Brian Tayler, European Marine Equipment Council

Ronald Vopel, European Commission

Japanese Delegation:

Koichi Baba, Maritech Engineering Japan Co. Ltd.

Hiroyuki Habuka, Tokimec Inc.

Norio Hata, Ishikawajima-Harima Heavy Industries Co. Ltd.

Yasuhiro Hosokawa, Japanese Marine Equipment Association

Takashi Imaizumi, NKK Corporation

Masayoshi Ishige, Kamome Propeller Co. Ltd.

Ken Ito, Mitsubishi Heavy Industries, Inc.

Tatsuo Kaneko, Niigata Engineering Co. Ltd.

Isao Kishimoto, NABCO Ltd.

Kou Koiso, Ministry of Transport

Dr. Takeo Koyama, University of Tokyo

Takashi Maruo, Yanmar Diesel Engine Co. Ltd.

Yoshio Nakashima, Nakashima Propeller Co. Ltd.

Takeshi Naruse, Ministry of Transport

Kenkichi Sakai, Kawasaki Heavy Industries Ltd.

Kenji Shigematsu, Sumitomo Heavy Industries

Hiroshi Tabuchi, Mitsui Engineering & Shipbuilding Co. Ltd.

Hidemitsu Yamada, Tokimec Inc.

Yuji Yamaguchi, Shipbuilder's Association of Japan

Professor Hiroyuki Yamato, University of Tokyo

Sanji Yoneyama, Kamome Propeller Co. Ltd.

Introduction

This report is documentation of the proceedings at the follow-on workshop to that which was held in London, England, on October 28, 1996, relating to electronic communications within the maritime industry, with special focus on the shipbuilding sector and its vendor base. This workshop was sponsored by the Office of Naval Research Asia and the University of Michigan Transportation Research Institute, Marine Systems Division.

One of the major changes occurring within the shipbuilding industry is in the area of electronic communications. An emplaced electronic network is seen as one of the mechanisms to significantly improve competitiveness of the shipbuilding enterprise. It provides the opportunity to have instantaneous information transfer, which supports the concepts of shortened production times of flexible manufacturing systems and the mass customization of products. In recognition of this benefit, shipyards and their vendors around the world are actively involved in developing and emplacing electronic communication systems. National efforts are occurring in the United States, in Europe, and in the Pacific Rim. Individual shipyards are aggressively evaluating the concepts, and some are actively into the implementation phase. Some of the vendor associations are supporting the implementation initiatives of their members. And, most of the classification societies are evaluating expanded electronic communication networks linking them to the shipyards and to the vendor base.

American efforts have revealed issues suggesting a need to examine benefits of international cooperation on some of the issues. First, and foremost, is the question of whether there is an interest in other regions of the world to have cooperation. And, if there is an interest, the question then becomes one of determining those areas where cooperation would be most beneficial. Finally, there is the selection of the most effective method[s] for cooperation.

The American investigations have also revealed issues relating to information security, information formatting, functional relationships, and organizational and/or institutional barriers.

Because of the complexity of the issues, the variety of stakeholders, and the international nature of the questions raised, it was deemed appropriate to have a continuing dialogue following the workshop in London, to focus on issues related to the dynamics of electronic communications in the shipbuilding industry and its vendor base. This report is for the follow-on workshop held in Tokyo, Japan.

Purpose of the Tokyo, Japan, Workshop

The Tokyo workshop proposed that the leadership of the international shipbuilding community establish a forum in which priorities, requirements, and practices are articulated to the community developing this technology and to those working to establish standards. The purpose of this workshop was, therefore, to (1) consider if a formal forum for cooperation is needed at this time, and (2) if so, what steps should be taken to establish this forum.

Objective of the Workshop

The emerging network for electronic commerce in the shipbuilding industry is potentially large, complex, and crosses international borders. The business processes and the technical issues associated with an enabling infrastructure, forces a focus on international cooperation. Consequently, there is a need to identify the priorities of the international shipbuilding industry and its members. The topics that need to be discussed by the international industry are related to improving the institutional factors that may have an impact on the competitive goals of reducing costs, and shortening delivery time. The objective of the workshop is to:

- Describe experiences and activities currently underway relative to electronic digital data generation and transfer appropriate to the maritime supplier base;
- Share thoughts on the issues to be considered and dealt with;
- Share lessons-learned based on previous experience; and
- Suggest ideas on how to establish an international leadership forum dealing with electronic information exchange for the shipbuilding industry, particularly in the next five years.

Issues

The following topics were explored at the workshop:

- What should be the system architecture of collaborative shipbuilding?
- What information is exchanged for common understanding?
- How does the industry avoid establishing premature standards?
- What are the concerns for protecting proprietary data?
- What level of detail should be aimed for in data exchange?
- How can the industry encourage adoption of electronic information exchange by small/medium sized suppliers.
- Who are the beneficiaries of electronic information exchange?
- What information consistent with the ISM Code is captured and exchanged in support of maintenance and ship operations?
- Who maintains data for the delivered ship and manages data related to design changes after delivery?
- Who keeps the operations manuals updated?

Background / Workshop Structure

The workshop was organized into four sessions. In the first session, there were presentations by representatives from each of the three major world regions represented at the meeting: United States, Europe, and Japan. Each presentation was an overview of the major efforts underway and activities since the last workshop in that region to effect an electronics communication system, optimized to the needs of the shipyards and their vendors.

The second session was configured into four eight-to-eleven person breakout groups. Each of these groups was asked to discuss a general topic. The general topics were:

- System architecture of collaborative shipbuilding, information exchange for common understanding, avoiding premature standards, and protecting in-house data.
- The level of detail in data exchange.
- Beneficiaries and benefits of electronic information exchange, and encouraging adoption by small/medium sized suppliers
- Maintenance of ship operations data, focused on the ISM Code.

The third session was a presentation by the four breakout groups of their thoughts relative to the topics. This was followed by a listing of the comments presented by each group.

At the conclusion of the breakout presentations, the floor was opened to general discussion for all of the participants. The workshop was concluded with a wrap-up synopsis by the workshop moderator.

Opening Presentations

US Information Technology and Electronic Commerce Projects

Summary of Maritech Program

Andy Dallas
(see Reference 1)

NSnet: Building an Information Culture in the Marine Industry

H. Bruce Bongiorni

NSnet was conceived in 1993 as an experiment in applying emerging information and communications technologies in the maritime industry, including shipbuilding and its suppliers. In 1994, NSnet was established as a Defense Advanced Research Projects Agency (DARPA) MARITECH project, and was the first project in that program to deal specifically with information technologies. The project team is being led by the Marine Systems Division of the University of Michigan Transportation Research Institute (UMTRI-MSD), and is currently scheduled to end December 31, 1999.

On its face, NSnet was conceived as a means of getting U.S. shipyards to communicate, share information, become more open in their relationships with each other, and, in the process, become familiar with the infrastructure for electronic commerce. Underlying this was the understanding that technology transfer succeeds only when there is a "pull." That is, unless there is a user need that compels the use of a new tool, the familiar way of doing business is "good enough." NSnet was also conceived with the understanding that no new technology is adopted unless it is made more familiar --so familiar that it can almost fade into the background of the business. As the technology becomes less threatening and less mysterious, it becomes more likely to be assimilated into regular business practices.

Broadly defined, electronic commerce is the use of information technologies to make the buying and selling of products more efficient. This means that organizations can deliver higher quality products (goods and services, as well as information and knowledge) to customers in less time and at lower cost.

The electronic commerce framework is based on existing business practices using the existing technology infrastructure. This includes using faxes for moving forms, electronic data interchange (EDI), and e-mail, ranging to the Internet and Web technologies. But the electronic commerce framework can be extended to new combinations of existing technology (e.g., video-on-demand, networked simulations, shared environments, collaborative work). Ultimately, the electronic commerce framework will require new business practices, new relationships, and new technologies.

NSnet and the Growth of the Internet

One of the reasons the Internet has become a ubiquitous tool for electronic commerce has been the development of technologies for proprietary systems to connect to a network using a standard computer interface. What this means is that computers can be connected to a common network and share information, regardless of their operating systems or underlying hardware. The look and feel of the user interface is the same at work and at home. The tools for customization and application development are readily available, easy to use, and inexpensive, allowing the user community to tailor the applications to their needs or the needs of their customers.

No one knew at the start of the NSnet project that the Internet would become so popular and pervasive. More opportunities became possible and practical as the Internet became more familiar to everybody, and the growth of the Internet and the World Wide Web (the Web) has been dramatic. In 1989 there were only a few hundred thousand hosts (computers providing information). As of January 1997, there were nearly 15 million hosts.

NSnet began as a basic Internet service provider (ISP) for U.S. shipbuilders, and in late 1993 went on to establish one of the first sites available on the World Wide Web. After a year or so there were many members of the maritime community who had their own Web sites, and commercial ISPs became so prevalent that NSnet stopped providing those basic services. NSnet's original customers, US shipyards, currently represent only a fraction of all users. Other interests served include government, education, shipping companies, equipment suppliers, and marine services. NSnet has evolved into being a content provider for the entire marine community: gathering relevant information, knowledge and experience, and making it readily available.

One of the first information products NSnet established was a list of links to maritime-related Web sites. As these links increased in number, a database was created that can be easily searched, and is updated on a continuous basis. Not only does NSnet find relevant sites, it also reviews them and provides brief abstracts of their content. This is of significant value as the Web becomes more cluttered with extraneous information, and finding what is needed becomes more time consuming.

In addition to the links database, NSnet has also provided on-line support to some of the MARITECH projects, and to the National Shipbuilding Research Program (NSRP). The NSnet project has made it possible to distribute NSRP project reports in electronic format. The library holdings and catalogues of National Shipbuilding Research and Documentation Center were originally only available in paper format. These catalogs are currently available on the Web, providing free-form search of titles, authors, and abstracts. The final reports themselves have been converted into electronic documents, and are available for downloading on the Web.

The Future of NSnet

The role of NSnet is as an agent of cultural change in the maritime community. It has as its mandate the introduction of emerging information technologies to the maritime community, and making their use commonplace. More powerful applications of information technologies for competitive advantage depend on narrowing the knowledge gap. Therefore, as the Internet evolves, NSnet will continue to follow the development of new technologies and new business practices that emerge as a result of those technologies.

Educating the user community remains a driving force for the project. NSnet will provide information and research on various topics of interest to the user community and make

this information available on the Web through white papers and articles. Demonstrations and workshops will be offered when appropriate.

New and emerging collaboration tools is another area where NSnet will be focusing in the near future. These tools allow geographically distributed people to work as if they were physically collocated. They also allow for asynchronous interactions rather than synchronous practices, such as meetings. As the tools mature, the access and practices have to be developed.

NSnet will also focus on education on-demand for the maritime industry. While this is sometimes referred to as distance learning, this is a misnomer and does not do the concept justice. Although educational materials delivered via the Internet do allow for geographic differences, it also allows for temporal differences. In this busy work world, finding time to attend a scheduled class, whether it is delivered via closed circuit television hook-ups or a live broadcast over the Internet, is difficult. Education on-demand will deliver educational materials at a time and location that suits the needs of the learner.

Please browse the NSnet site. If you have any questions or comments, send a message to info@nsnet.com. (see Reference 2)

SHIIP and SPARS

Christine Languedoc and Danielle Fernholz
(see Reference 3)

Electronic Catalogues

Marty Fritts, SAIC on behalf of MMA
(see Reference 4)

Maritech Agile Shipbuilding Toolkit

Rick Steiner
(see Reference 5)

European Information Technology and Electronic Commerce Projects

MARIS

The following is the documentation provided by Mr. Ronald Vopel in support of his presentation entitled "Presentation at the Multi-National Shipbuilding Workshop Electronic Data Exchange and Communication for Shipbuilding in the 21st Century, Yokohama, 20-21 October 1997"

Introduction

In February 1995 a ministerial conference on the G-7 level was held in Brussels. It was dedicated to question how to implement the so-called Global information Society successfully and how to deal wit the resulting technological, economic and societal impacts. The challenge of globalization that largely results from the spreading of advanced information and communication technologies (ICT) together with the increased free-trade, will change most of our private and business activities. Concerning the industrial sector - and our case the maritime industries - companies will be urged to recess the way in which they do business - locally and globally. Ministers have chosen the approach of identifying number of selected pilot projects implementation. The general idea was that pragmatic applications in pilot projects are the best to speed up the supply of ICT and ease demand. MARIS is one of the eleven agreed pilot projects. It is co-led by European Commission and Canada and it is the only one which is directly related to industry

Characteristics of MARIS

a. The Maritime Information Society initiative is a framework under which currently four sub-projects demonstrate the potential benefits of information technologies and telematic applications. They cover a broad range of maritime activities.

MARSOURCE

Creation of a fisheries and oceanic information network. Existing data bases with information on oceanography, fisheries and scientific research will be interlinked. The final objective is a better management of resources in order to - for example - preserve fish stocks and enhance the availability of aqua culture products.

MARTRANS

Setting up a Port Logistics Information Network. Real-time information will be provided on the movement of cargo and vessels; tracing and tracking services for cargoes and vessels will be developed. The provision of real -time information will result in a more efficient management of the logistic chain. The projects under the MARTRANS or related to it will of course not only look at the improvement of port and shipping logistics, they will as well focus on the complete inter-modal transport chain, since globalization here really means global solutions - the provision of effective and efficient transport services from door to door.

MARVEL

The intelligent manufacturing of ships and other maritime systems. The aim is to interlink shipyards and their partners in a common global network using standardized data exchange mechanisms. This will raise productivity by better procurement of equipment and shorter lead time, e.g. through "virtual" testing and approval of hull designs by classification societies or scientific laboratories. Projects under MARVEL or related to it focus on the use of the EDI and STEP data exchange standards for design, production, maintenance and repair - covering ICT applications for the ship's whole life-cycle.

The current situation in MARVEL: Three distinctive EU projects under the ESPRIT program are working in the definition, specification and implementation of communication tools for business processes in shipbuilding, ship surveillance and ship operation. three more projects are currently being discussed or have entered contractual negotiations with the ESPRIT team respectively. The tools derived from these RTD activities can especially benefit SMEs since automated or semi-automated tendering, design, testing or ordering allows maritime companies to free human resources in turn can be used for the development of new competitive products. Productivity gains have been estimated to range from 30% to 50% depending on the task in question. Similar projects exist in the USA and in Japan.

SAFEMAR

Development of a ship reporting system for vessels to support the implementation of various international conventions and resolutions. This project will among others result in the creation of a Vessel Traffic Management and Information System (VTMIS), which will also include electronic chart functionalities. This MARIS sub-task shows clearly the advantages for the general public coming from the application of advanced ICT. Sea transport can be made safer without an additional workload put on crews or maritime authorities. Thus we will be able to have - at the same time - more humane work environments on board, fewer accidents at sea and promising new equipment markets.

MARIS is user-driven - following the bottom-up approach it is industry itself which identifies its needs and priorities with regard o information technology applications. It is neither the European Commission no any public authority which defines the necessary formats for the interlinking maritime players. Since there is no dedicated MARIS budget, projects under MARIS are funded from existing research programs. MARIS will therefore only cover aspects of international co-operation and co-ordination, political and public awareness, e.g. by sponsoring conferences.

MARIS is building on existing systems - it is not our primary concern to develop new systems and technologies. Maritime industries will not be urged - at least not by the European Commission - to invest again in completely new systems. ICT-based systems are already widely available and applied in numerous maritime fields. Unfortunately these

existing systems are very often limited to certain application areas and regions. What is missing is the interconnection wit the access to other systems on a global level. MARIS seeks to help in developing there interlinks in order to create a global maritime network where maritime industries can communicate with possible partners around the world. New systems will only be developed where it is necessary for the creation of the global network.

MARIS is an open framework - in two senses: It aims to integrate maritime players world-wide, and, in addition to the four existing sub-projects, new fields of application where the structure and the results of MARIS can be of benefit, are approached in an active way. Currently MARIS partners are looking into the areas of "Maritime Education" and "Maritime Tourism and Leisure" - two sectors which will surely gain more and more importance in the future.

Achievements So Far

On the G-7 level an organizational structure has been established with competent partners in the Member States. Anyone looking for information on MARIS, or co-operation partners in maritime information technologies, should find effective points of contact in his or her country or region. This information. as well as additional information on projects and resources, is available on the internet through a dedicated MARIS web-site.

MARIS has been seen a significant enlargement beyond the G-7 states. The Mediterranean, the Baltic Sea and Eastern Asia have become new focus points.

On the regional level the MARIS network was formally inaugurated in May 1977. The network currently comprises four nodes in Bilbao, Bremen, Genoa and Helsinki, but is already expanding within Europe and beyond. It can be assumes that regions will be the big winners of the Global Information /Society, because their local knowledge can now be brought to the world. The MARIS network nodes will serve as the "hinge points" and bring together local maritime industries and their demand for advanced solutions with the global state-of-the-art in maritime information and communication technologies.

Results from various MARIS projects will be presented on the occasion for the WORLD EXPO '98 in Lisbon "The Oceans - Heritage for the Future." (see Reference 6)

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Joint Global R&D in the Field of Information and Communication Technology (ICT): Maritime Industries Motivation

H. E. W. Hoffman
(see Reference 7)

RTD Projects under MARIS

The following is documentation provided regarding Electronic Data Interchange for the European Maritime Industry (EDIMAR) presentation made by Dr. Alfred Mechsner:

Ladies and Gentlemen,

My name is Alfred Mechsner, I am working for HDW. HDW is one of the major yards in Germany, well known for the design and construction of sophisticated and advanced container vessels, submarines, naval ships ferries and cruise liners.

In this presentation I would like to give you an introduction to the EDIMAR project, EDIMAR stands for "Electronic Data Interchange for the European Maritime Industry."

EDIMAR is a project funded by the EC. The scope of EDIMAR has been harmonized with the Marvel OUS project and thus being assigned to the G7-MARIS initiative.

Folie Content
In this presentation I would like to give an overview of the present state of information exchange and inter-organizational co-operation in the maritime industry. This is of course mainly reflecting the European industry.

Then I would like to present our ideas on how communication should look like in the future and what could be the expected benefits from improved EDI based information exchange.

Following that I will give an overview of the EDIMAR project, the involved partners, the objectives and the application areas.

Folie Situation of Today

The design and the construction of high quality ships requires the effective cooperation of various parties like the yard, the classification societies, the owner, the suppliers and others.

In order to achieve short delivery times, improved efficiency, the flexibility for building various types of ships with a high complexity and for the economic utilization of resources the yards more and more outsource different areas. By this the number of partners is even more increased.

The situation of today is, that the communication and the exchange of information between the different partners is mainly based on the exchange of paper based information. Main areas of this information exchange are the purchasing, the logistics, engineering and approval.

Most of the information originate from electronic data, which are printed out and sent to the partner. In 95% of the cases these data are keyed in again into the EDP system of the receiver. This practice is causing high costs for the communication and the Organization and is a never ending source of errors, causing time delays and extra costs.

Folie Future Electronic Communication

The optimization of collaboration and outsourcing activities requires improved information exchange as well as the collective use of information. The paper based exchange of purchasing, design and production information has to be replaced by digital data exchanged via communication networks.

With Electronic Data Interchange (EDI), which is defined as the automated exchange of structured messages between different companies or sites we want to achieve improvements in the expense for communication. In addition to this EDI will open the way for optimizing the established organizational structures, As EDI give potentials for more and more standardized communication processes, these could be performed to a certain extend automatically. This will give the opportunity to streamline the in-house processes and the Organization.

Folie Measurement of EDI Potentials

Measurements of the potentials, which could be gained by the introduction of EDI, have been carried out in a national pilot project. In this project the efforts for the ordering and delivery of steel plates have been analyzed.

The results show, that for the shipyards a reduction of up to 70% for the orders and 90% for the order response could be achieved.

The supplier can expect a reduction of up to 78% on the administrative work. For the trading house the benefits sum up to 35%.

This results have been the incentive to strengthen the efforts for the introduction of EDI based communication for various business areas.

Folie Partner of EDIMAR

For the EDIMAR project partners from all different areas of the shipbuilding process cooperate in an European project.

For the yards there are HDW from Germany, who is also the prime contractor and the project manager, Chantiere de'l Atlantique from France, Astilleros from Spain and Fincantieri from Italy. These are the 4 major European yards, representing a total output of 3.9 Bil. ECU (4.4 Bil $). The number of employees sum up to 25,000.

Yards like Astilleros or Fincantieri consists of different distributed yards and production facilities, which demands a even higher effort for communication and organization.

All this yards are involved in the design and construction of highly sophisticated vessels like cruise liners, containers vessels, LNG carriers, RoRo ships etc., which especially require a lot of equipment and external supply.

For the suppliers there is INEXA from Sweden, supplier of steel plates and profiles and MacGregor from Finland, supplier of cranes, winches and hatch covers.

From the classification societies Lloyds Register from Great Britain is participating, covering mainly the standardization aspects in the project.

As Research Institute there is BIBA (Bremer Institute fur Betriebstechnik und angewandte Arbeitswissenschaften) from Bremen University.

The software vendors are represented by ACTIS from Germany, a major supplier of EDI converter, KCS (Kockums Computer Systems) as a well known shipbuilding CAD systems developer and BALance Technology Consultant, who are for long time involved in all kinds of EDI activities.

The project has started in Jan. 97 and will continue to the end of 1998.

(in total 11 partners, 17 man years, total costs of 2.8 MioECD, duration 24 months)

Folie EDIMAR Project Objectives

The overall objective of the EDIMAR project is to develop, to implement and to demonstrate an IT environment for EDI business between companies involved in shipbuilding.

This environment should be mainly based on available standards and utilize as far as possible "of the shelf" solutions.

This EDI based communication chains should support the procurement chain, which includes ordering, delivery, invoicing and payment. The parts and equipment to handle are classified as standard parts, raw material and "make to order" products. For the "make to order" products also the design and the design refinement chain should be supported.

One way to achieve this goal is the definition of EDIFACT messages, which have to be adapted for the special needs of the maritime industry.

In addition to this EDIMAR will contribute to the development of the STEP Application Protocol for Ships Mechanical Systems (AP226), which is the standard for the exchange of technical product data.

As a third main objective the EDI based communication process shall be integrated into an inter-organizational workflow system.

Folie Standards

The only way to achieve a broad acceptance and wide introduction of EDI for multi-lateral exchange of information is the use of international standards.

For the Electronic Data Interchange for Administration, Commerce and Transport there exists the so-called EDIFACT standard, which is a international ISO standard, defined by UN bodies. EDIFACT is defining a wide range of different message types. EDIFACT is branch independent, but for the use of the various EDIFACT messages the format and the semantic of the content has to be agreed on by the partners. For the automotive and the consumers industry there are subsets for standard parts already in place. EDIMAR will develop a maritime subset, which is suitable for products used in the shipbuilding industry.

STEP which stands for Standard for the Exchange of Product Model Data is another international standard, which scope is to cover the information requirements of the whole life cycle of a product. EDIMAR will concentrate on the development of that part of the model, which is required to exchange design data, needed in the design and design refinement chain. The STEP AP development includes:

- the development of an Application Activity Model
- the definition of information needed to be exchanged
- the development of an Application Reference Model and
- the submission of the AP for the CDC (Committee Draft for Comment) for world wide balloting.

Folie Product Description Methods

If we look on the different pails and equipment, we want to handle, we could classify them by the complexity of their technical description. Standard parts like nuts and bolts can mainly be described by numbers (i.e. part numbers, catalog number etc.)

For raw material like steel plate and pipes we have to use attributes and for very complex parts like engines and equipment we have to use product models. The simple description for standard parts and raw material can be completely covered by the EDIFACT standard.

The STEP standard on the other hand is well suited for the description of very complex parts, using the capabilities of an object oriented approach.

The need for procurement and technical data for the "make-to-order" products requires therefor the combined use of this different standards.

Folie EDI for Commercial Data

How does the infrastructure for a EDIFACT message exchange look like?

To prepare for instance an order all required data are taken from the in-house application system of company A. Of course this data are stored in different structures in each company. These order data are transformed by an EDI converter into an EDIFACT message, which has to be compliant to the defined subset. This converter can also provide archive possibilities to record transactions as well as security and communication services.

The compiled messages are transferred via common networks like ISDN or Internet to the EDI system of the receiver. There this messages are again checked, whether they are conformant to the defined subset and then transformed into the specific data structures of the receivers application system,

This complete chain can operate automatically, triggered by the senders application system. In the receivers application system special actions could be triggered on receipt of a certain message, leading the way to more and more automatic processes.

Folie EDI for technical date

For the transfer of technical data needed for the design and the design refinement process the data are extracted i.e. from a CAD system. This data are transformed by a postprocessor into a neutral format, which has to be in accordance to the defined STEP standard.

The integration between EDIFACT and STEP is done by a special message called ENGDAT message, which describes the attached data. By this mean the ordering of a part like i.e. a pump can be done. In this case the commercial data are included in the EDIFACT message and the technical specification of the pump is included in the STEP file. This STEP file is then attached to the EDIFACT message and transferred to the receiver. There the technical data are separated from the EDIFACT message. This technical data are again transformed by a processor, which generates the specific format for the receivers application system.

Folie EDIMAR in the Maritime World

The benefits from the results of EDIMAR depend on, whether the developed standards will be widely adopted. In order to achieve widely accepted solutions, EDIMAR actively supports the MARVELOUS SIG. In this EDI SIG all interested parties and related projects find a platform to exchange results and to harmonize their work.

The STEP related activities in EDIMAR will be harmonized and disseminated by the co-operation with EMSA, which is the European Maritime STEP Association. EMSA is a European association, driving the development of all ship related AP's. By the co-operation with EMSA it should be ensured, that the results are conformant with the industry requirements and other ship related AP's.

In preparation is a co-operation with the European suppliers Organization, on national basis there are already established co-operation's with i.e. steel suppliers.

Last but not least, EDIMAR is open for further international co-operation with other EDI related project. (see Reference 8)

The following is documentation of the presentation made by Dr. Joachim Brodda MARVEL OUS regarding the Maritime Industry's Virtual Enterprise Linkage ((MARVEL OUS) project:

Maritime Industry's Virtual Enterprise Linkage (MARVEL OUS) is a project under the umbrella of the G7 initiative MARIS (Maritime Information Society) and is accepted as a user reference project under the 4th framework program of the European Commission.

MARVEL OUS is an end-user driven project. The impetus behind the development comes from the end-users of the system. The consortium consists of shipyards, classification societies and research institutes (eleven companies from seven countries).

Project objectives

MARVEL OUS will:

- define Process Chains for design, manufacturing, logistics and survey,
- identify suitable Information and Communication Technology to support these chains,
- install accompanying measures to shorten product development and improve logistics,
- promote application concepts through pilot installation of state of the art technology,
- identify gaps in current applications and therefore,
- trigger new RTD projects, and
- assures their complementary coverage of the entire life cycle.

MARVEL OUS will identify and harmonize generic requirements for use of advanced information and communication technology (IT and CT) in manufacturing and engineering across the maritime industry, building up links with other sectors for the mutual benefit. MARVEL OUS will develop detailed specifications of IT and CT user requirements and will prototyping, test and demonstrate the conception basis of commercially available solutions. (see Reference 9)

SEASPRITE

Jerry Goodwin
(see Reference 10)

Japanese Presentations

State-of-Art of IT within the Japanese Shipbuilding Industry

Mr. Ken Ito
(see Reference 11)

Lessons learned from the NCALS Project in Japan

N. Hata (see Reference 12)

Breakout Meetings

Session 1

Topics

- System Architecture of collaborative shipbuilding.
- Information exchange for common understanding.
- Avoiding premature standards.
- Protecting in-house data.

Participants

J. Brodda

A. Dallas

D. Helgerson

K. Ito

K. Johansson

K. Kiriake

C. Languedoc

Y. Nakashima

T. Naruse

K. Sakai

H. Yamato

Conclusions

Presenting a summary of the discussion in breakout session 1 was Mr. Johansson. The discussion topic for the group was the system architecture for collaborative shipbuilding. Mr. Johansson reported that no conclusion was reached during the session, however there was a lot of constructive discussion on the topic. Mr. Johansson then proceeded to present a summary of the discussion and elements of a conclusion.

The first part of the discussion centered on a shared understanding of collaboration in shipbuilding. The question asked was "What is collaborative shipbuilding?" The group members reviewed shipbuilding in Japan, the United States, and Europe, and found a lot of similarities, particularly, the problem of heterogeneous system environments and heterogeneous shipbuilding environments. This later was particularly related to the size

of shipyards. The group also identified differences, focusing on the different ways of designing related to shipbuilder size.

When talking about integration or collaboration, the group members identified two ways of doing it: horizontal and vertical. In the horizontal case, shipbuilders coordinate work between shipyards. In the second case, shipbuilders must collaborate vertically by integrating with designers, classification societies, and suppliers.

With regard to enabling technologies, their part of the session was more of a brainstorming session with a lot of ideas being presented. The group concluded that in a collaborative shipbuilding architecture words like EDI, STEP, and product model would be prominent. The group identified the product model as the most needed enabling technology with exchange of product model data between shipyards though EDI and STEP.

Mr. Johansson reported that the group identified a goal for the marine industry of establishing a method for communication worldwide, as shipbuilding is a global business. Discussion was on how this could be done. Also expressed were long-term views on how to build a network to exchange information on shipbuilding to achieve knowledge sharing.

Toward the end of the session, Mr. Johansson reported that the topic of the virtual enterprise was discussed. The group members suggested that the discussion of an architecture for collaboration and integration in a virtual enterprise be expanded to include suppliers and operators. In the short term, the group suggested that there should be definition of a minimal interface between shipyards, operators, and suppliers in order to get started and gain experience. The Japanese Ministry of Transport expressed an interest in future discussion on virtual enterprises.

The group concluded that vertical integration is an international issue, particularly in integration of shipyards with suppliers. Shipyards are sourcing equipment internationally, and suppliers are interested in selling their products internationally. This was seen as a subject for near-term discussions where discussion of horizontal integration is more of a long-term proposition.

Mr. Dallas added that the group spent a little bit of time on a common issue: finding a business case for this technology. In particular, he commented on discussion of the need to show the top executives in our corporations that there is a return on their investment and real business reasons to use information technologies.

During the question and answer session, Mr. Fritts asked if there was any discussion of security issues related to data and data transfer. Mr. Johansson responded that this was not discussed during the breakout session but was discussed during the break.

Mr. Schaffran asked a follow-up question based on Mr. Dallas' comments. His question was whether the group identified any business cases that were suggested as opportunities or is this an area for a follow-on initiative to define the business cases? Mr. Johansson responded that no specific business cases were discussed and that this was a natural follow on to the discussions in the breakout session.

Session 2

Topic

- What level of detail in data exchange should be aimed at?

Participants

L. Chirillo

D. Fernholz

J. Goodwin

N. Hata

H. Hoffmann

M. Ishige

I. Kishimoto

K. Shigematsu

R. Steiner

Conclusions

Mr. Goodwin, chairman of this group and the report to the workshop body was presented by Mr. Hata.

The theme of discussion for group number 2 is shown in the slide presented (figure 1): "What level of detail in Data Exchange should be aimed at?" However, the members of group number 2 thought that before they had a discussion on this topic, they should first have a common understanding of the relationships between the organizations who participate in the detail exchange transactions.

The group members developed a diagram shown in the slide presented by the reporter (figure 2). This diagram shows interactions between the shipyard, the ship owner, the classification society, and various suppliers. The question discussed was "What information is exchanged between these parties?" In particular, the discussion focused on the exchange of commercial information and of technical information.

The group documented these relationships in the diagram for discussion purposes. What followed was a brainstorming discussion, which looked at the shipyard-to-shipyard, the shipyard-to-owner, and the shipyard-to-subcontractor transactions.

The group spokesperson then took an example of the owner-to-shipyard interaction. In this case the volume of information exchanged between the owner and the shipyard was compared in exchanging tender requirements, as an example.

The circles shown on the slide were described as representing the types of information exchanged between the owner and the building yard. The information volume was quantified and compared. In Japan a 30-page document is exchanged between the owner and the shipyard. This is in contrast to the 300-page document exchanged between an owner and a U.S. shipyard. The group concluded from this that the volume of information exchanged varies by region or country.

The group discussed the exchange of functional-design and production-design information between these parties. They also examined shipyard and subcontractor information-exchange transactions. In this latter case, very detailed information is exchanged.

The group discussion then focused on the shipyard and subcontractor information exchange. The group concluded that the subcontractor should be involved at the early stage of design. In particular, the subcontractor would be very confused by design changes. Therefore, the first conclusion by the group is the need for concurrent engineering practices with the subcontractor.

With regard to the information exchanged between two shipyards or shipyards and a classification society, the level of the detail of the information exchanged starts as simple then becomes more complicated. An example of simple information is catalogue information which is less complex than three dimensional CAD product-model data.

To illustrate the point, the group number 2 spokesman described a graphical representation in which a vertical axis represents the complexity of the information and the horizontal axis represents the organization (machinery, steel, etc.). In this way, a matrix of what kind of information is exchanged was developed. Much of what was discussed by the group at this point was technical, and there was a rush to put the information together for presentation to the other members of the workshop. The general conclusion of the group was that functional design-level exchange is the most useful.

Exchange of production level of detail information was discussed. However, the group believes that if there would be little value in exchanging production information as facilities constraints and capabilities are quite different between shipyards. In this case, it is a comparison of apples to oranges and as such functional design-level information exchange is more useful.

Europe, the United States, and Japan have some commonalties. However, in details there are differences. Consequently, future EDI standards may be explored in the same fashion as STEP and there is the potential for a common EDI standard. But the final conclusion reached was that the kind of information and level of detail of information exchanged will depend on the environment and circumstances. Though the information used by different partners may look like the same information, it varies. As a result, the group concluded that a single standard cannot be applied. Business practices must be considered and business process requirements applied on a case by case basis.

From the floor, the question was asked, "Did you discuss the information exchange between the subcontractor and the shipyard?"

A member of the panel responded that they did discuss this issue. He stated that it is true in some cases subcontractors should get involved during the functional design process. He cited as an example, the purchase of equipment mounted on the deck may not be such a case. On the other hand, the subcontractor would need to get involved in the design of the A/C system.

Another question asked from the floor was should the subcontractor get involved with the design after the specification is firm.

The presenter responded that there may have been some misunderstanding of what was said. He said that in this group there were representatives of European, U.S. and Japanese subcontractors. He noted that shipyards sometimes change their specifications and the subcontractor has some trouble keeping up. The information exchange between the equipment manufacturers and the shipyard would be as early as possible in the design process. Specifically, the shipbuilder relationship with the equipment manufactures would begin in the plan review.

The presenter added the clarification that a system solution provider should be involved early in the design process. In this case, the system solution provider needs to be given both the responsibility and the authority to manage its portion of the specifications.

Figure 1: First slide of the Group #2 report

Group #2

- Topic:
  - What level of Detail in Data Exchange should be aimed at?

Figure 2: Second slide of the Group #2 Report

Group #2

- What we did:
  - categorization of EDI
    - from organizations
    - from kind of information
      - commercial info
      - technical info

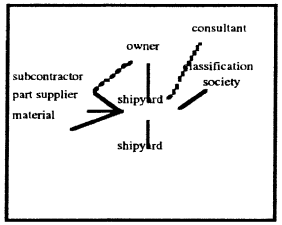

Figure 3: Third slide of the Group #2 Report

Group #2

- Sum-up
  - Sub-contractors;
    - should be able to JOIN EARLY in order to provide BETTER SYSTEM SOLUTION
    - provided that the functional specificaiton is FIRM

Figure 4: Fourth slide from the Group #2 report

Group #2

- Sum-up
  - TIME is MONEY
    - priority should be given to EDI of functional design information to SPEED UP plan approval and FACILITATE inter-shipyard cooperation

Figure 5: Fifth slide from the Group #2 report

Group #2

- Sum-up
  - Case-by-Case:
    - Detail which is required for any EDI must be determiend by the business process requirement on a case-by-case basis

Figure 6: Sixth slide from the Group #2 report

Group #2

- Sum-up
  - Potential for common EDI Standards
    - some business process throughout international shipyards are similar enoughto create the potential for common EDI standards in the future (like STEP)

Session 3

Topics

- How to encourage adoption by small/medium sized suppliers.
- Who benefits from electronic information exchange particularly if the exchange is easy for a comprehensive system holder, but excessive work for users of simple systems

Participants

R. Ahlers

K. Baba

B. Bongiorni

H. Bunch

M. Fritts

H. Habuka (Yamada)

Y. Hosokawa

T. Kaneko

A. Mechsner

H. Tabuchi

Conclusions

Mr. Yasahiro Hosokawa from the Japanese Equipment Manufacturer's Association reported the activities of the third breakout session. There were twelve members of the workshop participating in this breakout session. Professor Howard Bunch served as moderator and notes were prepared by Mr. Bongiorni.

The topic of discussion was how to encourage the adoption of electronic commerce by small and medium suppliers to the shipbuilding industry. Mr. Hosokawa noted that three items were discussed in reference to the main topic. These were:

- Who benefits from use of electronic data interchange (EDI) and electronic commerce (EC)?
- How to should EDI and EC be introduced to small and medium suppliers?
- What is the cost of implementing and using EDI and EC?

Mr. Hosokawa said that as he listened to the report from group 2, he realized the group could have done more. He said that the failed to define the concept of EDI and EC.

However, Mr. Hosokawa said that the group did discuss the classification of information according to its complexity.

The group first discussed who benefits from the EDI and came to conclusions similar to those of group 2. Mr. Hosokawa reported that the group concluded that both the suppliers and the shipbuilders would all benefit from EDI and EC. Also referenced in the discussion were benefits to classification societies and other organizations mentioned in this context.

With regard to the introduction of EDI and EC, Mr. Hosokawa reported that the group took as an example a case involving a marine equipment manufacturer. In this case, EDI and EC are easy for a comprehensive system holder to implement (a prime contractor for example) and excessive work for users of simple systems (a small supplier for example). However, Mr. Hosokawa noted that there was some discussion of circumstances where it may in fact be easier for a simple user than for a comprehensive system holder to implement EDI and EC as the technologies become simpler to use and more accessible.

In this context, Mr. Hosokawa reported that the discussion was broadened to include cost of implementation, as this was considered to be a significant barrier to implementation. The group discussed the costs associated with EC and EDI, in particular noting that the actual cost is beyond the purchase of hardware and software. Mr. Hosokawa reported that the group considered the possibility that the most significant cost impact to implementation may be the human factors such as education, training, insecurity, dislocation, and other social impacts within the organization.

Mr. Hosokawa concluded that no specific conclusion was reached by the group however there was a consensus that EDI and EC are a necessity. He then asked Professor Bunch to add his observations to the report.

Professor Bunch commented that one item noted by the group was that the closer the relationship between the shipyard and its suppliers, the less there was a need or benefit to be accrued from EDI or EC. He said that he found this point very impressive for those members of the group from Europe and the United States.

Professor Bunch reported that the group discussed the Japanese shipbuilder relationship with their suppliers which has almost instantaneous communication. In this situation, there is not the apparent benefit from EDI or EC. But the members of the group discovered that as Japanese shipyards start to look at a supplier base outside Japan, the need for and benefits of EDI and EC become more apparent. Professor Bunch reported that the group found that as Japan begins to think in a global context, there is the need to put into place EDI between suppliers and shipyards.

Professor Bunch then reported on the group's discussion of the cost of installing EDI and EC. He noted that this was a topic of interest to the Japanese attendees. He stated that the group found the tangible costs were easy to determine, but what is unanswerable is the cost associated with the cultural change associated with EDI and EC. The group tried to estimate some of these costs such as dealing with legacy data and systems, education and training, and cultural changes to the organization. No one in the group had an answer to this problem or an estimate of the associated costs. Professor Bunch concluded his comments by noting that the group tried to approach an estimate of these costs through a case study with limited results.

Mr. Kaneko added his observations on the discussions in the group. He pointed out that typically information is not being supplied to marine equipment manufacturers, but to other organizations such as the shipyard, owner, or classification society. He also noted that Japanese marine equipment manufacturers are small, usually with twenty to twenty-five employees. The cost of implementing EDI and EC can be prohibitive. However, there may be an opportunity to mitigate this using the emerging Web technologies.

Session 4

Topic

Maintenance and ship handling data, focused on ISM Code. Who maintains data of delivered ship and design changes after delivery? Who keeps the operations manuals updated?

Participants

J. Garvey

T. Imaizumi

T. Koyama

T. Maruo

U. Rabien

D. Rossi

R. Schaffran

R. Vopel

Conclusions

One of the Japanese delegates reported the results of discussion in breakout group 4. The theme of discussion for this group was focused on maintenance and operations data with

reference to the IMA code. The presenter reported that in the first half of the discussion, Dr. Koyama explained the ISM code.

The presenter summarized what was presented. The goal of ISM is to insure the safety of the ship by identifying and defining the responsibilities of the owner and builder. The captain and seamanship for example are the responsibility for the ship owner/operator. ISM addresses the hardware such as the hull, as well as the operating skills of the crew including software. ISM also deals with how the safety of a vessel is to be managed. The ISO 9000 standard is being applied to equipment suppliers and builders, and, for safety of the vessel, ISM is becoming a standard like ISO 9000. However, ISM does not specify the details, only the functional requirements that the owner must establish and implement his own safety system. According to Dr. Koyama, the ISM code will be effective July 1998.

The presenter reported that the group began their discussion by identifying how various information is exchanged starting from construction to operation of the ship. The group created a matrix of the information and who has responsibility for that information. On one side of the matrix were listed the builder, classification society, and manufacturer. The lifetime manager was also included as was the repair yard. On the vertical side of the matrix printed in red, the group listed the product model data for a vessel. The group used the symbols C for creation, M for maintenance, O for monitoring, U for data user. A block of the matrix was outlined in red to indicate information required until the ship is handed over to the owner and identified as the responsibility of the builder and equipment manufacturers. The remaining information was considered to be data used and maintained by the management company.

The reporter for the group said that the group concluded that environmental data and operational data was typically included in the ship's manuals. However, the owner/operator is responsible for maintenance of data such as coating thickness and hull plate thickness over time.

The group also concluded that the product model will change over time from the model handed over from the shipyard to the owner at vessel delivery. That is, maintenance of the data is required by the owner or ship manager. The group concluded that this is a new role for the owner/operator. The group also identified future information needs to support new businesses or future businesses.

The reporter stated that the group identified four stages for data handling and concluded that there is a general need to reorganize the information to better understand the relationships. In particular, the question was asked what information areas does Seasprite cover and what are the roles of the shipbuilder and classification society in providing and maintaining vessel data.

The group concluded that EDI only covers the creation of the product model, but there is other data created and changed over the life cycle of the ship. The group then asked how safety data will be handled. The group also recognized that new kinds of information exchange beyond EDI will be necessary. As a result, there might be some missing points which require a more thorough examination.

Mr. Garvey pointed out that in the process of filling out the matrix there was a conspicuous absence of the owner/operator. He noted that session members consisted of shipbuilders and suppliers, and suggested that in future discussion we should reach out to the owner/operator community.

Mr. Dallas concurred with Mr. Garvey commenting that the virtual enterprise extends beyond the gates of the shipyard, and this was a conclusion reached by Group 1 also.

Closing Session

General Discussion: Where do we go from here?

Japan

Dr. Koyama gave his summarization first. He presented a brief review of the discussions at the workshop over the two days. Dr. Koyama described three different positions which were characterized by the key words competition, cooperation, and collaboration.

Dr. Koyama observed that the notion of collaboration and cooperation in shipbuilding were easy to understand. However, he pointed out that in discussion of competition in shipbuilding, there was no reference to a target for that competition. He suggested that the discussants were alluding to Japan as the target, because Japan is the market leader and wants to stay competitive in the world market.

But Dr. Koyama brought up many of the issues that are facing Japan, in particular the aging of Japanese society. He pointed out that in various industry sectors, the work force is aging and there are fewer replacement workers as a result of these demographics. According to Dr. Koyama, one of these industries is shipbuilding. Consequently, to maintain its position in the market, Japan must achieve higher productivity.

Dr. Koyama further observed that the U.S. and Europe shipbuilding industries are seeking to enhance their competitiveness, and see information technology as a key tool for doing so. His conclusion was that the United States, Japan, and Europe are looking in the at information technologies with a common target, improved productivity. Dr. Koyama summarized by saying that throughout the discussions in the workshop, he has heard nothing that has surprised him. This has been a forum which has confirmed that we have a lot in common.

With respect to the virtual enterprise, Dr. Koyama stated that to accomplish this there needs to be common EDI standards and he noted that shipbuilding is a unique industry. He estimated that there are 20,000 ships engaged in seaborne trade, that this is a very independent industry, and yet we need to develop a platform in which we must use a common technology.

Dr. Koyama expressed his thanks to the efforts of the workshop representatives from Europe and the United States. His conclusion was that this series of meetings and presentations was a very good opportunity for information exchange.

Europe

Mr. Vopel provided the closing conclusions on behalf of the European delegation. He considered the presentations to be good, putting forward the same problems and solutions faced by Japanese, European, and U.S. shipbuilders.

Mr. Vopel pointed out that shipyards must produce ships with added value, and that competing with the other countries that have a lower wage rate (implying the Koreans) requires that shipbuilders must be more productive and flexible.

He also observed that vessels must be flexible or special in light of increasing safety issues. The public won't let ship owners, operators, and builders off the hook if a vessel is involved in an accident with an impact on the environment or a loss of life. Mr. Vopel concluded that shipbuilders will need to produce safer, more reliable vessels.

With regard to open standards, Mr. Vopel commented that when shipyards made everything themselves, they had alot of over head and were inefficient. They have tried to develop information systems on their own, but have been overtaken by the web, browsers, and other software developments.

Mr. Vopel observed that the discussions during the workshop were lively and to the point. He felt that the breakout session were busy and that the summary reports to the workshop were good.

Mr. Vopel said that he believes the lines pointing to the future are clear. The question in his mind is how are we going to handle this knowledge. Some of the European members will go back to the STEP communities and tell them we need solutions now, and they need to be smart and deliver solutions.

Regarding EDI, Mr. Vopel concluded that the representatives at the workshop must fly the technology flag. He noted that most of the issues related to standards are in areas that are precompetitive and, consequently, there is room for cooperation.

Mr. Vopel was quite happy with how things went and will try to come up with some conclusions on his trip home. He expressed his thanks to all and commented that he thought the setups were perfect. He expressed his thanks to the translators

As a topic for further discussion, Mr. Vopel suggested considering a time line for the implementation of what was achieved at this workshop. Also suggested for future discussion is identifying common cooperation structures.

Finally, Mr. Vopel stated that he had initially feared that the workshop would be too focused, but that a good beginning had been made in discussion of a number of issues. He suggested that there may be a need for continued discussion in more detail among smaller groups.

U.S.

Mr. Dallas spoke on behalf of the U.S. delegation. He expressed his thanks to all the participants and the organizers for their efforts. He considered the participation by US representatives at this workshop and ICCAS very successful. He was impressed by the nature of the discussion questions and how they were synthesized.

Mr. Dallas stated that the first question considered the system architecture for collaborative shipbuilding, which is a broad business-based issue. The next questions addressed topics that got into specifics of how this new business structure could be supported. In Mr. Dallas' view, each question led to the next and each supported the other quite well.

Mr. Dallas then commented on the fact that most of the U.S. workshop attendees work with the technologies discussed. He considered the struggle that most of the U.S. attendees face when trying to persuade industry executives to agree that there is a need for the technologies discussed during the workshop. Mr. Dallas stated that the workshop attendees need to show that there is a business case with the necessary return on investments for use of information technologies in support of improved productivity in shipbuilding. He noted that the costs for installation, training, and maintenance of information technologies can be quite high even though the costs of hardware and software are dropping.

He noted that information technology is developing rapidly. As information technology becomes outdated, costs to upgrade or replace hardware and software can be prohibitive. Shipyard executives are faced with the problem of whether to invest now or wait? Mr. Dallas stated that shipbuilding executives wrestle with these very difficult issues.

Mr. Dallas addressed Prof. Koyama's question earlier in this session of whether the first group talked about the business case in which information technology supports the shipbuilding strategy and the objectives of shipbuilding. He made reference to Prof. Koyama's comment that Japan is faced with the aging workforce and therefore must improve productivity. He then compared this to the U.S. shipbuilders also desiring to increase their productivity and having the problem of maintaining a skilled work force. He concluded that the issues faced by the United States and Japan shipbuilders are similar with regard to these business cases.

Mr. Dallas then addressed the issue of collaboration in development and application of information technologies in the shipbuilding industry. He observed that in many cases, information technology is viewed as a weapon, providing a competitive advantage. As a result, Mr. Dallas concluded, if you are an executive in a shipyard it may be difficult to collaborate in development of a technology tool with a competitor.

Finally, Mr. Dallas summarized these as tough issues, some of which are technical, some philosophical, and some cultural. He commended the members of his breakout group for their contributions to the discussion and efforts. He thanked them for helping him develop a better understanding of their issues. Mr. Dallas then thanked the organizers and participants for their efforts and contributions to the meeting.

Discussions

Prof. Koyama began and moderated follow-on discussion. He referred to Mr. Vopel's comment that he found the meetings over the last two days fruitful. He then put forward Mr. Vopel's question: How do we go forward from here?

Prof. Koyama then referred to Mr. Dallas' comment regarding the need to secure the support of shipyard executives and agreed that the only way to do so is by accumulating successful business cases.

Prof. Koyama then commented that information technologies are making advancements so fast that in half a year everything we have discussed may be obsolete. What will be the new information technologies? This is, he said, hard to determine.

He concluded that these are the important points suggested by the other speakers and asked if there were other suggestions regarding the themes for any future meeting.

Mr. Garvey commented that his interest in this meeting stems from his experience in the 1960s and 1970s when computer technology was introduced to the shipbuilding industry. While the technology made contributions in and of itself, the inability of shipyards to work together slowed the process of using these technologies.

He observed that we seem to be going through that process now and that the shipbuilding industry must work through that competitive/cooperative problem again. He commented that the shipbuilding industry needs to be responsive to its customers and promoted as progressive. He noted that the shipbuilding industry is often held up as being reactive, but believes that in many ways we are further ahead than other industries.

Mr. Garvey defined the "race to be second." This is the case describing people hesitating to take a step in a new area first. They want to see how the first guy fails before going following. In his view, this is not always a bad business policy, but sometimes this kind of forum gives professional people the confidence that they are on the right track. In this way, these people have an opportunity to work with peers, even though they may be competitors, with small risk of losing a competitive edge. But, Mr. Garvey noted, the benefit to the people developing the technologies is substantial.

Dr. Koyama agreed with Mr. Garvey.

Mr. Vopel referred to the problem of trying to convince the management of shipyards to take advantage of information technologies. He voiced a strong belief in the need for business cases and sees them as a means to develop practical solutions. Mr. Vopel noted that there is the possibility to define the business case for information technologies in the shipbuilding industry and present it before a forum that already exists. He cited the ECU type of meeting as such a venue noting that it would reach high shipbuilding industry management levels directly. He put this idea forward as a proposal for discussion.

Mr. Fritts then drew an analogy between gardens and different views of what gardening is. In a sense, he suggested, we have the same thing here in regards to information technologies: We have three different views of gardening. We have plants, or in this case technologies, that we all equally consider useful and are looking for a common way to use. He proposed that rather than looking at global cooperation, it may make more sense to work together on a case-by-case basis.

Mr. Vopel suggested that we may be able to identify two or three groups that have a need to talk to each other in an electronic way. With a lot of preparation, we could then bring them together to find out how this can be achieved. As an example, Mr. Vopel brought up the interaction between model basins and shipyards during predesign. He asked whether that could work if focused in such a way.

Mr. Fritts responded that he thought the best way to make progress is to pick an area in which there can be rapid progress. This brings up instances of other applications and there is a snowball effect.

Dr. Koyama then referred to Mr. Garvey's earlier comment which he understood to be similar to Mr. Fritts comment: to go beyond a passive or reactive attitude. Dr. Koyama suggested that Mr. Garvey's perspective was a view of the problem in a more competitive light. In that case, by virtue of competing we would stimulate each other into more proactive use of information technology in our industry. Dr. Koyama likened this kind of situation to an olympic competition with separate events such as 100-meter dash, a 500-meter dash, and so forth. But Mr. Garvey's point and Mr. Vopel's points appear to be the same. Mr. Garvey agreed.

Dr. Koyama then asked Mr. Vopel to elaborate on the communication scenarios.

Mr. Vopel hoped that the industry would find these scenarios and noted that this depends on the penetration of information technology into the shipbuilding industry. He suggested that there are systems in place that are not used or not sufficiently used for communication, and that maybe we should start with these cases rather than with those that require introduction of new systems.

Mr. Vopel observed that on the supplier side, there are those that are using information technologies, but there are those that just sell from stock and are not interested in interactive exchanges. He said, for example, from EDIMAR is looking into cranes since these are large, sophisticated systems that are highly customized. In another example, the MARVELOUS project is looking at jumbo-izing as a case since this is also highly collaborative. Through projects such as these we would be able to showcase these systems as an alternative to a paper-based system. I would ask the EU projects to come up with these kinds of scenarios.

Mr. Vopel stated that under pressure of EXPO '98 to EU, maritime research had to produce sexy results in order to convince the general public that there is a benefit to spending all the money on these projects. As a result, they were pretty creative with their demonstrations which are actually being built and will be on display at EXPO '98 in Lisbon in May through September 1998. Mr. Vopel stated that he is looking forward to this opportunity for the shipyard community to sell these projects to a public familiar with the shipbuilding industry in only a casual way. He suggested that if such demonstrations can convince a younger generation that shipbuilding has an exciting future, then they may also convince a CEO that there is an exciting future.

Dr. Koyama summarized the views expressed as:

- It is necessary to describe business cases that convince shipyard management.
- It is necessary to describe cases that can be used to convince the public.

He also suggested that peripheral organizations can work together and, as a result, accumulate such cases. In Dr. Koyama's view, EXPO '98 is something that will happen, but that those involved in the shipbuilding industry should not just sit and wait for business cases to happen. He stated a belief that there are some implementations that can be accomplished to support business goals and opportunities in the near term if we agree on some of the common issues.

Dr. Koyama continued that a common issue to all the attendees is that shipbuilding top management has yet to have a full understanding of the benefits that can accrue to their businesses. In order for them to deepen their understanding we must accumulate business cases, but these will not just happen. Dr. Koyama urged that we must bring about those cases by being more active and not passive. He asked Mr. Garvey if his suggestion was to generate competition within our group.

Mr. Garvey responded that this was what he was suggesting and added that meetings like this promote confidence among the community of technology developers that they are exploring the right areas. He commented that nothing moves a company forward faster than seeing the other competitor going forward. With respect to information technology, Mr. Garvey stated that he thinks it is clear to everyone that this area is developing

quickly, and there is a serious risk of being left behind. This, he continued, is a big worry among business people who do not have a solid business basis for their decisions.

Mr. Dallas commented that education and training are needed among executives in information technologies and the related business issues. He stated that executives have a knowledge of shipyard processes and issues, but not of new processes or opportunities. He said that he believes we must cast information technologies in terms that are familiar and relevant to shipyard executives. He thinks that information technologies create new ways of doing things. Mr. Dallas gave as an example his experience with NSnet (see the briefings above) and tried to convince shipyard executives that e-mail is important. He compared e-mail to the use of fax machines but at a lower cost. Mr. Dallas observed that many of the meeting attendees are designers and engineers and don't understand the thought processes of the executives.

Dr. Koyama then asked the Japanese representatives how they have dealt with their bosses and asked if they had any experiences that could be passed on to the other meeting members.

One of the Japanese representatives expressed surprise that there was so much interest in how to get shipyard management involved. He shared a rule that he and some of Japanese counterparts have used to get their management involved. This, he said, was to tell them that Europe is far ahead and Japan will be behind. He also commented that in many cases he and his counterparts haven't accomplished the targets for which they aimed. When this has happened top management was disappointed and felt they had been cheated or misled by the system people. But now they are saying that this is not true, that is, that they are seeing the benefits of the information technology deployment. The Japanese representative suggested that maybe European and the United States meeting members should say that this is happening in Japan and we must catch up. He then asked if there were any experiences that the suppliers represented could share.

Mr. Ito commented that many of the executives in Japanese shipyards are engineers, and they understand internet and information technologies. For them, however, the main issue is cost. So far they have identified the web as an economical step in advancing the use of information technologies. For example, Mr. Ito said we first tried to exchange drawings in electronic formats. In this case, Hewlett Packard plotter driver is used to create a file for drawings. For technical documents, Mr. Ito stated that his company used the Post Script format and saved the information to file. They are now using the Adobe pdf format since a Japanese version was introduced in May.

Mr. Ito continued to say that, as for drawings, his company saves them as vector data rather than raster and Japanese characters are saved as text. They have not used any special compression methods. So that without a lot of extra cost, Mr. Ito said, his company is implementing EDI. Mr. Ito said that these issues are related to the ways

Japanese shipbuilders and suppliers are using information in their companies and recognizes that attention must be paid to future protocols.

Dr. Koyama then asked for another comment from more senior management represented at the meeting. He asked if there were another successful Japanese project to which we could refer. He then suggested that maybe European and the United States delegates will go back to their management and say that Japan is ahead.

Another member of the Japanese delegation noted that all the people that participated in the Japanese CIM project took that information back to their respective organizations. In this way, they had common concepts but had to work under different circumstances and environments to implement CIM in their companies. He referred to his company's efforts where they implemented some of the results from the CIM project. He then commented that his senior management attributed their success to participation in the CIM project.

The meeting discussion then turned to follow-on activities to this workshop.

Mr. Schaffran from the United States delegation then suggested that an international vision for the role of information technology be developed. He suggested that there are cases where United States, Japanese, and European projects can benefit from sharing of information between efforts. He further suggested that there are areas where European, Japanese, and the United States shipbuilders should work together rather than separately. Mr. Schaffran then recommended that there be one more meeting to discuss this subject.

Dr. Koyama then referred to comments made by Mr. Vopel in which Mr. Vopel said that this kind of cooperation should be continued.

Mr. Vopel suggested that meeting delegates work together in developing STEP. He commented that there are a number of bottle necks and that there is a need for more implementation efforts. He commented that a standard becomes very large, and if we wait until it is complete, it may be overtaken by technology. Mr. Vopel stated that the software vendors and the shipbuilders need to be working together. The shipbuilders can define business cases that would establish prestandards, and the software vendors could do the development. Mr. Vopel continued, saying that he was never in favor of premature standards, but has changed his mind in this case. He said that developing a standard just takes too long.

He suggested that STEP is a place for higher-level applications where shipbuilders can work together, and, at a lower level, standard parts catalogues can be developed. In this latter case, Mr. Vopel said, industry should just go ahead and do it. In this way, shipbuilders will see the advantage very quickly. He noted that some of the European

projects have focused on this approach in getting suppliers on board and said that shipbuilders should push the high-level STEP work.

Dr. Koyama then asked Mr. Hanson what he saw as the relationship of this kind of meeting to ICCAS.

Mr. Hanson commented that computer applications in ship design and construction and exchanges of information on these subjects are what ICCAS is about. However, he noted that ICCAS is not a working group. As such, in his opinion, a forum like this would supplement the development of information technologies in the industry. In hind view there is no competition between ICCAS and this type of meeting to push development.

Dr. Koyama agreed with Mr. Hanson, and Mr. Dallas added that maybe this kind of forum feeds into ICCAS, and it may be possible to include an executive track at ICCAS meeting.

Dr. Koyama then observed that the meeting was coming to an end and asked, "How should we follow-up?"

Mr. Garvey stated that he had observed the dynamic of the last two days and how people interacted. He said that there was the possibility of getting carried away by the enthusiasm, and suggested the meeting delegates digest what has happened during the last few days. In particular, he would like to get back to Dr. Koyama and the Japanese delegates to discuss further the next step. He suggested that Prof. Bunch would do the same thing with regard to the European delegates, and together they would talk to the US delegates to see if there is concurrence in pursuing the issues raised at this meeting.

Mr. Vopel agreed and suggested that he felt it necessary to reflect on the proceedings, then find the right way to go the next step.

Mr. Garvey cautioned that one danger is to jump to conclusions on what is the next step. He suggested the attendees should let standards and other aspects of information exchange develop naturally and not be forced or imposed.

A member of the European delegation agreed and stated his opinion that there should evolve a more natural basis for follow-up discussions. He suggested that the attendees find natural relations between companies such as relations between shipyards and their suppliers, using those to define needs.

Dr. Koyama noted the commonality on the preceding statements and summarized the consensus that workshop delegates go back to their own countries and consider the creation of a common vision. He further summarized that there should be a continued

exchange of information and ideas, and that attendees should also promote the cooperation in a natural way.

With this the session was concluded.

Appendix

Attendee List

Shipbuilding Electronic Data Exchange Workshop Participants List

No.	Co.	Name	Title	Organization	Address E-mail	Tel Fax
1	JP	Norio HATA	Manager, Naval Architect Ship & Offshore Engineering Dept. Shipbuilding & Offshore	Ishikawajima-Harima Heavy Industries, Co., Ltd.	1-1, Toyosu 2-chome, Koto-ku, Tokyo 135 JAPAN norio_hata@ihi.co.jp	81-3-3534-3808 81-3-3534-3880(F)
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References

Reference 1

ICCAS

14 October 1997

MARITECH Overview

MARITECH is an Industry/Government, Cost Shared, Technology Development Initiative to Improve Productivity of Ship Design and Construction Processes in the United States of America

Major Areas Addressed:

- Design and Engineering
- Production Processes
- Electronic Commerce/Information Technology

This Presentation will only address what is being done in the Electronic Commerce/IT Area

MARITECH Electronic Commerce/Information Technology Projects

Objective:

Develop and Implement an Electronic Information and Communication System that will help to reduce the Time and Cost of the entire Ship Design and Construction Process from Concept Development through and including Life Cycle Support

IT, if properly developed and implemented, will play a major role in helping U.S. shipyards improve their competitiveness

Top Level Requirements for MARITECH IT Projects

- Support Creation of Collaborative Shipbuilding Business Enterprise that are Globally Distributed
- Allow for the Interactive and Responsive use of Enterprise-wide Information Sharing
- Leverage off of Open and Widely Endorsed Standards

MARITECH IT Projects

Product Development

- Commercial Object Model of Products/Processes for Advanced Shipbuilding System (COMPASS)
- A First Principles Approach for Shipbuilding Integrated Process and Product Development (FIRST)

Supplier Relations

- Shipbuilding Partners and Supplies enabling the Shipbuilding Virtual Enterprise (SPARS)
- Electronic Data Interchange and Electronic Commerce (EDI/EC) Between Shipyards and Suppliers

Factory Operations

- Shipbuilding Information Infrastructure Project (SHIIP)
- Process Improvement Tools for Ship Construction

Policy and External Environment

- Maristep Ship Product Model Exchange Project
- MARITECH Agile Shipbuilding Tool Kit (MAAST)
- NSnet

Life Cycle Support

- MariSTEP
- Process Improvement Tools for Conversion, and Repair

Reference 2

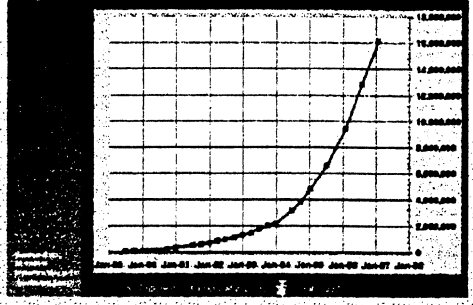
NSnet Project

H. Bruce Bongiomi, Project Director

Marine Systems Division
University of Michigan
Transportation Research Institute

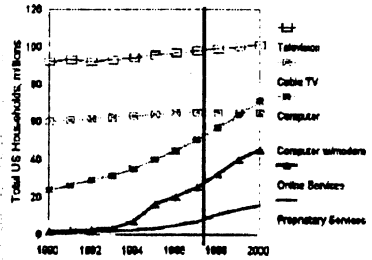
NSNET

Internet Hosts 1989-1997



NSNET

Cultural Change: Household Connectivity



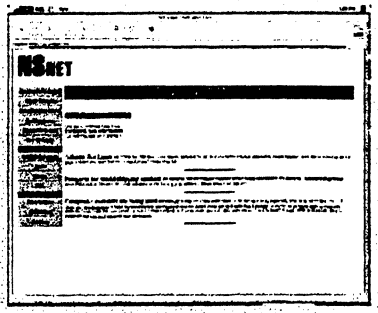
NSNET

Overall Status

- *Basic technology infrastructure in place*
- *Content developed and made available*
- *Able to provide resources for collaborative work*
- *Education and Training resources have been developed*

NSNET

NSnet Entry View



NSNET

Project Goal

- *Introduce the US. marine industry to new and emerging information and communication technologies*
- *Provide the cultural infrastructure necessary for the marine industry to incorporate information technologies in their business practices*

NSNET

Project Objectives

- *Education and training in emerging information technologies*
- *Create a "pull" for adoption of emerging information technologies*
- *Create and maintain an expertise in application of emerging information technologies to support the marine industry*

NSNET

Project Participants

- *Marine Systems Division of the University of Michigan Transportation Research Institute (UMTRI-MSD)*
- *Washington Decision Support Group (WDSG)*
- *Shipbuilder's Council of America (SCA)*

NSNET

Reference 3

SHIIP - SHIPBUILDING INFORMATION INFRASTRUCTURE PROJECT
SPARS - SHIPBUILDING PARTNERS AND SUPPLIERS

Multi-National Shipbuilding Workshop

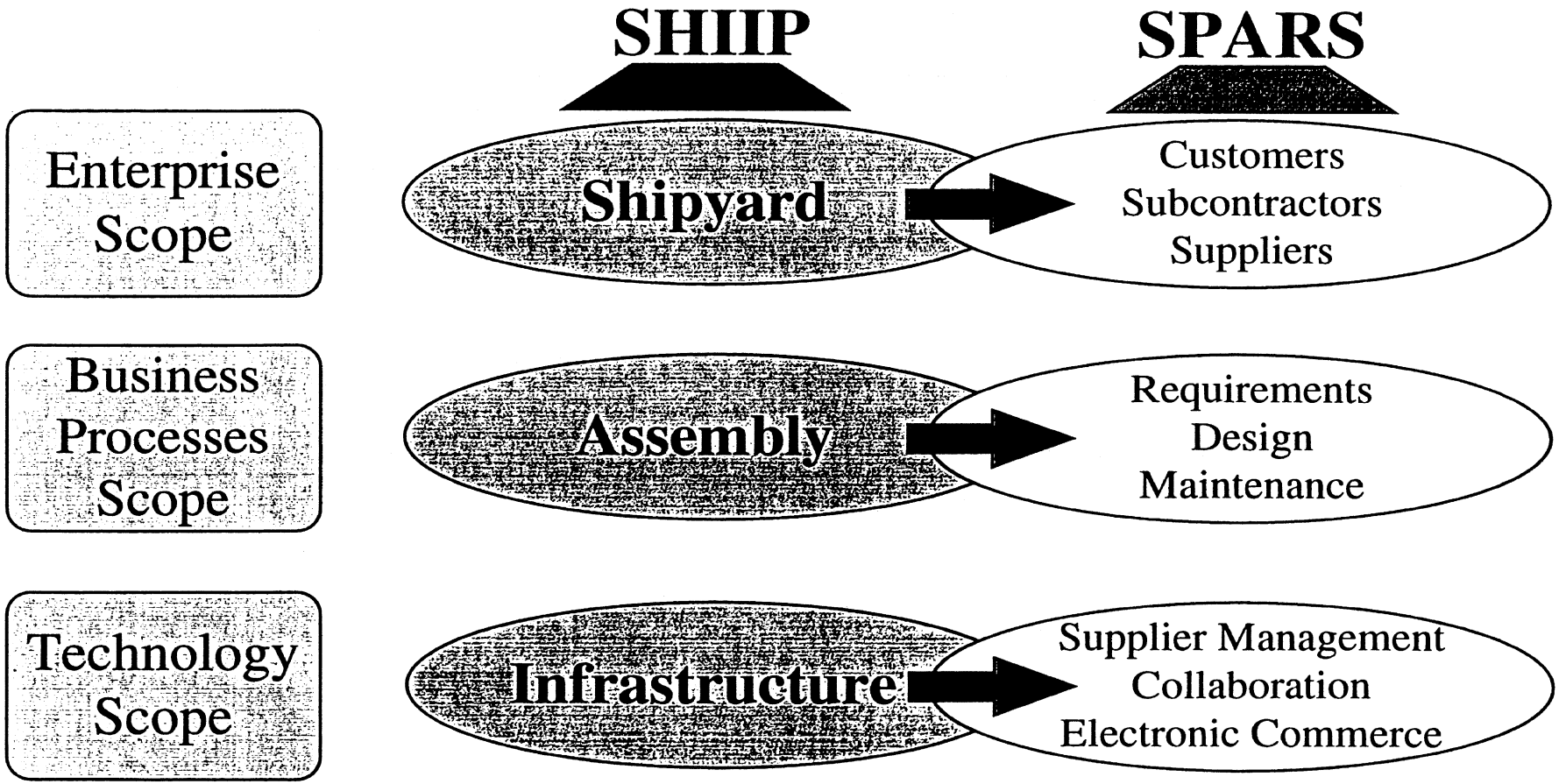
on

Electronic Data Exchange and Communication for Shipbuilding in the 21st Century

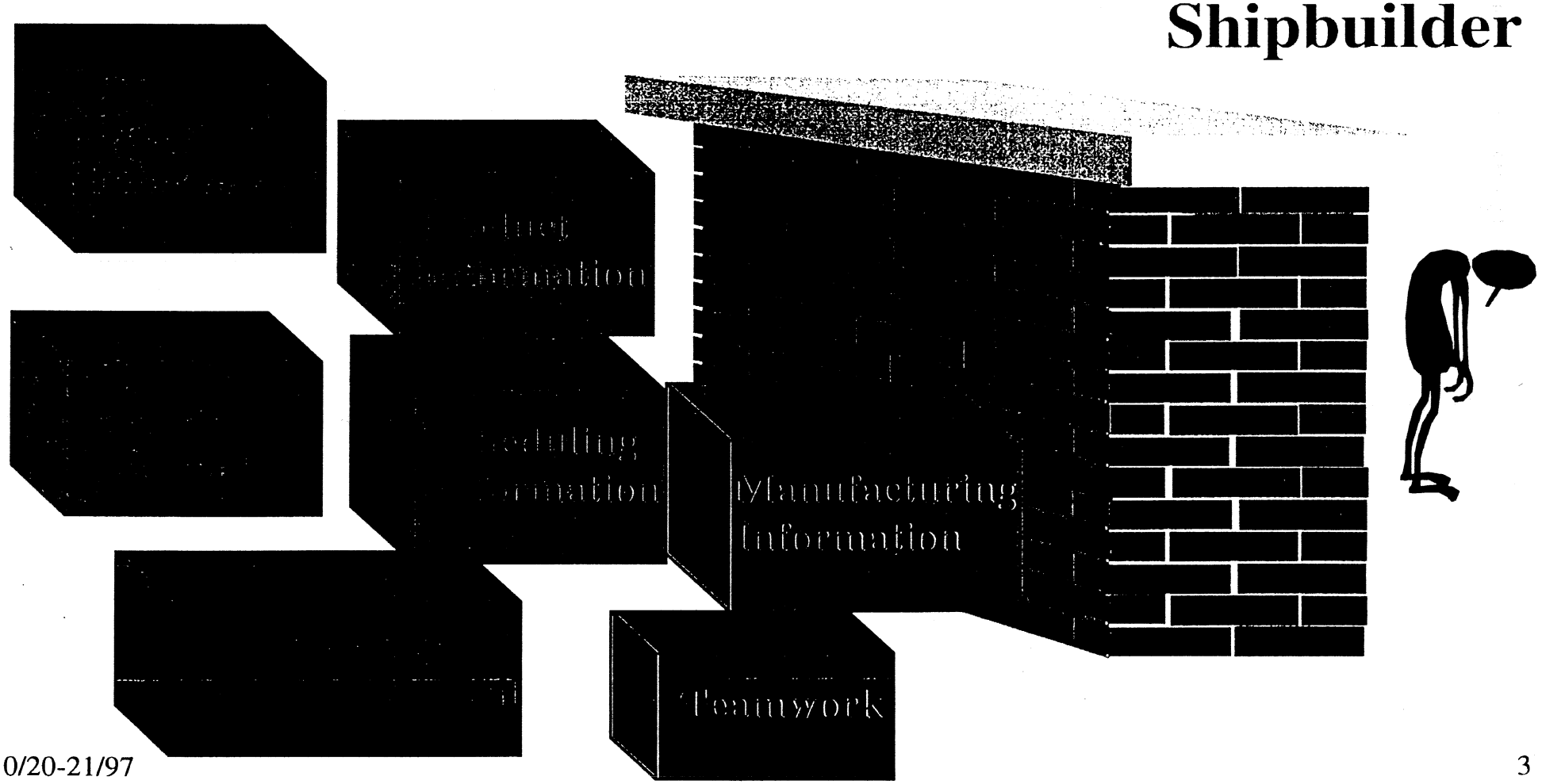
October 20-21, 1997
Yokohama, Japan

presented by: Christine Languedoc
Danielle Fernholz

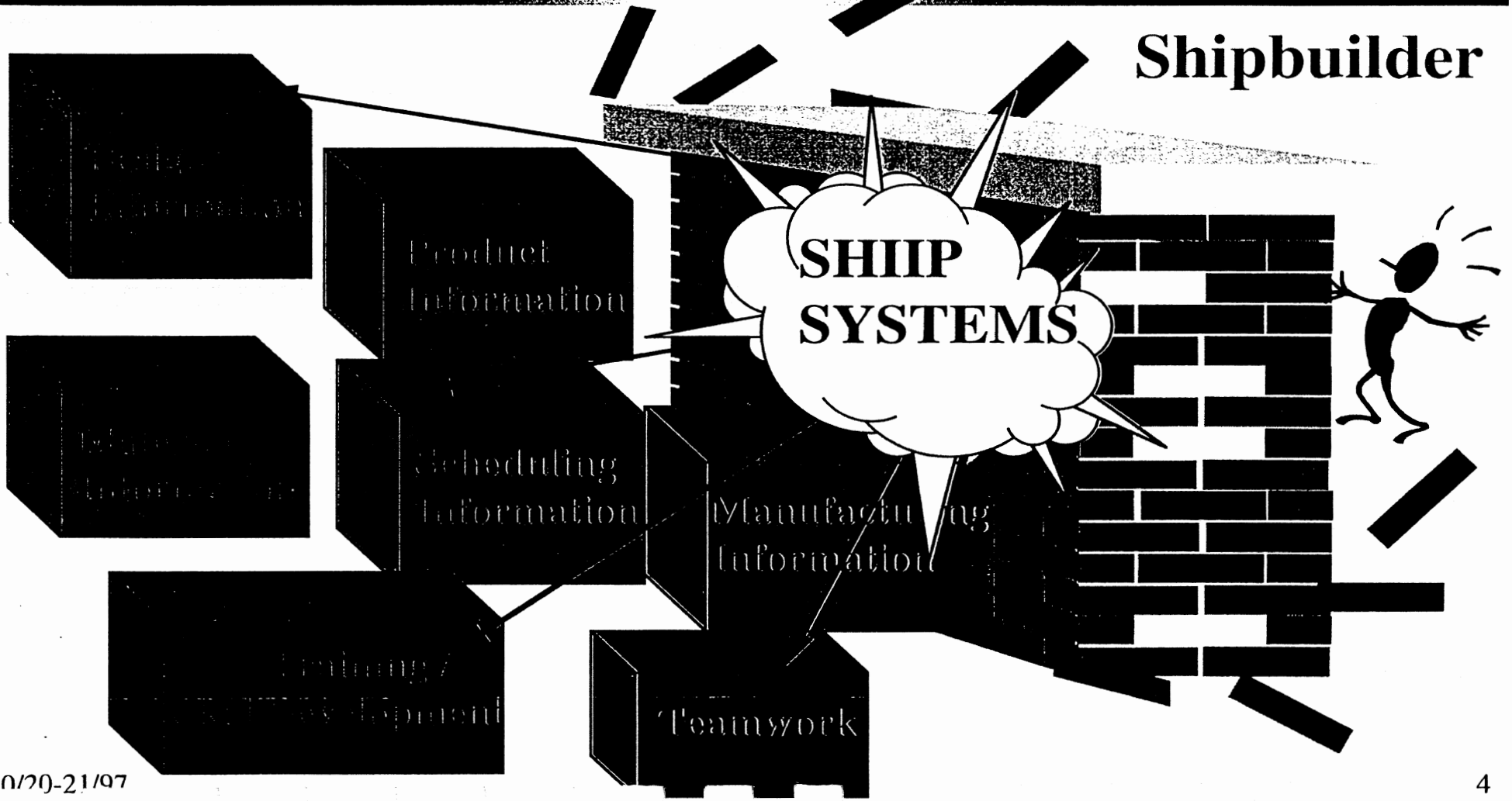
SHIIP to SPARS



Information and Cultural Barriers



Allow People to do More with Less



SHIIP - Information Technology

- **Flexible and User-Friendly Enterprise Information System**

  -Browser Technology - Easy access to many sources of enterprise information

  -Standards-Based - Easier to upgrade and integrate than proprietary technologies

- **Distributed Visualization Technologies**

  -High-Rate Communications - Enables 3D graphics transmission to worksite

  -Low-End Viewers - Self-guided access to design data at the worksite

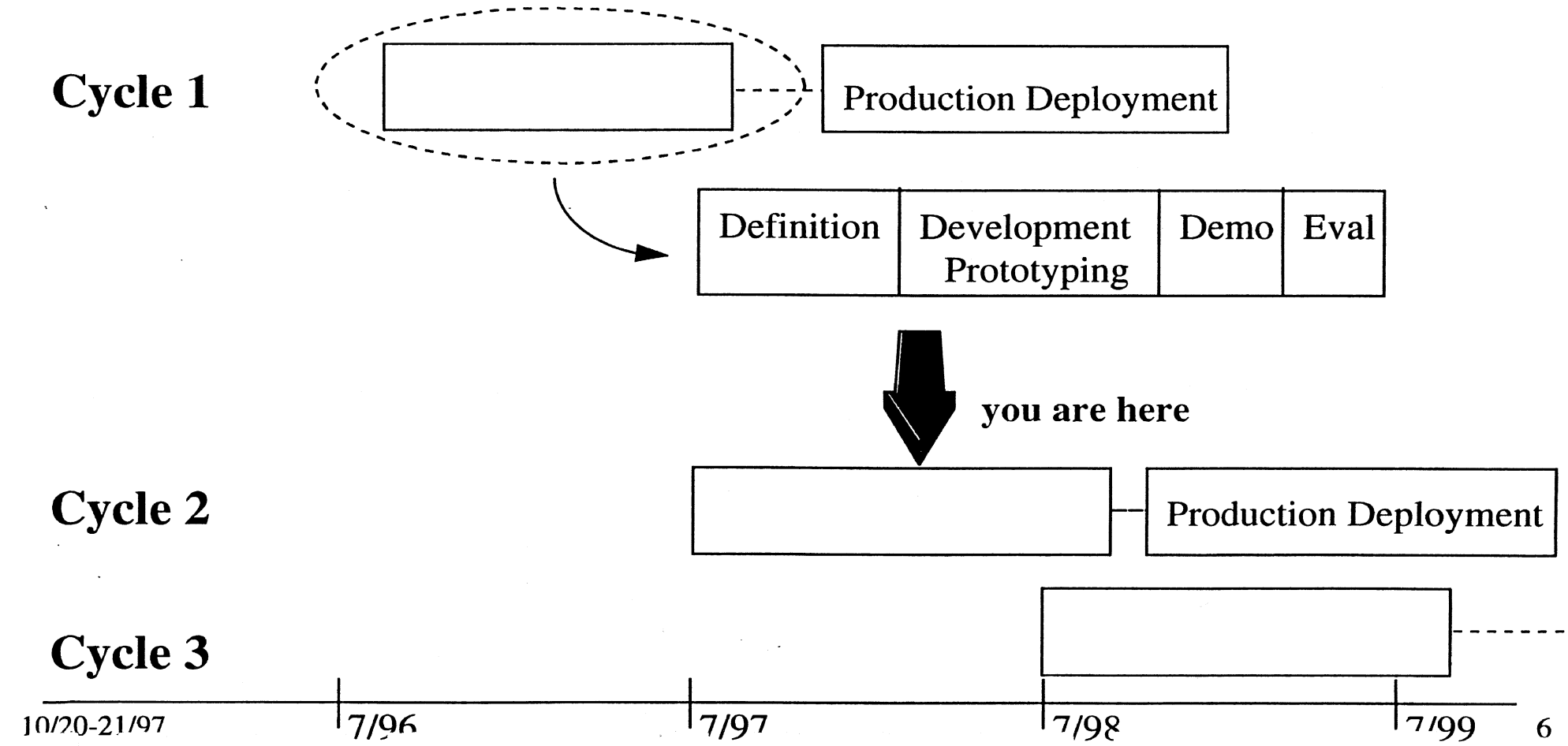
- **Demonstration and Validation of Production Readiness**

  -Prove through pilot deployment before committing to production use

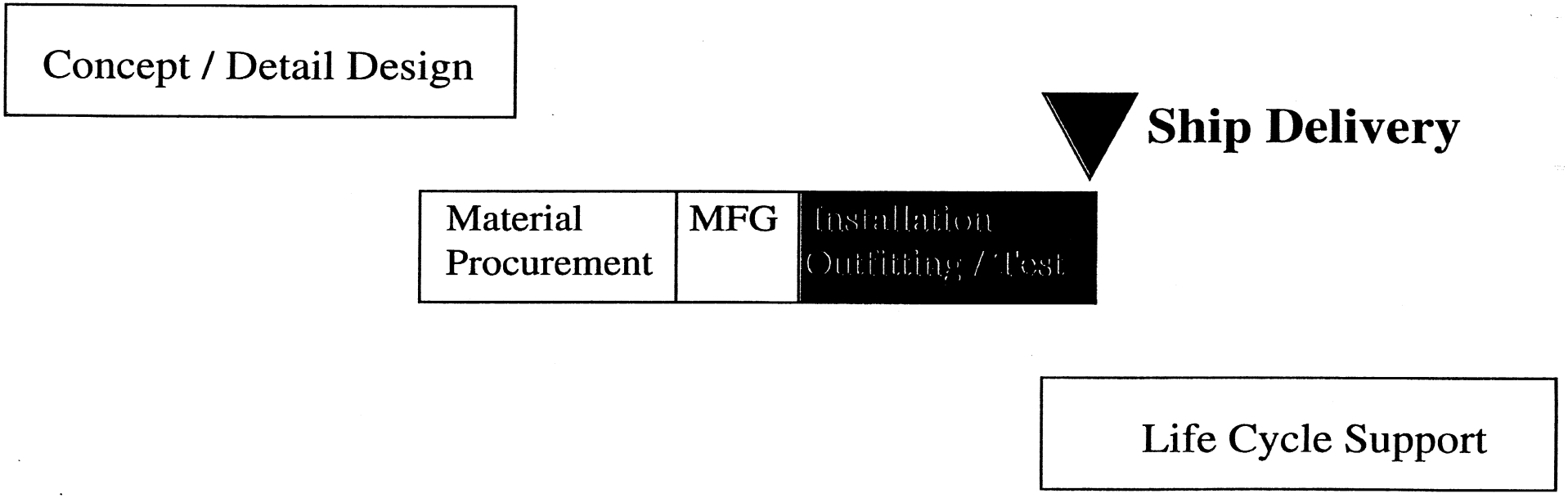
- **Single Point of Entry**

  -Uniform method of accessing data from multiple datastores

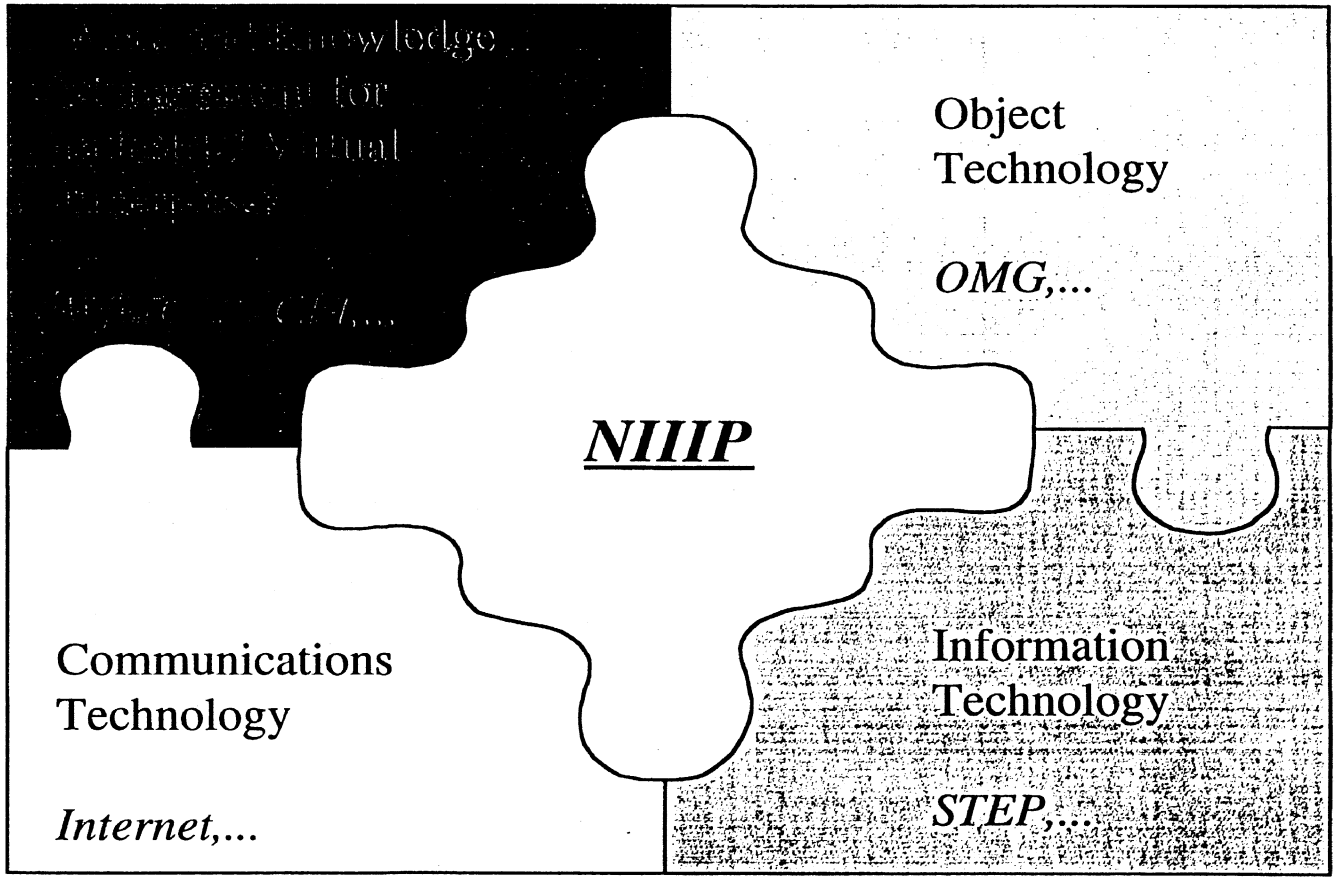
SHIIP Program Schedule



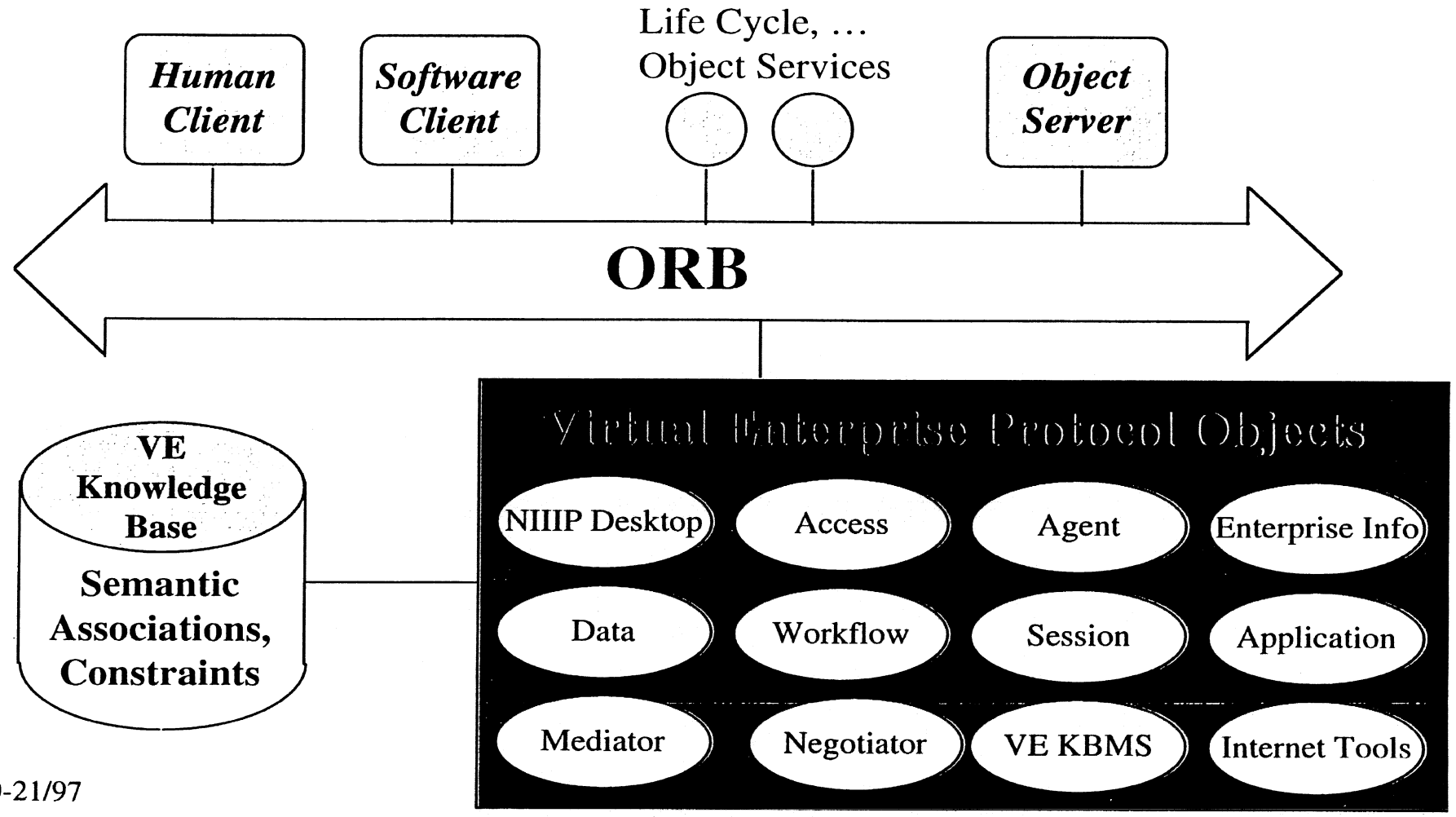
SHIIP is Focused on the Later Stages of Construction



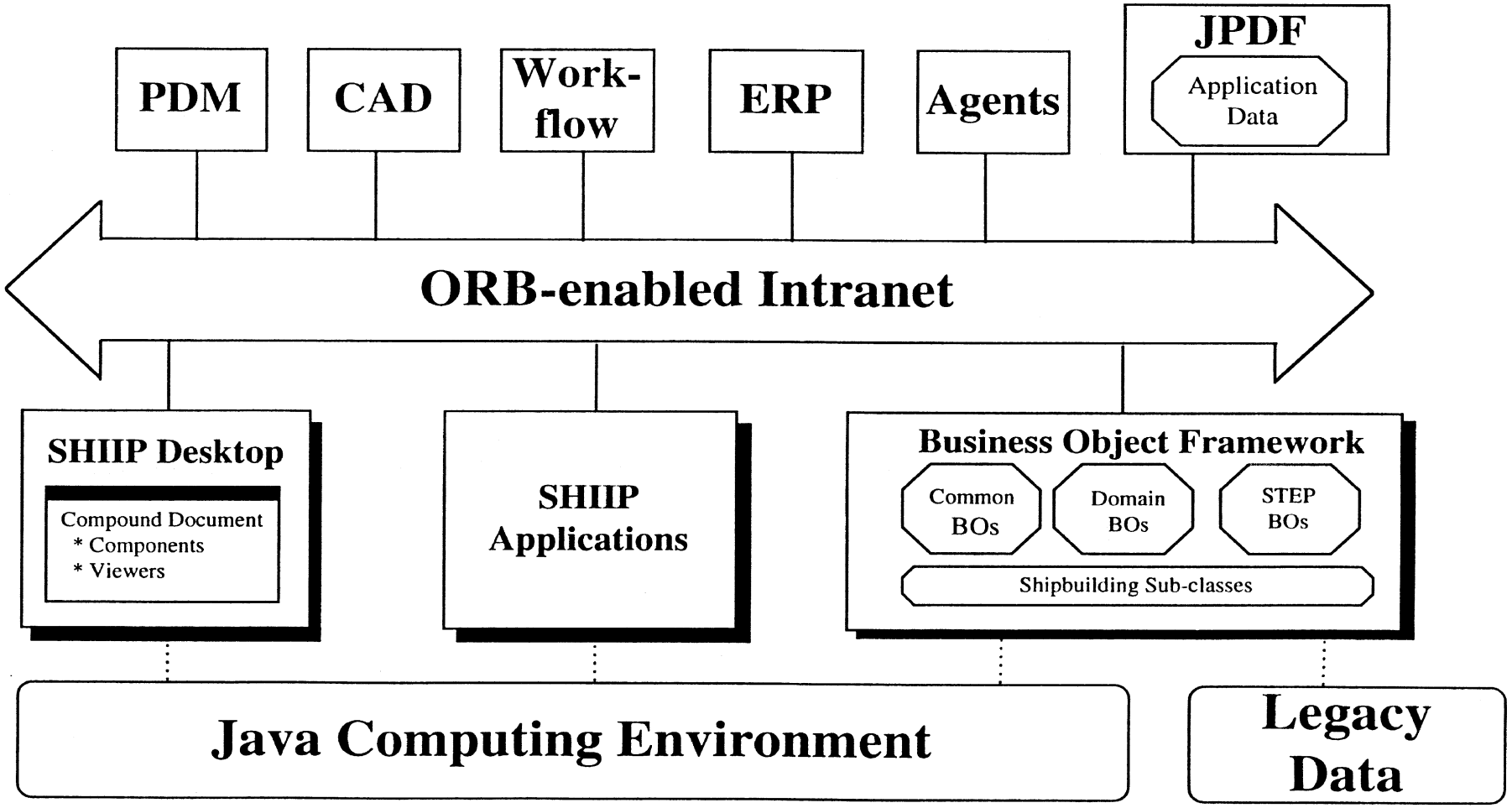
NIIIP Reference Architecture



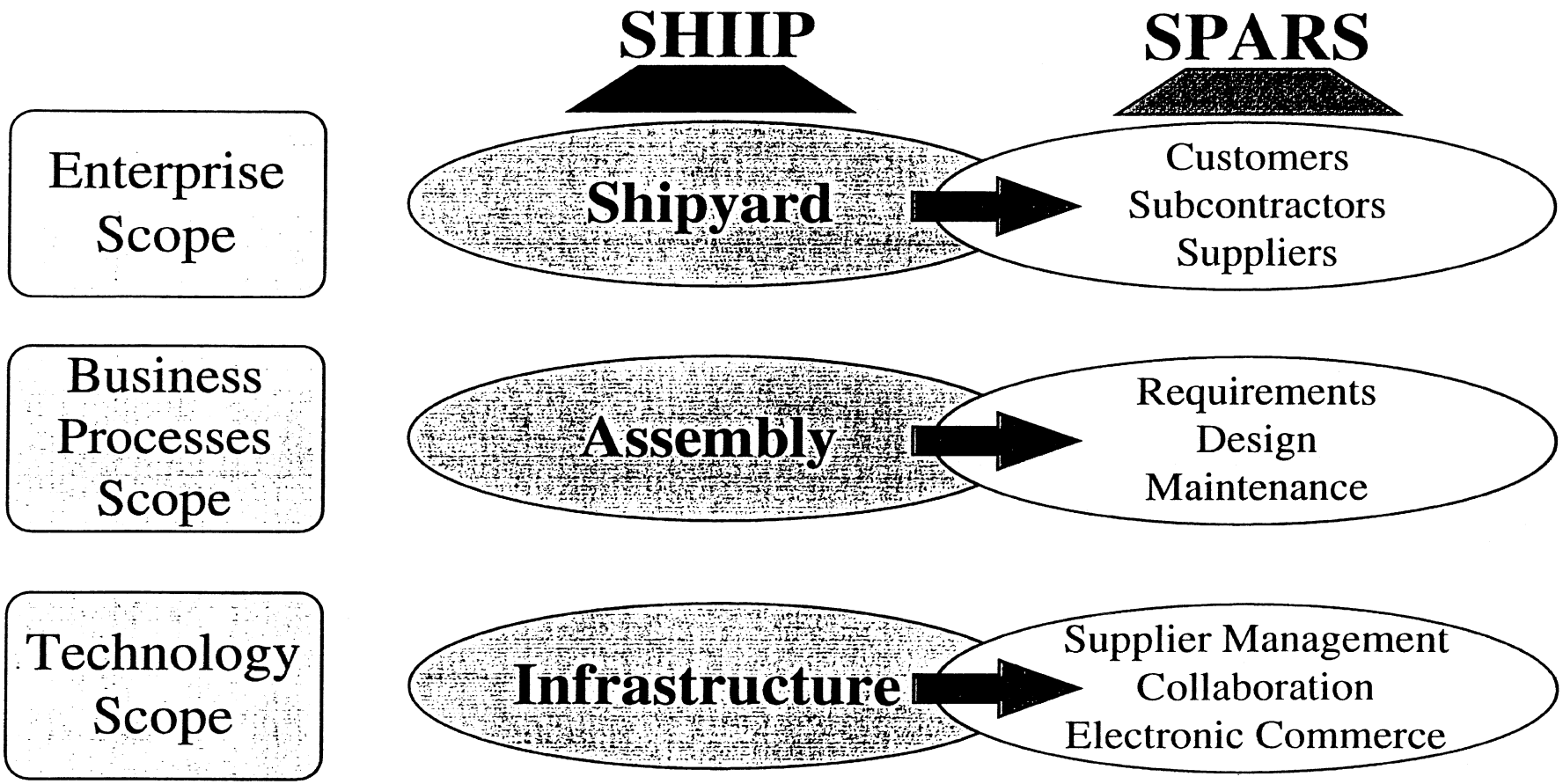
SHIIP: Uses NIIIP Reference Architecture



SHIIP Information Infrastructure



SHIIP to SPARS

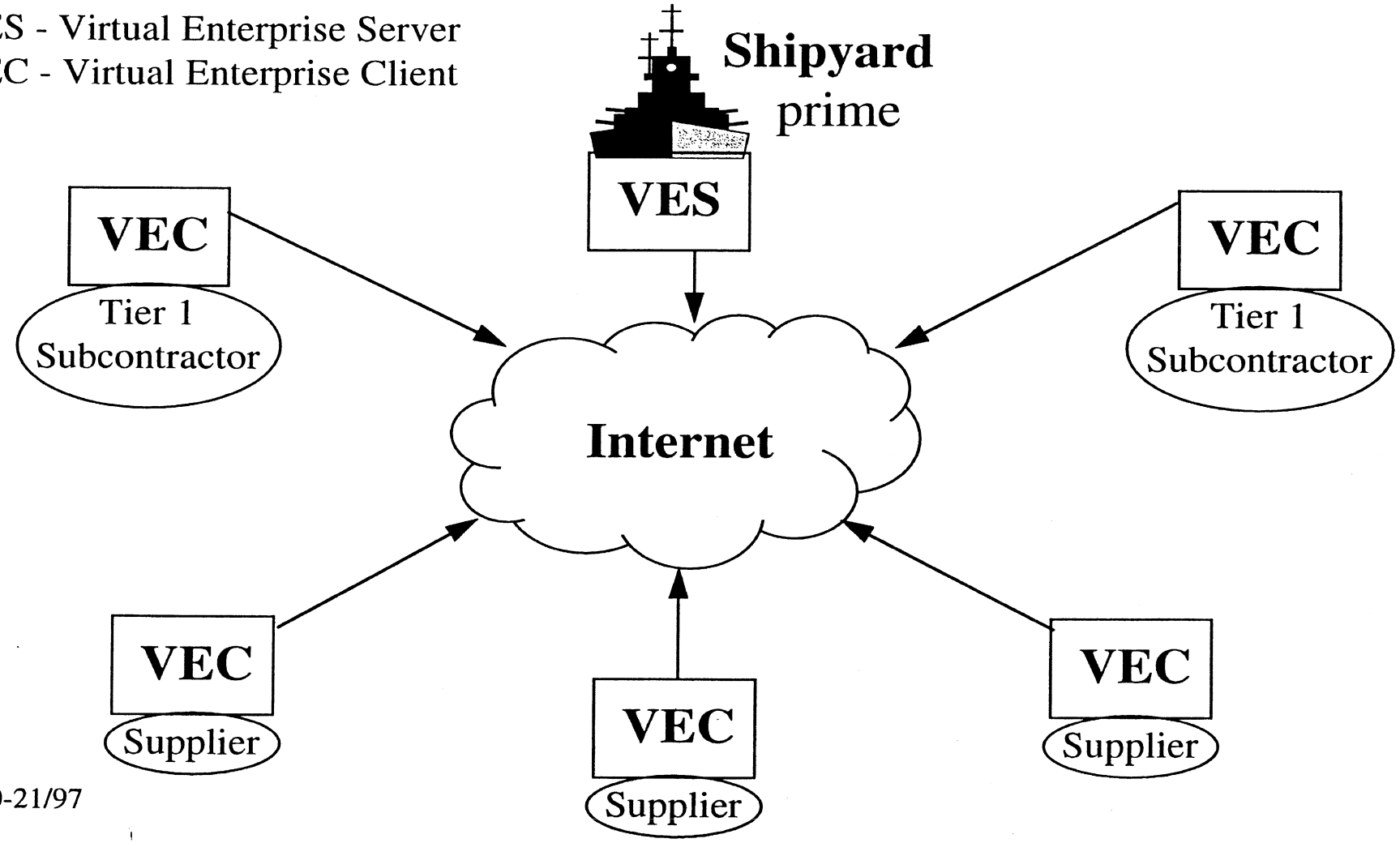


SPARS: Vision, Goals, Objectives

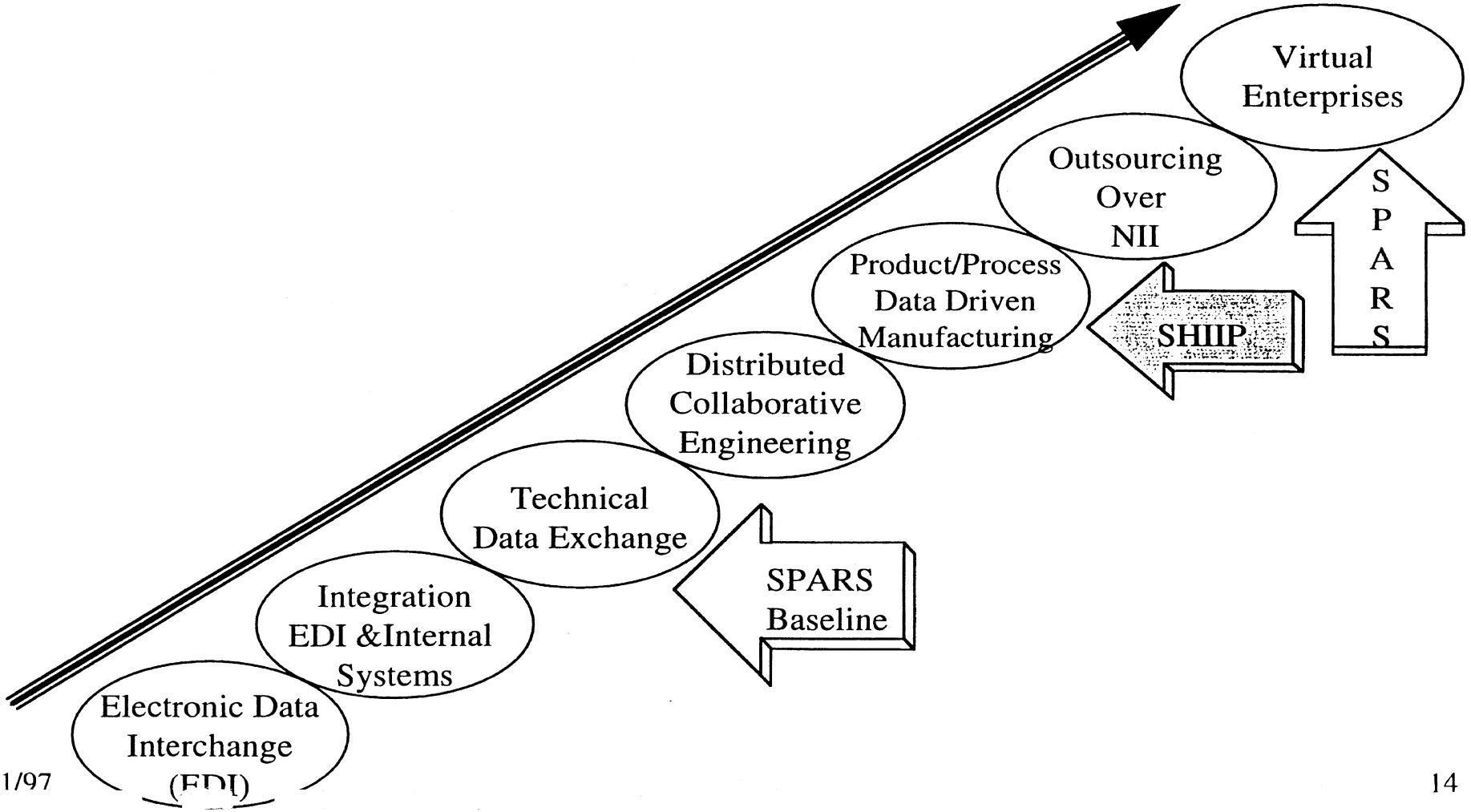
- **Establish a Virtual Enterprise (VE) Infrastructure in US Shipbuilding Community**
  - -Shipyards, Subcontractors, Suppliers, Customers
  - -Enable Electronic Commerce / VE Operations
- **Apply NIIIP Technology**
  - -SPARS is a Deployment Project
  - -Extend and Enhance NIIIP for the US Shipbuilding Community
- **Operational Goals**
  - -Tangible/Measurable impacts on the US Shipbuilding Community
  - -Operational Targets
- **Fast Start --> Managed Growth --> A Phased Approach**
  - -Install a baseline VE Infrastructure in 9 months
  - -Extend, Enhance and Scale-Up over the project timeline
- **Tailored to Individual Shipyards**
  - -Accommodate shipyard priorities, skills and resources

SPARS Implementation

VES - Virtual Enterprise Server
VEC - Virtual Enterprise Client



SPARS Growth Path



Reference 4

Electronic Commerce and Electronic Data Interchange Between Shipyards and Suppliers

MMA Team Presenter

Marty Fritts
SAIC

The Marine Machinery Association

- Trade Association for Manufacturers of Shipboard Machinery
- Formed in 1984 to Help Members in Relationships With U.S. Navy
- Two Current Projects Involve "*Electronic Commerce and Electronic Data Interchange Between Shipyards and Suppliers*

First MARITECH Grant

- Three Year Program Began April 1996
- Government Funding of $2,112,474
- Administered by MARAD

Standards Development Work

- **Represent Marine Manufacturers to Standards Setting Organizations**
- **Lead ISO TC8/SC3 as Chair and Secretariat**
- **Help Navy in Conversion to Commercial Standards**

MMA's First Electronic Catalogs

- **MARITECH Funding Through MARAD**
- **Three Prototype Catalogs Underway**
  - Leslie Controls
  - Carrier Transicold
  - Flagg Brass
- **Manufacturers Provide Only Content and Supervisory Services**
- **MMA and Subcontractors Create the Catalogs**
- **MMA Gives Training and Loan of Equipment**

MMA's New Catalog Program With MARITECH Funding of $3.9 Million.

First 6 Companies:

- Alfa Laval
- Dresser Rand Steam Turbine
- Fairbanks Morse Engines
- Marotta Scientific Controls
- Reliance Electric
- Triumph Controls

Participants in Carrying Out Work

Science Applications International Corp.	Meetinghouse Technologies	Newport News Shipbuilding
Ingalls Shipbuilding	Computervision	Kockums Computer Systems
M. Rosenblatt & Son	Balance Technology	International Marketing and Business
NIIIP Consortium	Tygart Technology	NSWC Carderock

An Electronic Catalog Is All That A Paper Catalog Is--And MORE

- Full Featured Searching by Customer's Critical Criteria: function, application, environment, size, material, etc.
- Engineering Design Tools: sizing, material selection programs, etc.
- Integration of Product Data Into 3D CAD Programs
- Access to Price, Availability and Contacts

Catalogs on CD ROM's or WWW

- **Catalog Can Be Posted on MMA's Web Site At *http://www.marmach.org***
- **Or Posted on Manufacturer's Own Web Site With Link From MMA**
- **Catalog Can Be on CD ROM**
  - Cost About $2 Against Several Hundred for Paper Catalog

Practical Goals of the MMA Projects

Provide the means for doing business fully on-line

Reduce Cost and Schedule

Increase Competitiveness

Expand Markets for Products and Services

Improving Communications between Shipyards and Suppliers

Four major changes which must be instituted to improve communications between yards and suppliers and to foster world-class business practices through the newly acquired communications capability.

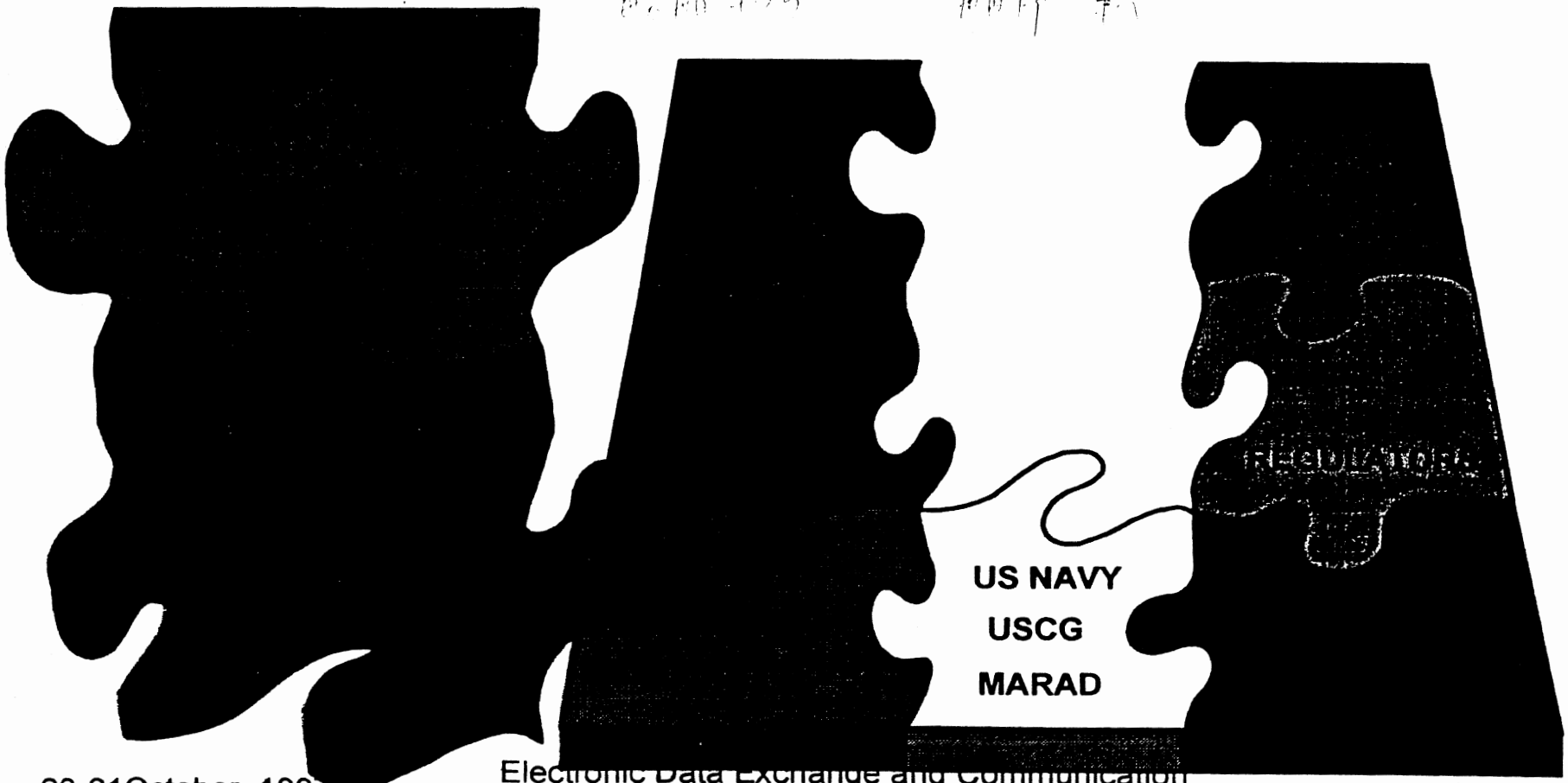
Investment in in-house computer hardware, software, expertise, and integration

Accessible methods for transforming data into and out of the proper formats for communication

Changes in the culture to foster yard/supplier teaming and collaborative programs mediated through electronic communications

Implementation of new business practices and the incorporation of advanced technologies

INTERNATIONALLY ACCEPTED STANDARDS FOR MARINE MACHINERY AND EQUIPMENT



Manufacturer's Catalogs

Prototype Catalogs
- Carrier Transicold
- Leslie Controls
- Flagg Brass

Background Data
- Marketing
- Directories
  - Sales
  - Support
- Search Engines
- Links

Engineering Data
- 2-D CAD
- 3-D CAD
- Icons
- Specifications

Commercial Data
- Type of Data
- Procedures

Security Requirements

Proprietary Software
- Sizing Programs
- Materials Selection

Leverage

- The heavy government and commercial investment in
  - the infrastructure of the Internet
  - the use of Web-based software
  - COTS hardware
  - the experience and expertise of existing organizations and programs which utilize the Internet
- Domestic and international experience in EC and EDI
- Existing and emerging standards for data communication
  - commercial and Navy
  - domestic and foreign

Electronic Catalog Technical Design Goals

- Reach the maximum number of potential users
- Flexible and expandable design, capable of containing standard catalog information and state-of-the-art electronic tools and capabilities
- Hi-level architecture which can readily incorporate new and emerging technologies and standards
- Development costs must be minimized and amortized over all products
- Catalog maintenance must be low cost, with manufacturers becoming capable of maintaining their own products

Electronic Catalog Development Environment

Web browser engine with HTML content and Java 1.02 applets

- access to maximum installed base (Unix/Win/Mac)
- ability to operate locally (CD-ROM)
- ability to operate remotely (Web)
- expandable through development of Java applets
- open, standard, non-proprietary technology set
- able to rapidly integrate new advances in technology
- HTML content to minimize data preparation and reuse
- database driven catalogs for low maintenance

PIPES

Product Information, Purchasing, & Engineering System

Currently - Paper, fax or (at best) shopping carts in an electronic mall

Manufacturers are coming on line with electronic "products" - marketing, engineering, and puchasing data

Customers can manually select products from an electronic catalog

Products need "adapters" to fit products into their CAD systems and product models

PIPES

Product Information, Purchasing, & Engineering System

Needed - PIPES to stream the data to the purchasers software

Define the sets of data required by each business transaction

Provide "agents" to gather data in proper formats and transmit with proper protocols

Use neutral formats to eliminate modifications and additions to product data

Reference 5

MAritech Agile Shipbuilding Toolkit (MAAST)

A DARPA MARITECH PROJECT

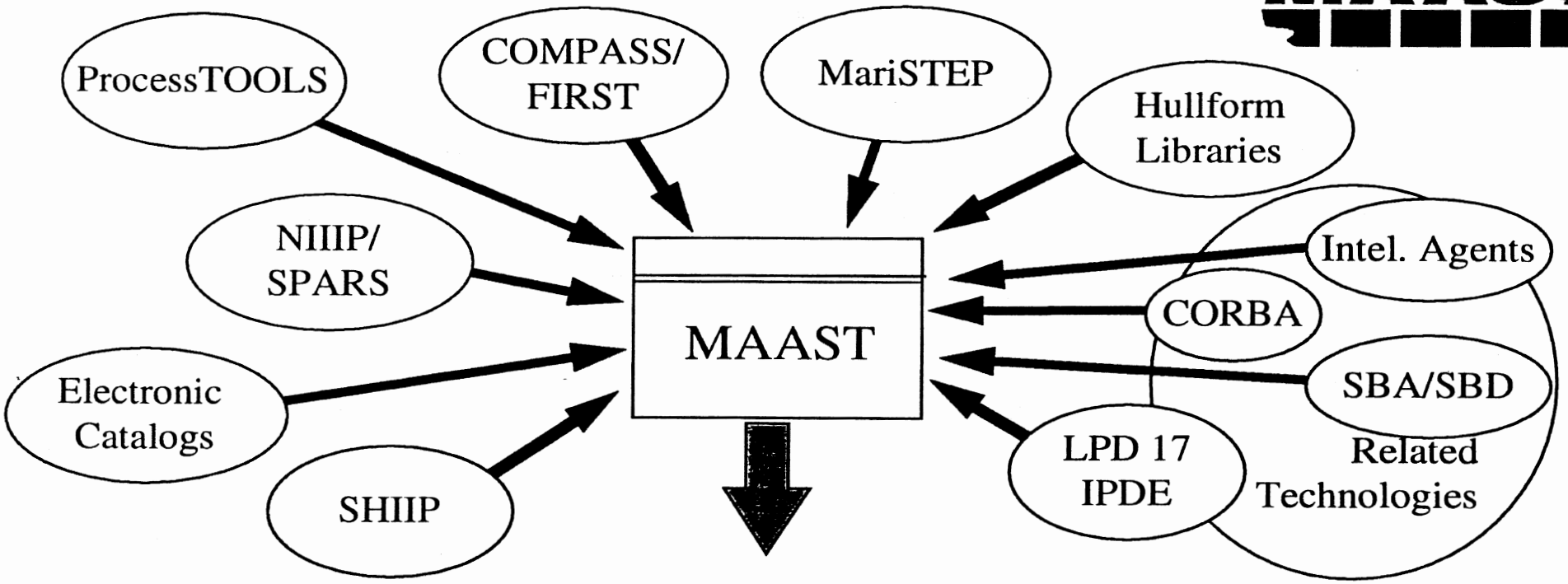
http://harc.hac.com/maritech/MAAST.htm

Presented to: Multi-National Shipbuilding EDI Workshop,
20-21 October 1997, Yokohama Japan

Presented by: Rick Steiner, Hughes Naval and Maritime Systems

fsteiner@ccgate.hac.com

Goal and Program Relations



- **PRODUCT: Maritech Agile Shipbuilding Toolkit (MAAST)**
- **GOAL: Increase the efficiency of American shipyards by providing infrastructure and processes for agile, cooperative, distributed shipbuiding ENTERPRISES (not just individual companies).**

Virtual Shipbuilding Consortium (VSC)

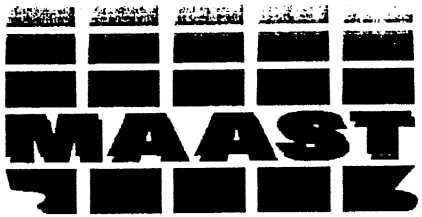
MAAST

advanced marine enterprises, inc. A Nichols Research Company	DESIGN SERVICES
Avondale	SHIPBUILDING
HUGHES AIRCRAFT	SYSTEM ENGINEERING & COMMUNICATIONS
INTERGRAPH	SOFTWARE ENGINEERING
ORINCON CORPORATION	PROCESS TOOLS AND TECHNOLOGY

Benefits of Technology Application

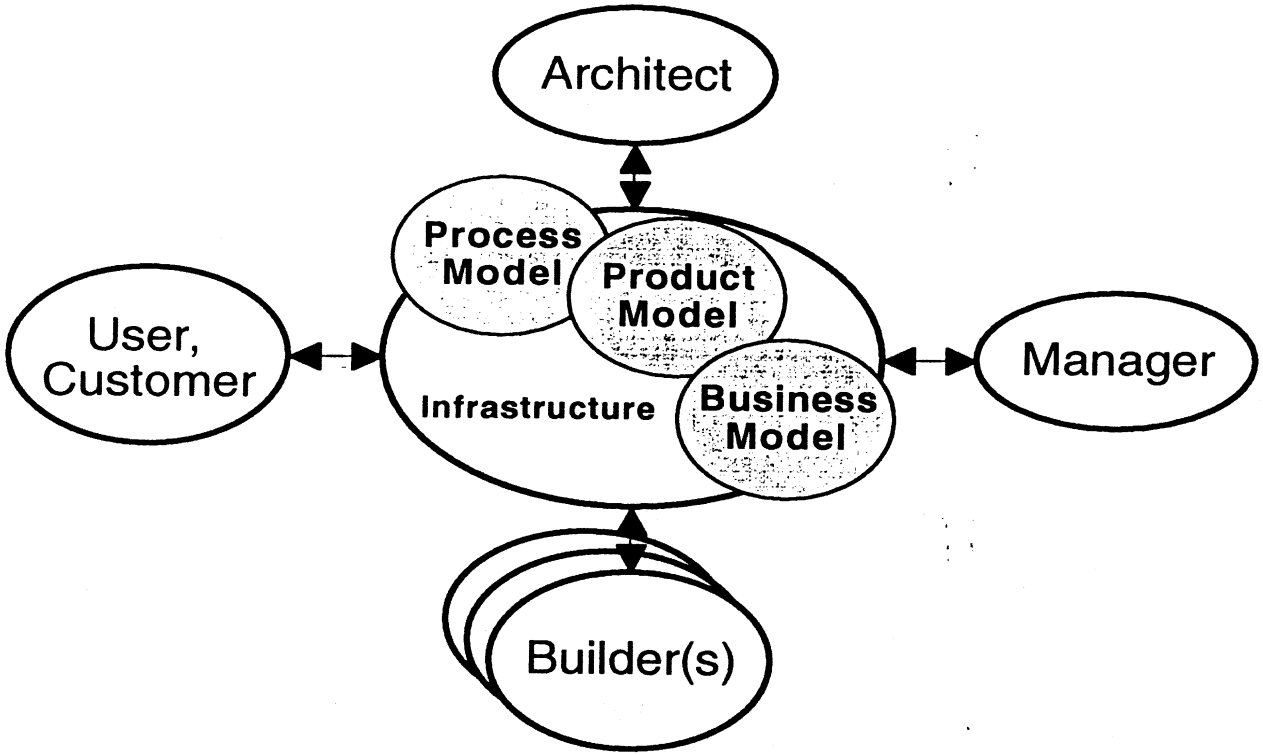
- Efficient Customer Dialog
  - » rapid response for cost and performance impacts of design changes
  - » reliable cost, schedule and performance preliminary estimates
  - » speed of computer agents vice human processing
- Front End Time Line Reductions
  - » goal of 50% reduction from preliminary design to start of fabrication
- Improved Designs
  - » encourages outsources to most efficient suppliers
  - » facilitates early design reviews by classification agencies
- Better Contracting Process
  - » more rapid access to supplier cost estimation
  - » automatic documentation, full disclosure, and vizualization tools for better contract definition and proposed product understanding

Focus of MAAST

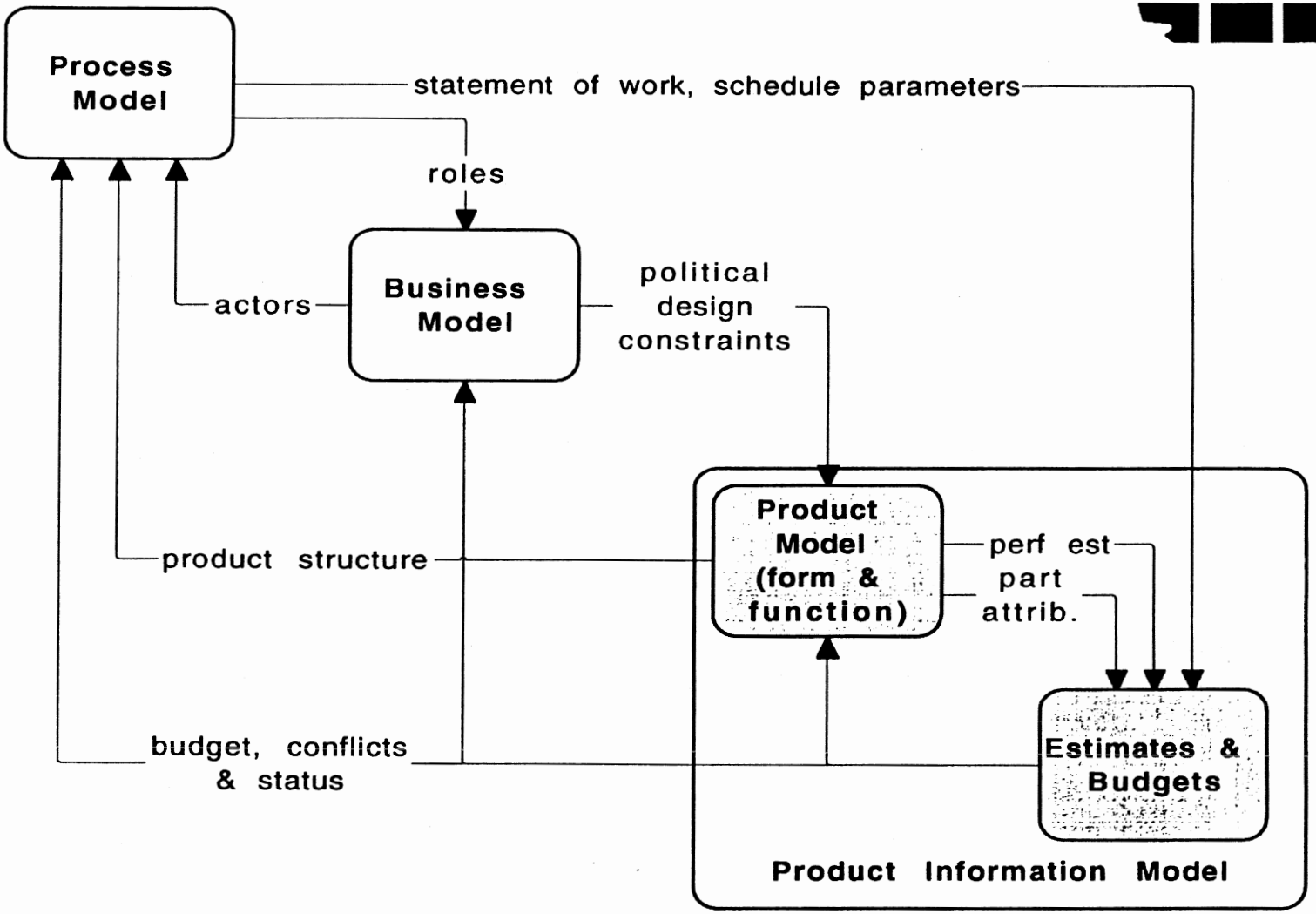


- Specifically, MAAST is meant to enable:
  - Virtual Shipbuilding Enterprises (VSE's)
    - distributed, collaborative mix of resources, facilities, & talent
  - Distribution and control of ship estimating, design, and construction process
- For '98, MAAST development will focus on pre-contract enterprise activities:
  - Pilot activity starting 1/98: "real" application
  - Prelim. design & estimating, VSE formation
  - data developed for pre-contract will be usable post-contract

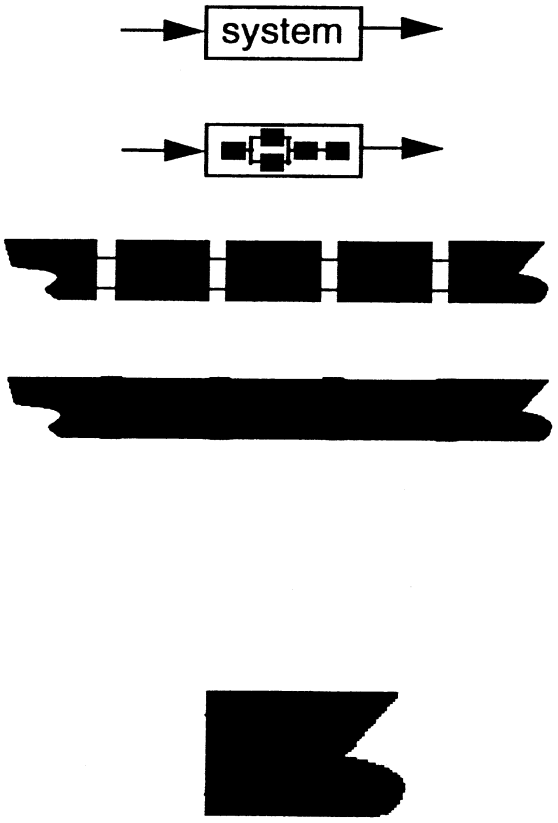
MAAST Supports Model-Based Design and Business Collaboration



MAAST Enterprise Model Logical Structure

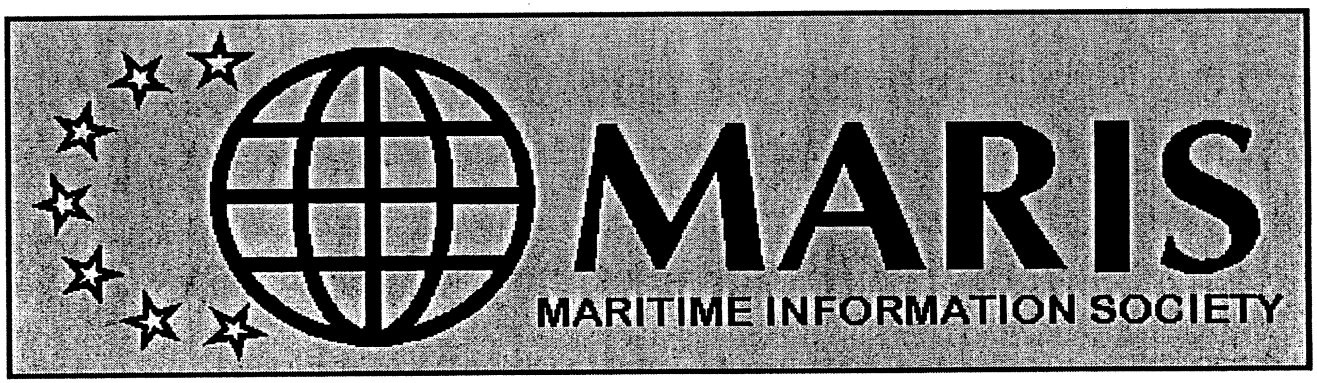


Layers of the Product Model



- Concept/Context Model
- Functional Model
- Quasi-Arranged Model
- Interface Model
  - » physical
  - » logical
  - » zone-stage
- Detail Design Model

Reference 6

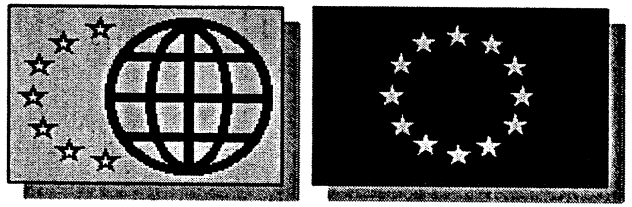


RONALD VOPEL
EUROPEAN COMMISSION
DIRECTORATE-GENERAL III - INDUSTRY
UNIT D-5 - MARITIME INDUSTRIES

Electronic Communication in Shipbuilding

Yokohama, Japan

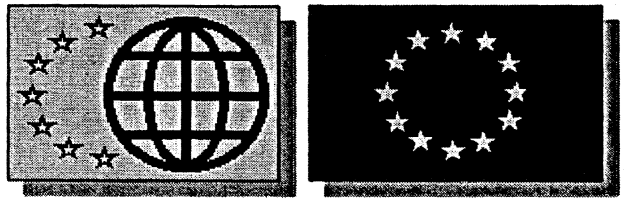
20-21 October 1997



The G-7 Initiative For A Global Information Society
Pilot Projects

- Global Inventory (*)
- Global Interoperability for Broadband Networks
- Cross-Cultural Education and Training
- Electronic Libraries
- Electronic Museums and Galleries
- Environment and Natural Resources Management

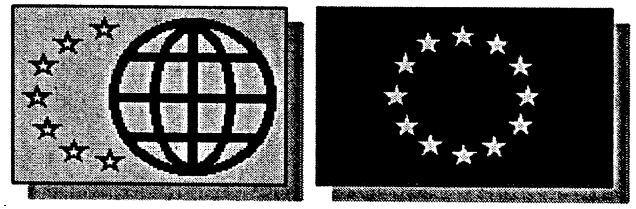
(*) Projects Under EU Co-leadership



The G-7 Initiative For A Global Information Society Pilot Projects (cont.)

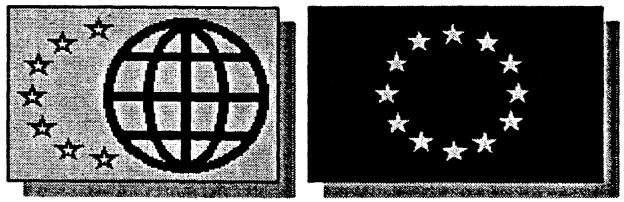
- Global Emergency Management
- Global Healthcare Applications (*)
- Government On-line
- Global Marketplace for SMEs (*)
- Maritime Information Society (*)

(*) Projects Under EU Co-leadership



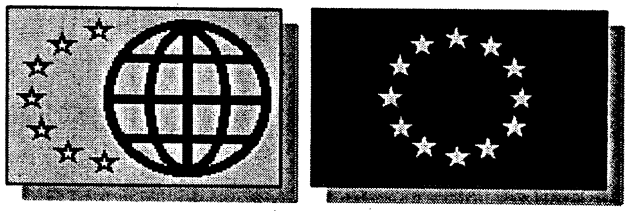
The Characteristics Of MARIS

- Covering a wide range of maritime IT applications
- User-driven, i.e. following the industry's demands and needs
- Building on existing systems
- Open for new maritime application fields and partners world-wide



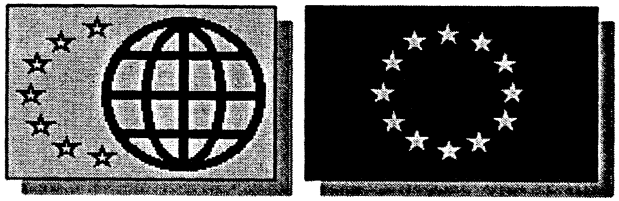
The Objectives Of MARIS

- Improve the competitiveness of maritime industries
- Enhance maritime safety
- Protect the environment and natural resources
- Benefit maritime regions, especially in remote areas



The MARIS Sub-Projects

- MARTRANS - Modules for a port logistics information network
- MARVEL - Tools for the intelligent manufacturing of ships
- SAFEMAR - Solutions for vessel traffic management and navigation
- MARSOURCE - A fisheries and oceanic information network



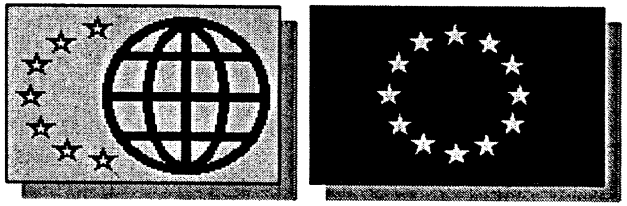
Shipbuilding in MARIS: MARVEL
MARITIME VIRTUAL ENTERPRISE LINKAGES

Objectives

- Greater competitiveness through higher productivity and more flexibility
- New process chains through world-wide communication between shipyards and their partners and world-wide equipment supply
- Cover the "data demands" of IT applications for the ship's whole life cycle

Action plan

- Identification of IT needs for business processes across maritime industries
- Interconnection of information systems through open communication -
- Development of demonstrators
- Creation of new communication components
- Contributions to standardisation efforts in data exchange



The Approach in MARIS

- Establishment of contact points on G-7 level and beyond
- Stock-taking of maritime IT projects world-wide
- Establishment of a regional network as an industry interface
- Information dissemination through publications, conferences, events and the internet (http://www.maris.int/)
- Presentation of success stories during the EXPO '98 in Lisbon

The MARIS Web Site
Frontpage

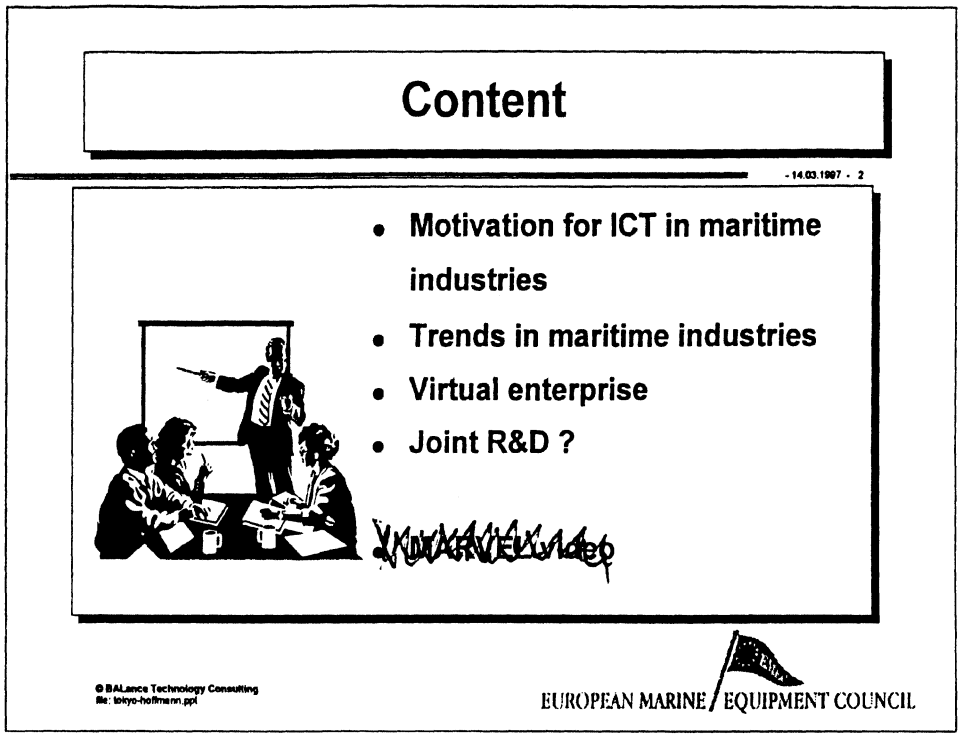
Reference 7

Mr. Hoffman (EU)

Ladies and Gentlemen!

I am very pleased for having the opportunity to give this presentation here in Japan. So, thank you very much in advance to our hosts and to the organizers of this workshop.

I will give you in my presentation some ideas on the maritime industries motivation to think about advanced information and communication technology and to think in this context about European and probably global co-operation for further developing the technology according to our needs.

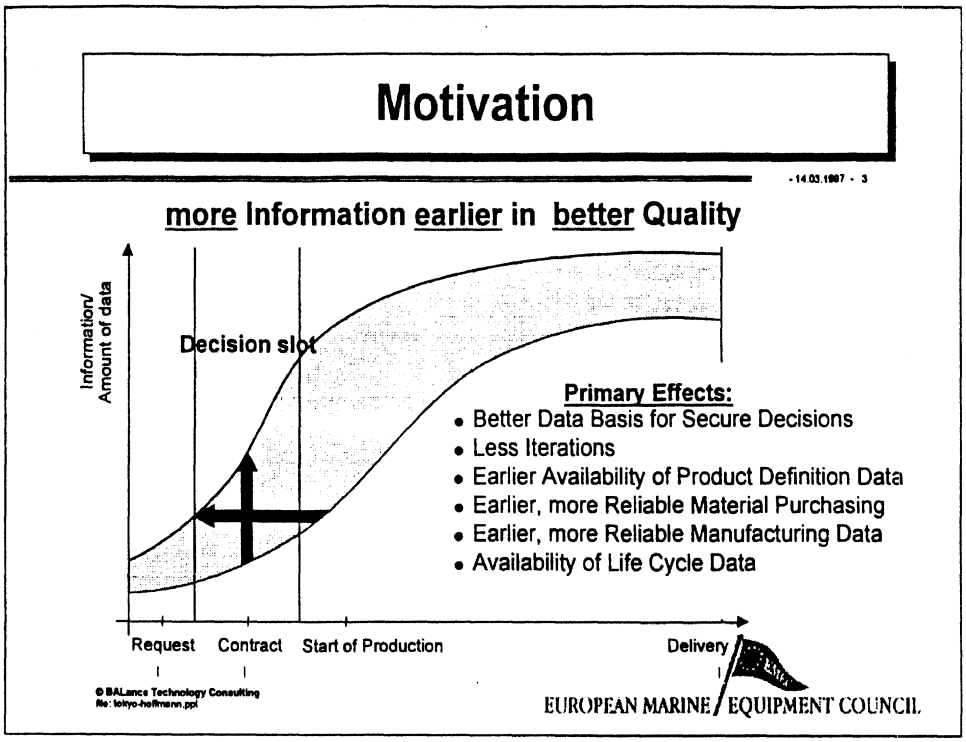


In my presentation I will give you at first some ideas on the motivation of our industry to introduce ICT.

I will continue in highlighting some actual trends in maritime industries and will from there give a definition on the virtual enterprise.

At the end of my presentation I will discuss some aspects for collaboration.

At the end you will see an actually video, produced for the European Commission last autumn, giving some background information on MARIS and MARVEL.



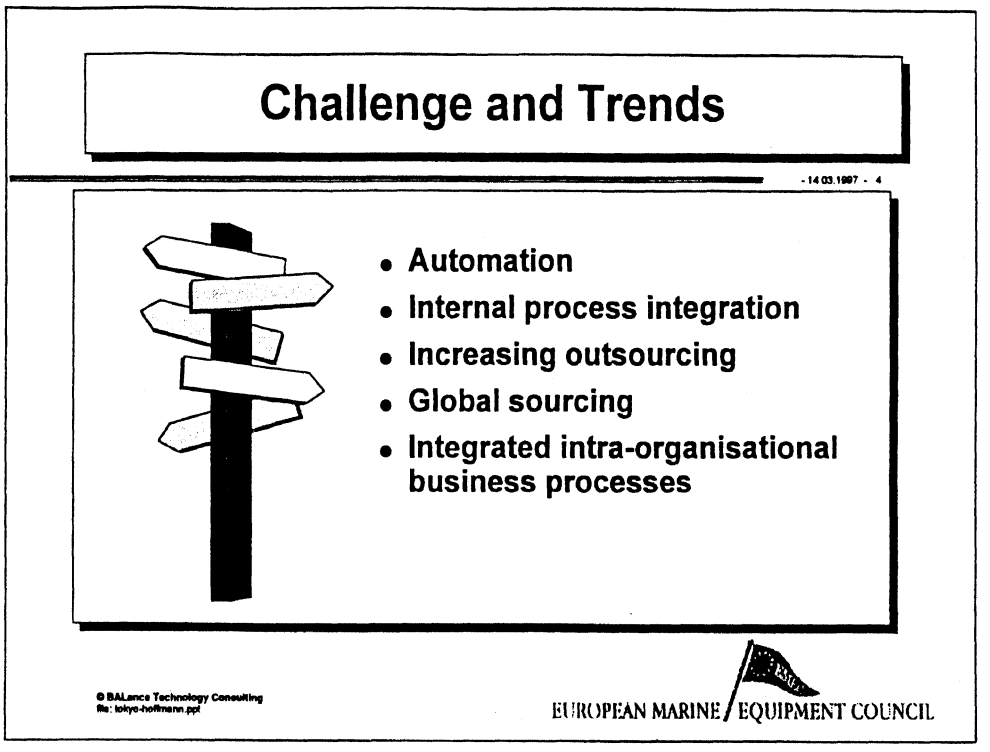
Let me start with the motivation to introduce advanced information and communication technology into our processes and organizations. The dilemma in shipbuilding including its related partners, i.e. suppliers, classification societies etc, is, that in the contract signing phase all relevant decisions have to be based on very limited hard data. Decisions are taken on the basis of estimates and on the basis of peoples experience. This is even more true if we have to sign contracts for totally new products.

The chance we see in newly available information and communication technology that we can overcome this decision dilemma by generating more information earlier and in better quality.

Naturally, the ultimate effect should be to make our products commercially more viable, i.e. reducing our costs. However, the more practical effects are:

→ Read the list! } ! Siehe Liste oben!

The latter effect may even improve our products by adding additional values to it.



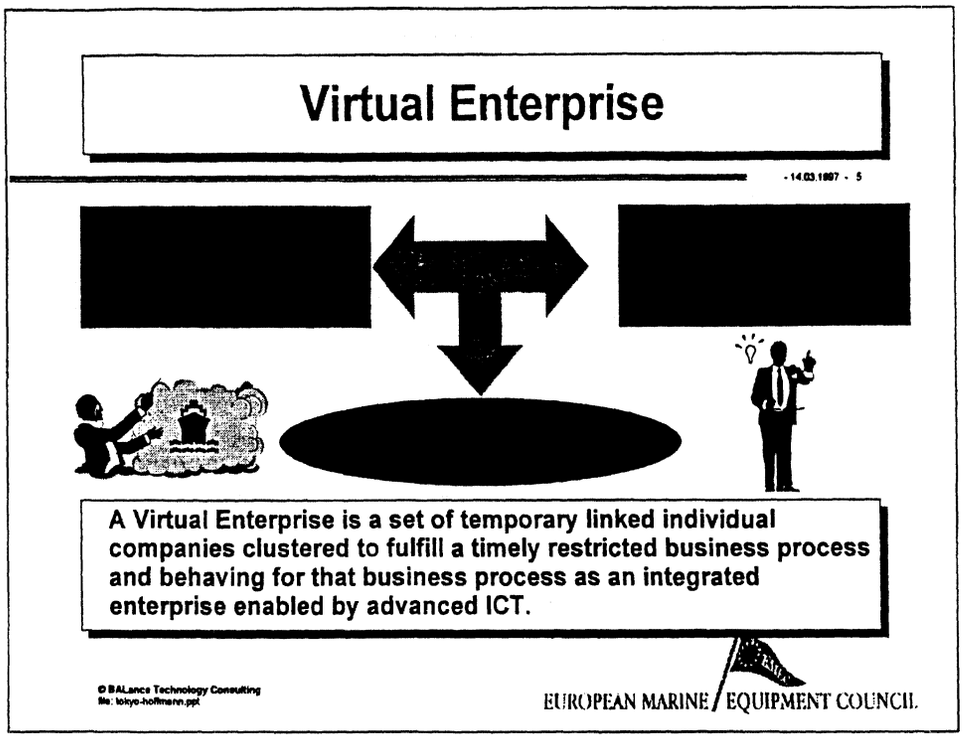
Triggered through these emerging new technologies and through a world wide pressure to reduce costs and to improve internal processes for the entire maritme industry, we can observe challenges and trends in the industry.

A natural and ongoing trend can be observed to more automated or robotized systems within the manufacturing process.

Island solutions of „computer added" applications grown in the last 20 years become more and more integrated process solutions.

A significant trend to outsource major parts of administration, design, manufacturing and maintenance can be stated. Here, because of the high cost levels in industrialized countries, the idea of global sourcing for materials and also different services is of increasing importance.

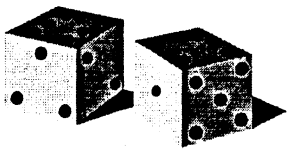
These outsourcing and globalisation trends logically need a more sophisticated and deterministic organisation. Companies involved in the same business process have to be interlinked more closeley. Therefore, more integrated intra-organisational business processes are required.



The availability and recent trends in advanced information and communication technology combined with observed challenges and trends in the industry in general and in particular for the maritime industry lead to what we understand today of a Virtual Enterprise.

→ Read the Definition } hier oder

Succes Factors for VEs



- Open Communication Infrastructure
- Openess of Software Systems
- Agreed Data Exchange Standards
- Harmonized Work Flows
- Dynamic Inter- and Intraorganisational Re-organisation

EUROPEAN MARINE EQUIPMENT COUNCIL

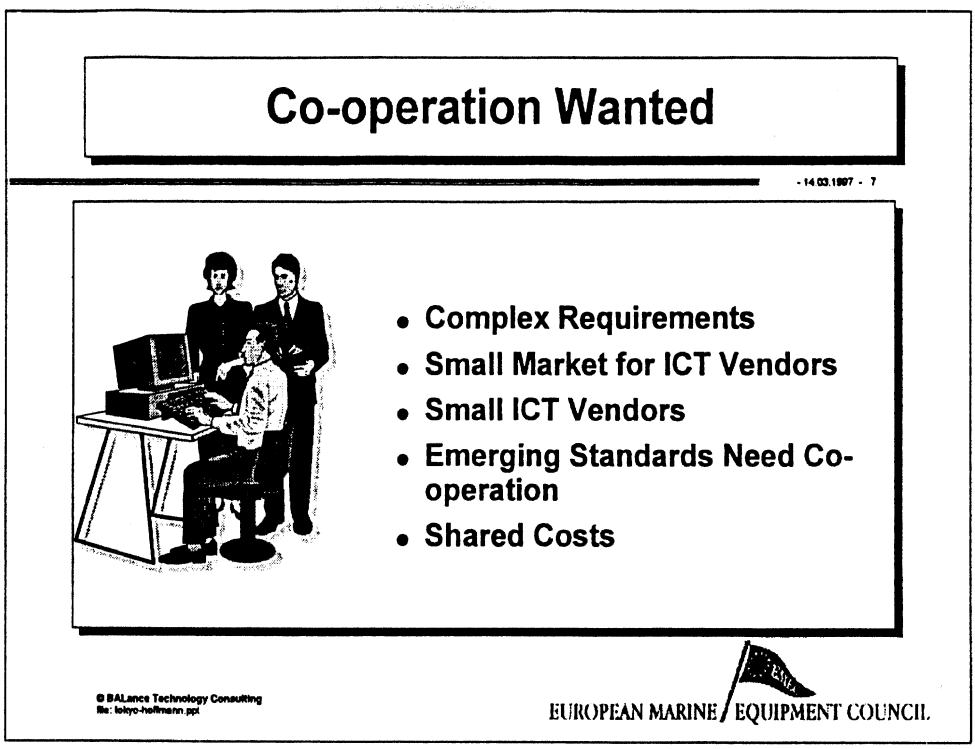
Having said this, we have to understand that there are some critical factors, making this Virtual Enterprise a success.

Major factors to our understanding are:

→ Read the factors. } siehe Liste oben

If we cannot overcome traditionally grown organisational structures or if we cannot agree on common platforms for communication we cannot benefit from the advantages of available technology. To be very clear in this. We believe that to realize succesful Virtual Enterprises it is not a problem of availability of basic technologies, it is a question of configuration of these technologies to our needs and a question of organisational changes.

This is not a one step approach. Once started, there is a need of ongoing and dynamic changes. We have to become more constantly learning organisations.



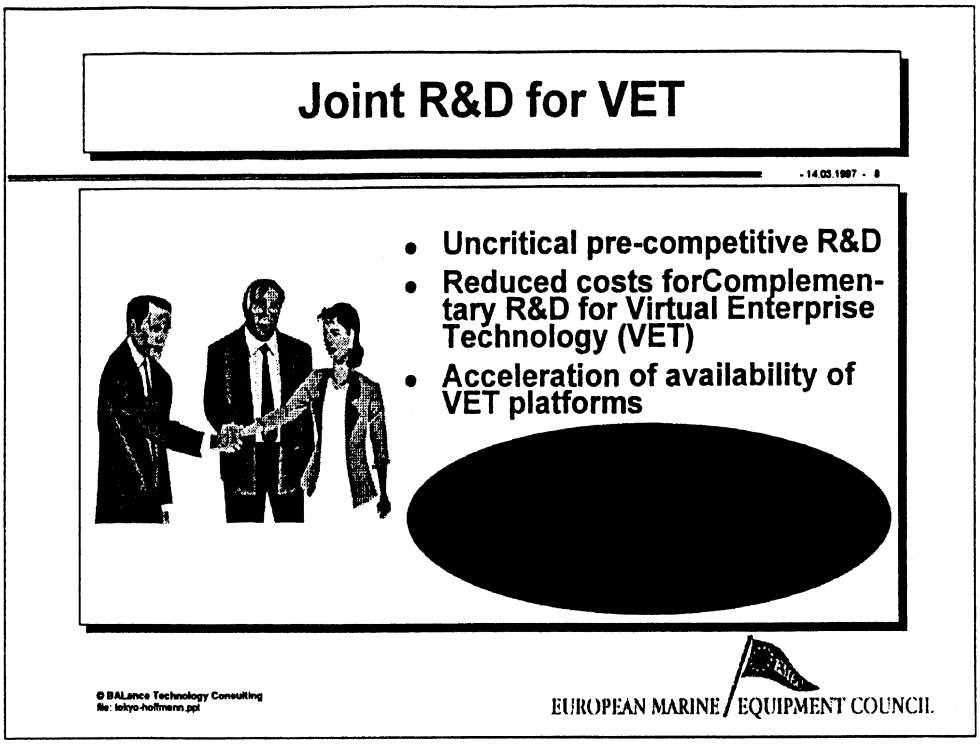
The configuration problem of available technologies will not automatically be solved by the ICT-vendors. Therefore, the maritime industry itself has to step into it. We believe, because of some of the following reasons, this need can be supported by an increasing level of co-operation.

At first within maritime industries there are some special, maybe more complex requirements, e.g. compared to batch production.

Secondly the maritime industry provide a relatively small market for ICT vendors. Automotive industry is much bigger and therefore much more attractive for vendors. Additionally, ICT vendors for the maritime market are often fairly small. They often do not have the capital basis to develop solutions on their own risk.

To develop required standards, e.g. for the exchange of data, which is in the interest of users, is not necessarily in the interest of software vendors. They earn their money with particular services around their propriatary products and very seldom by serving general standards.

However Last but not least, because the maritime industry in total is not very rich anywhere in the world, co-operation will reduce costs.

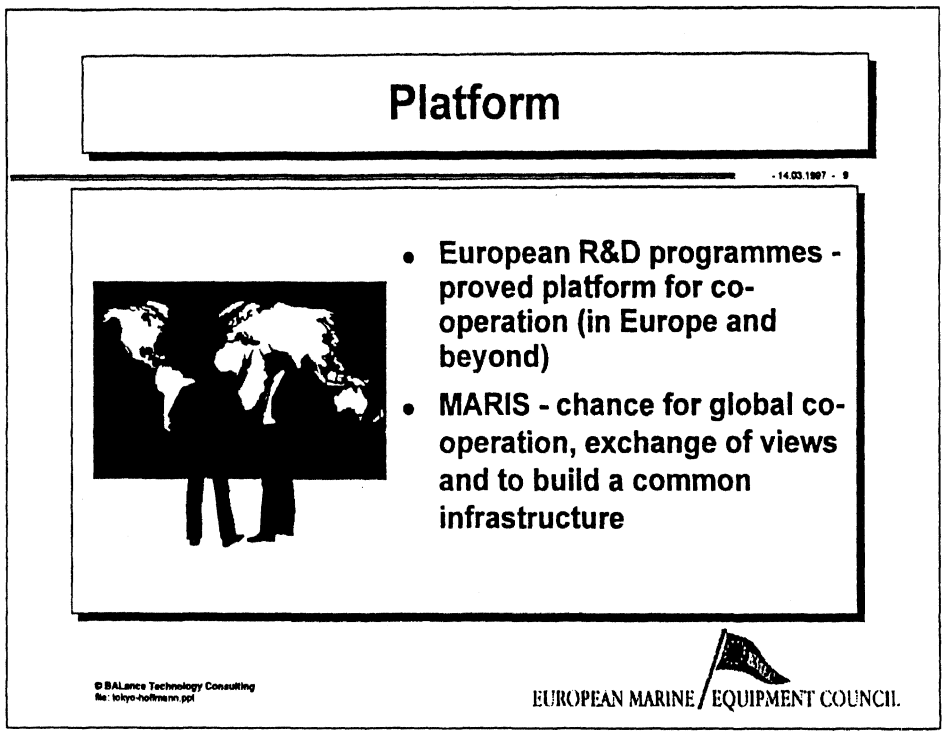


Of course, there are many objections against co-operation. Mainly if you think about co-operation horizontally between direct competitors, i.e. shipyard/shipyard, supplier/supplier.

But, if you start thinking about it more vertically, i.e. shipyard/supplier/classification society there is suddenly much more logic in co-operative actions.

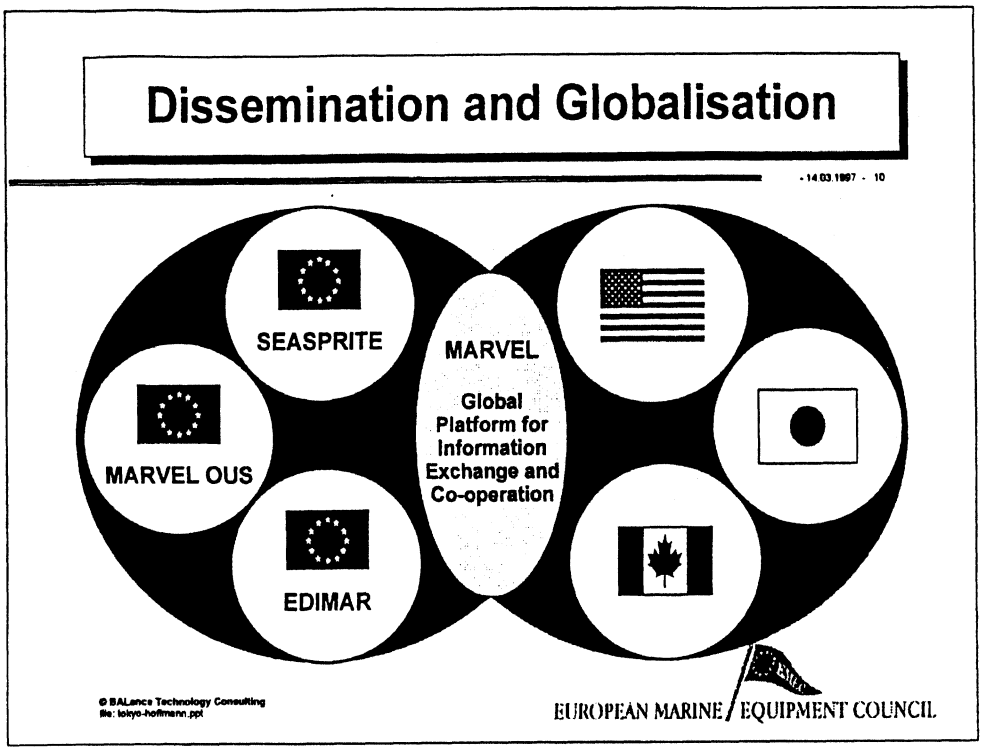
Some topics are even uncritical for co-operation between competitors. Whatever can be done with joint forces will lead to an earlier availability of Virtual Enterprise Technology. This will help the entire maritime industry in the competition with other industries.

The ultimate competitive advantage will just be gained by those companies who will timely lead the commercial application of the technology.



Today, for us in Europe available R&D programmes provide a proven platform for co-operation. It was a hard time learning for many companies and still many have not learned it at all. However, those companies who understood the spirit and who overcome to just argue about competition, benefit from these European initiatives a lot.

MARIS, not as a programme, but as a political umbrella, gives us a chance set up a global level of co-operation. It may provide to all of us an opportunity to exchange views and maybe also a starting point for a common global infrastructure for the maritime industry.



For the moment, Europe put three projects into the context of the MARIS/MARVEL initiative. I am convinced that within this workshop we will learn about more projects from the other G7 countries. I hope that we can make these projects the platform for a global communication or even co-operation in the future.

Before you will learn more about the three European projects MARVEL OUS, SEASPRITE and EDIMAR from my collegues, we will show you a video produced for the European Commission about MARVEL. It may give you some more ideas on the European perspective.

Thank you very much

Reference 8

Electronic Communication in Shipbuilding International Workshop - Tokyo Oct. 1997

EDIMAR

Electronic Data Interchange for the European Maritime Industry

ESPRIT Project No.: 22.624

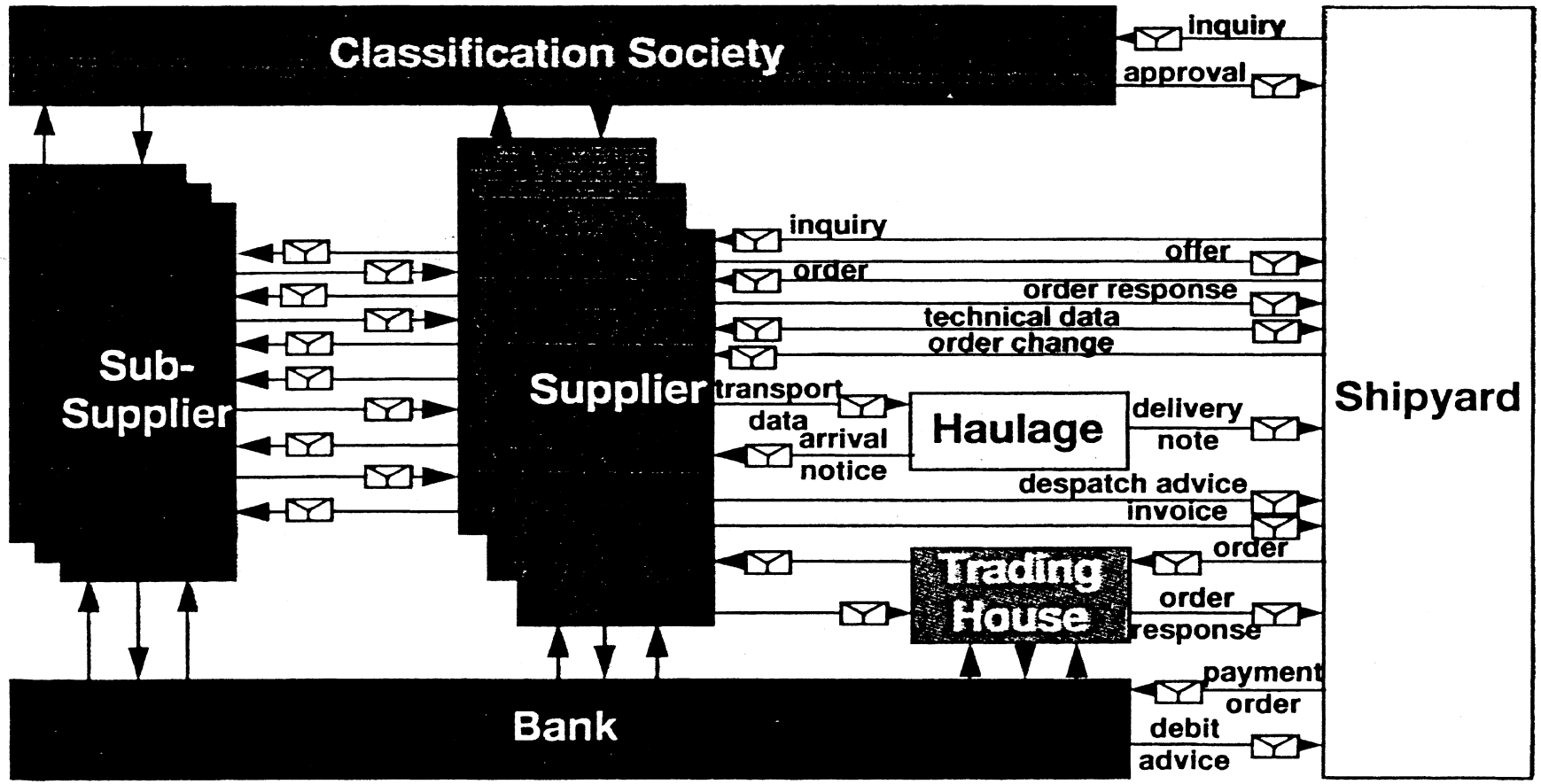
Alfred Mechsner
Howaldtswerke-Deutsche Werft AG

Dr. R. Ahlers
BALance

HDW

EDIMAR

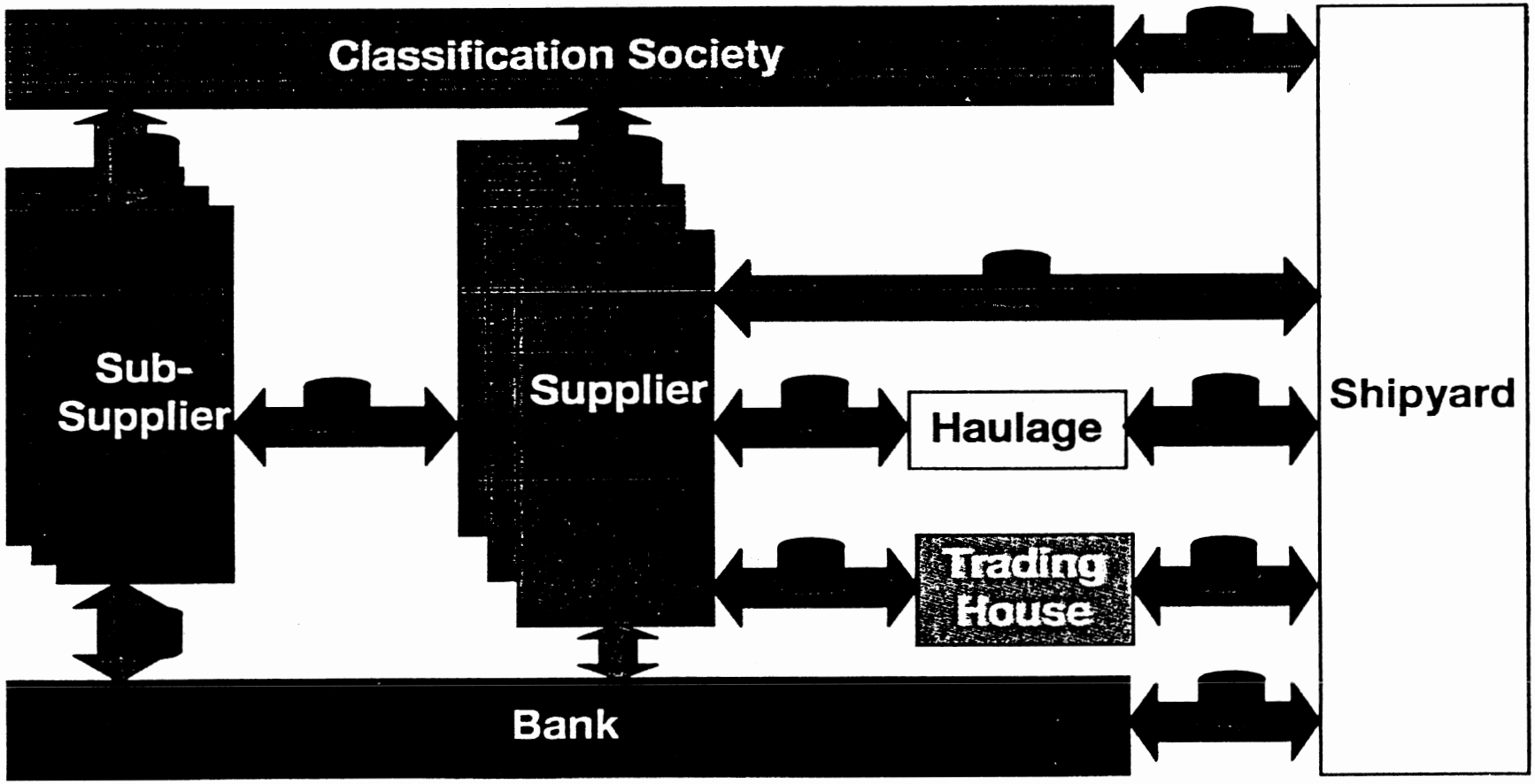
Situation of Today



HDW

EDIMAR

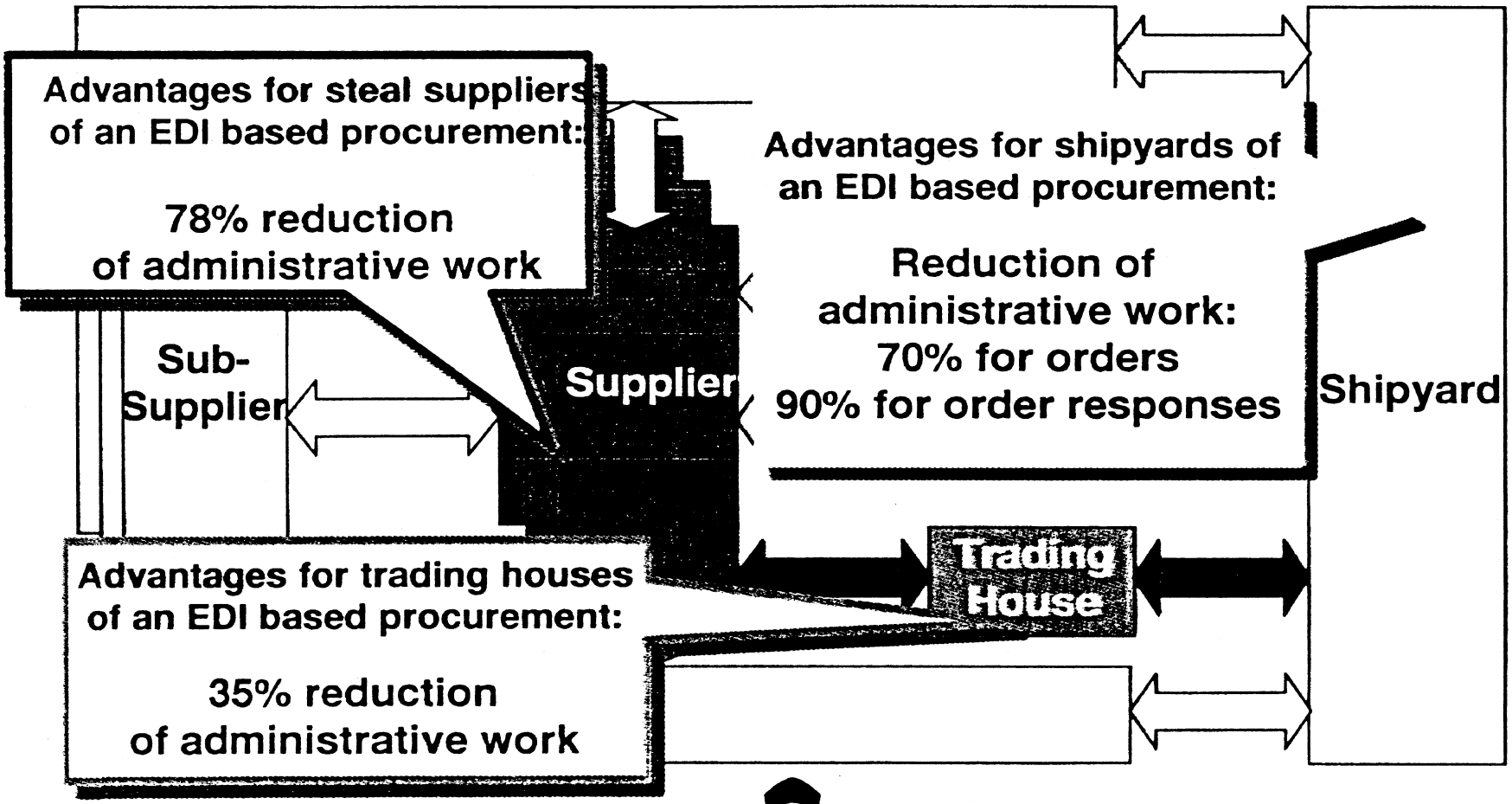
Future Electronic Communication



HDW

EDIMAR

Measurements of EDI-Potentials



HDW

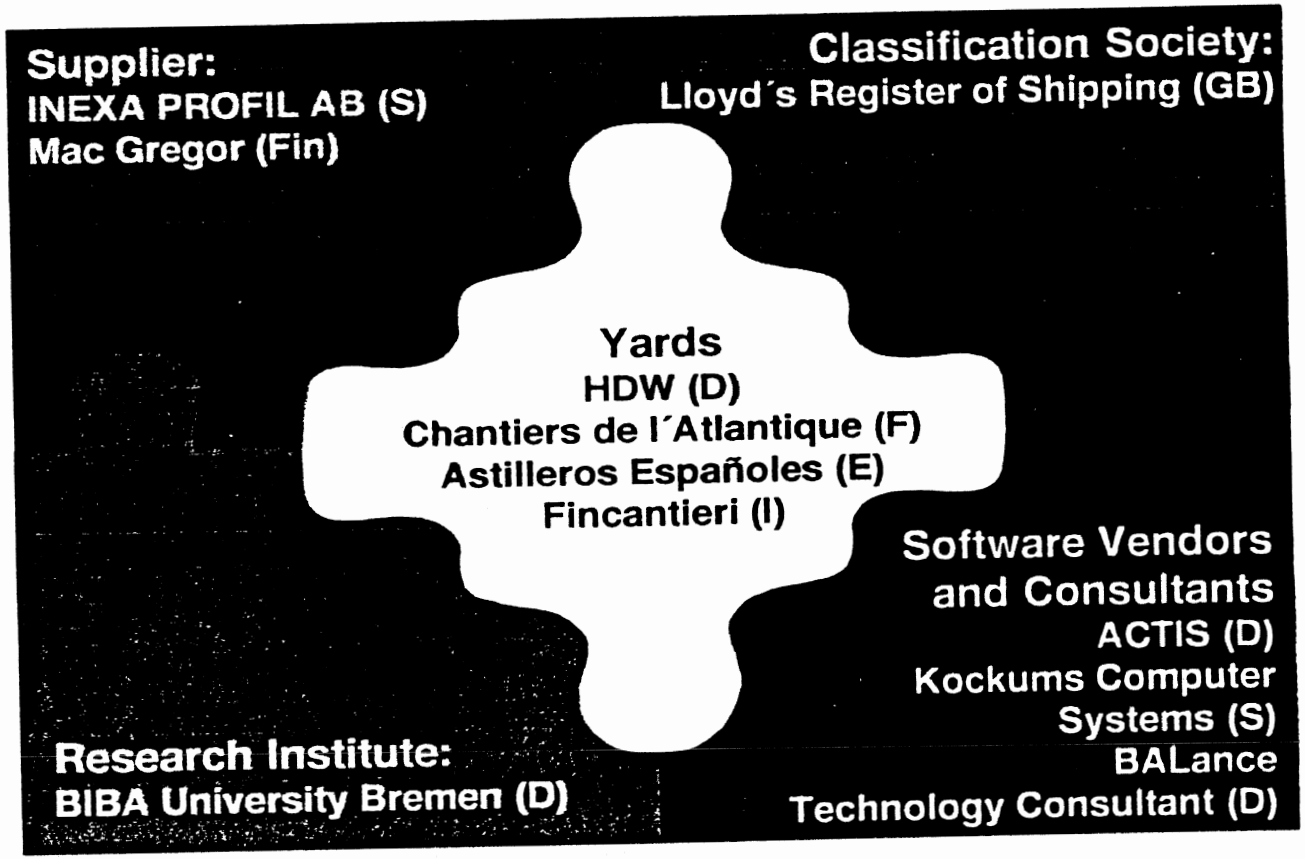
EDIMAR

Partner of EDIMAR

Prime Contractor: HDW

Project Start: Jan. 1997

Project End: Dec. 1998



HDW

EDIMAR

EDIMAR Project Objectives

Definition of EDIFACT-message contents (Subset) for supporting standard parts, raw material and "make-to-order" products for:

- ❑ procurement chains
- ❑ design and design refinement chains

Development of the STEP Application Protocol for Ship Mechanical Systems (AP226) as basis for the ISO standardisation process

Integration of the EDI based communication into an Inter-organisational Workflow

EDIMAR

Standards

EDIFACT (Electronic Data Interchange for Administration, Commerce and Transport)

- ❑ international oriented (ISO 9735, UN/ECE)
- ❑ branch independent
  - ⇨ Maritime Subset development under EDIMAR

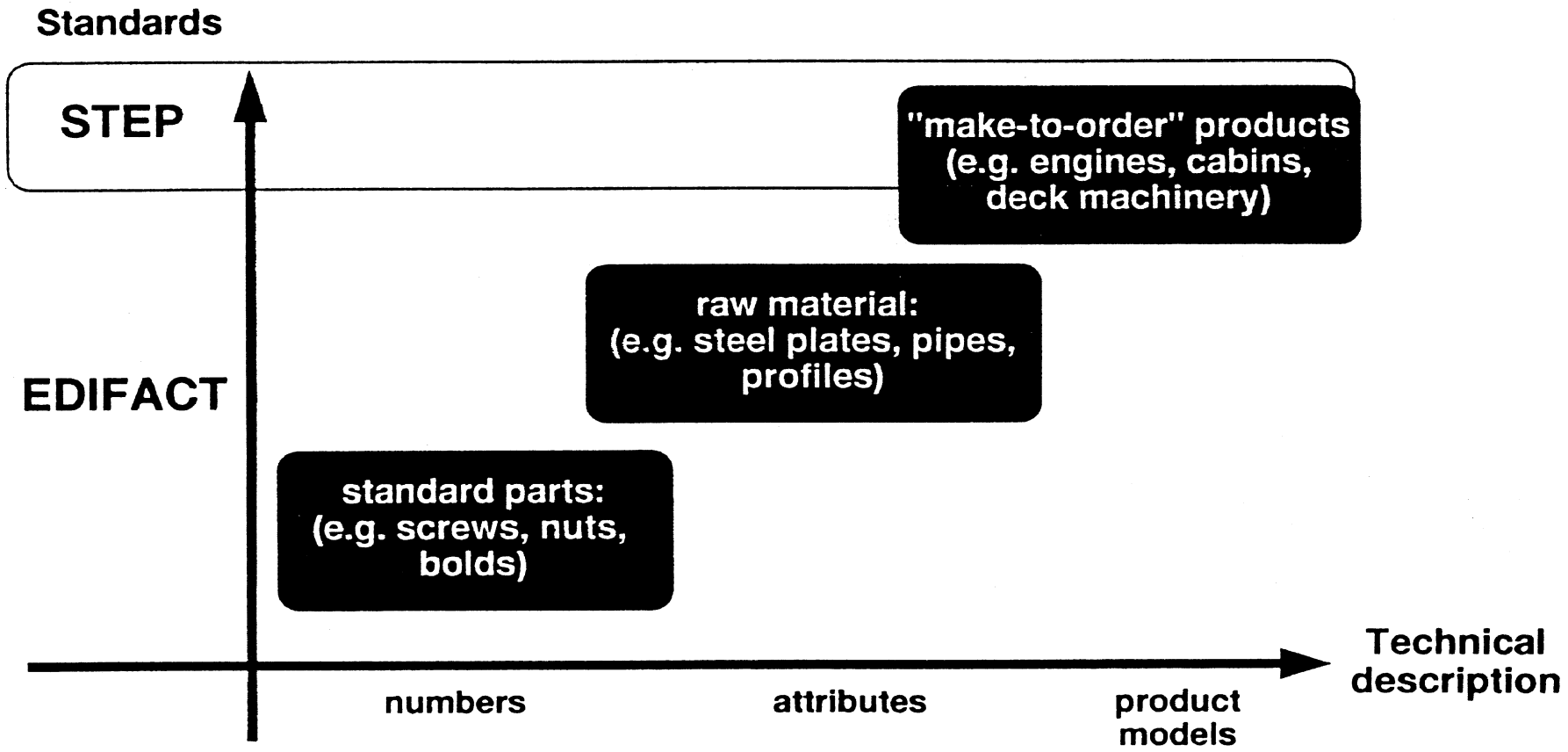
STEP (Standards for the Exchange of Product Model Data)

- ❑ international oriented (ISO)
- ❑ branch overlapping
  - ⇨ Support of Application Protocol AP226 (ship mechanical structure) under EDIMAR

HDW

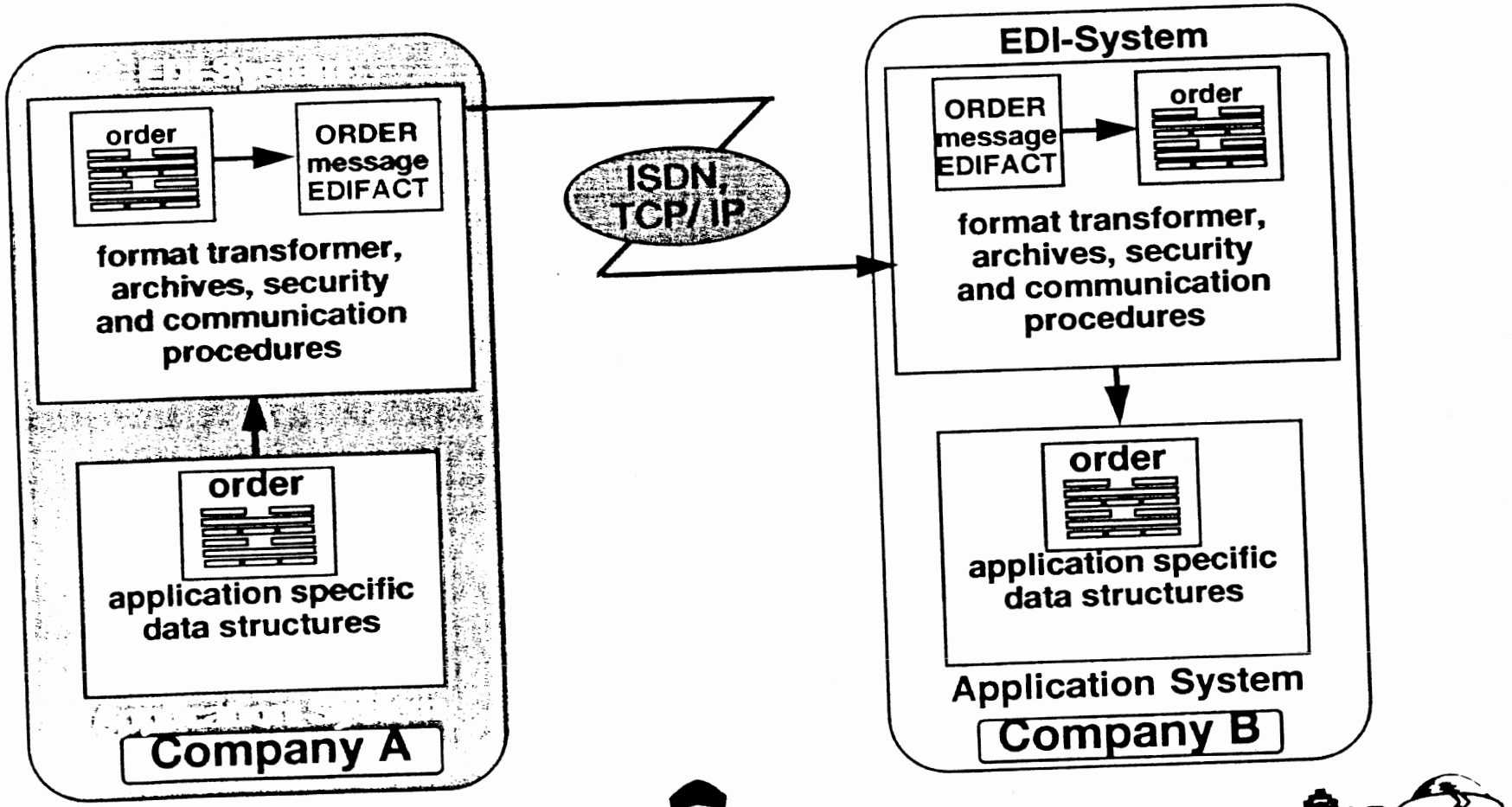
EDIMAR

Product Description Methods



EDIMAR

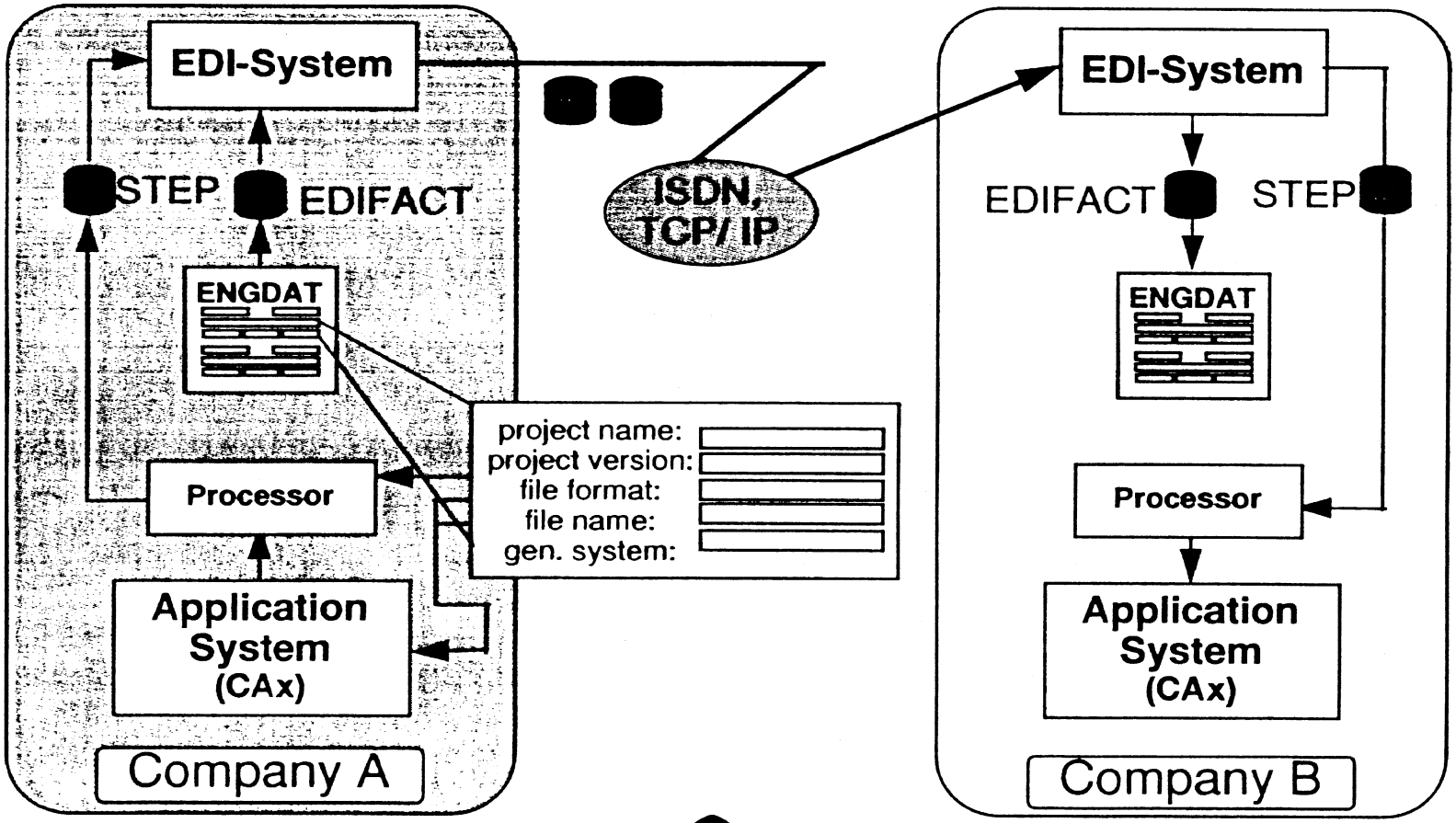
EDI for Commercial Data



HDW

EDIMAR

EDI for Technical Data



HDW

EDIMAR

EDIMAR in the Maritime World

- EDIMAR supports active the MARVEL OUS SIG
- EDIMAR co-operates with EMSA (European Marine STEP Association) for the development of STEP AP226
- Co-operations between the EDIMAR project and European supplier organisations are under preparation
- EDIMAR is open for further international co-operations

HDW

EDIMAR

Reference 9

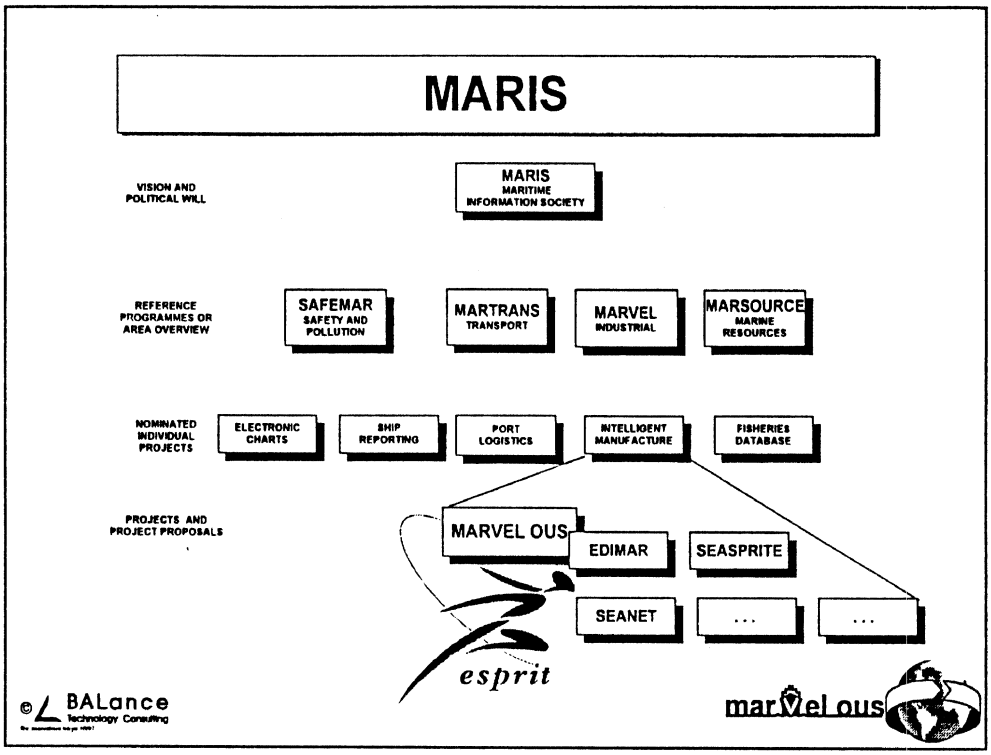
marVeLous

Maritime Industry´s Virtual Enterprise Linkage Open User Syndicate

Seminar
Electronic Communication in Shipbuilding
Tokyo, 20-21 October 1997

Joachim Brodda

BALance
Technology Consulting



MARVEL OUS and its ESPRIT Framework

Maritime Industry´s Virtual Enterprise Linkage Open User Syndicate

A European User Group Reference Project (EP 20.623)
..... open for global co-operation.

... to identify and harmonise generic requirements for use of advanced IT in manufacturing and engineering and to ensure the feasibility of the requirements and translate them into development projects (IT programme ESPRIT 8-16).

Industrial Targets / Workprogramme

MARVEL OUS will ...

- ... identify relevant process chains for design, manufacturing, logistics and survey (life cycle covering)
- ... identify current levels of IT and CT applications
- ... identify potential information technology and communication technology to improve productivity in process chains
- ... identify gaps in current applications
- ... promote application concepts through pilot installation and demonstration of state of the art IT and CT
- ... initiate know how transfer measures
- ... trigger new RTD projects

Project (Matrix-) Structure

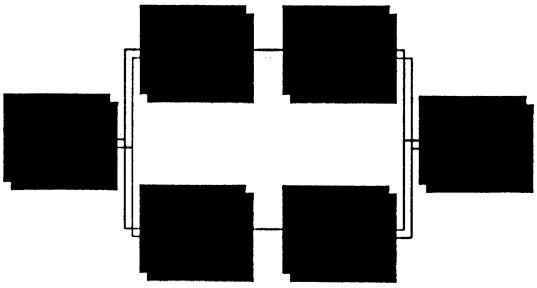
Work-packages

Task 1
Harmonisation and specification of user requirements

Task 2
Demonstration support and organisation

Task 3
Harmonisation of formats and protocols

Task 4
Definition of R&D gaps



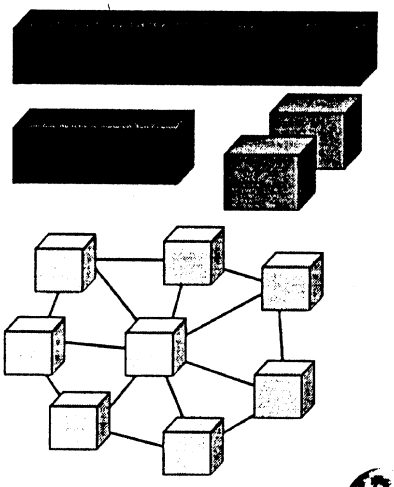
Migration Towards a Virtual Enterprise

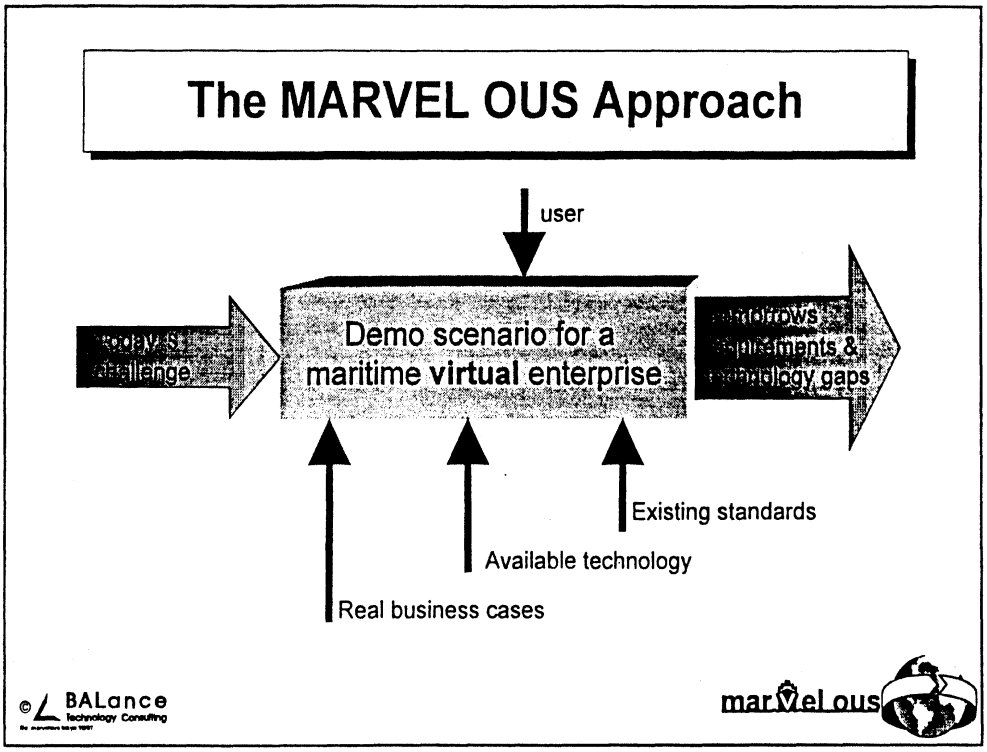
Full blown companies

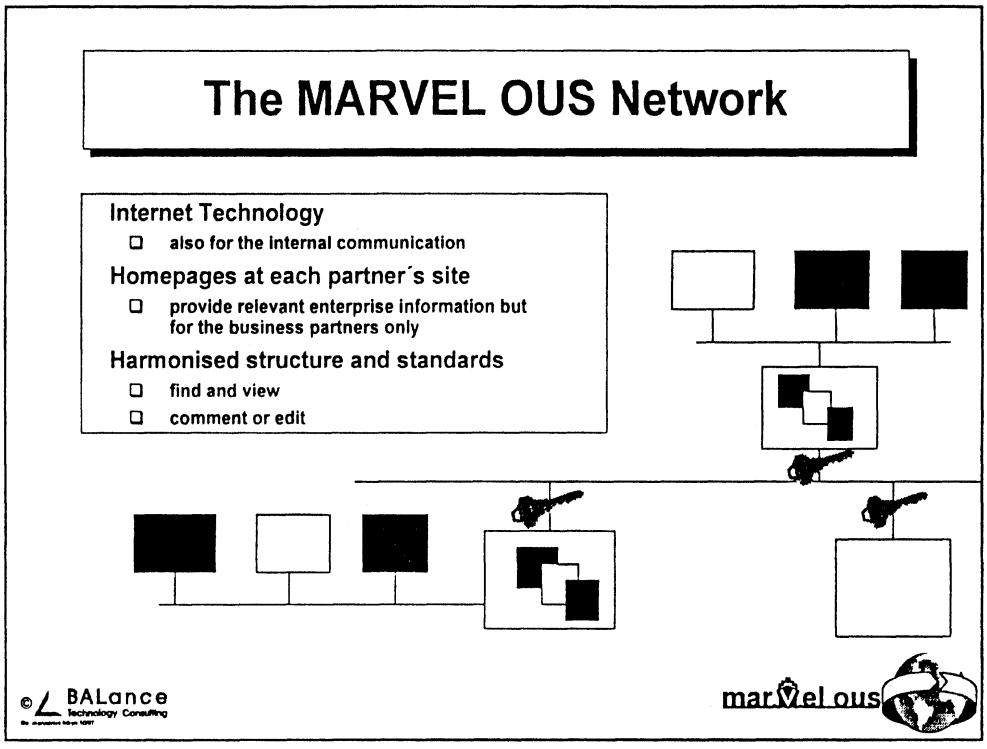
Outsourcing of divisions / departments

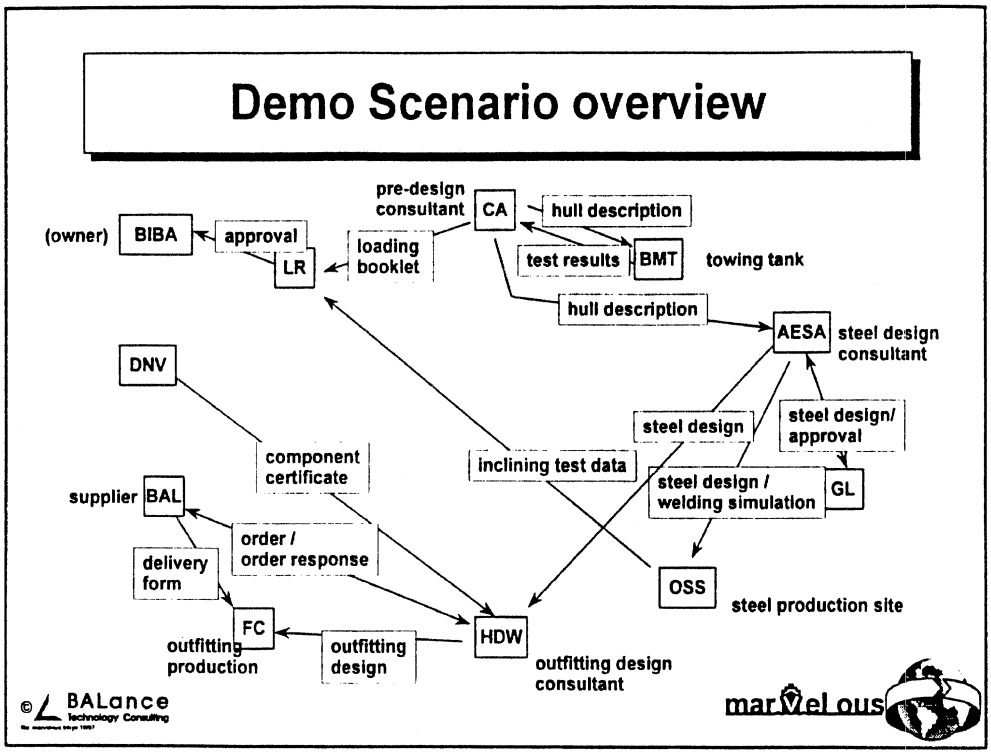
Central organisation of independant expert companies

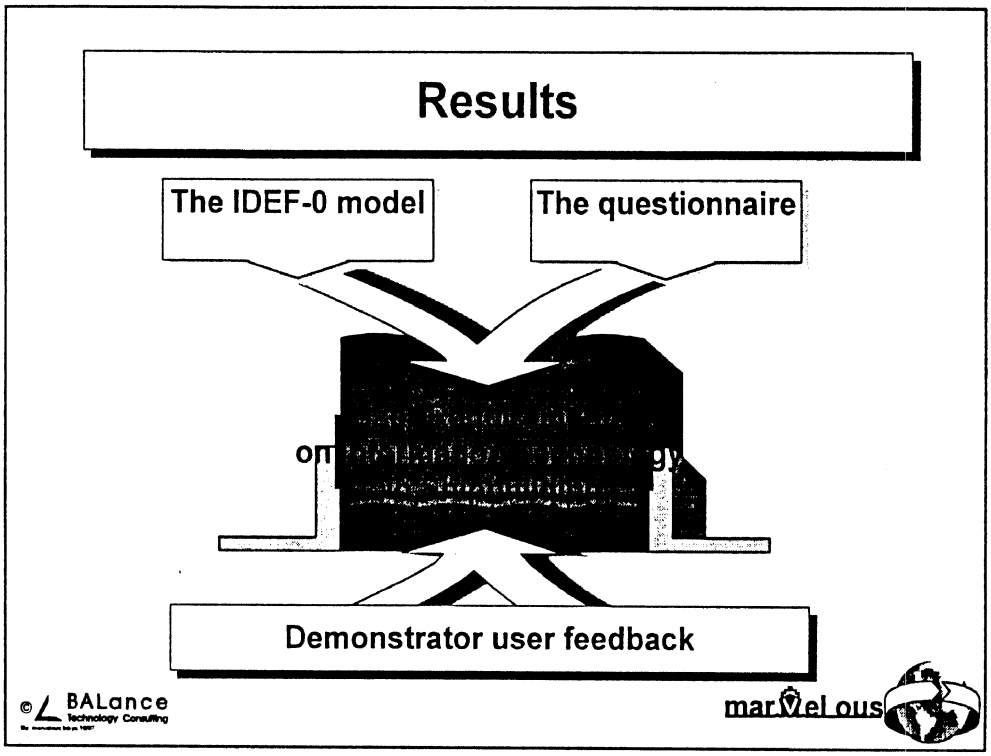
Connectivity of companies targeting at a common product



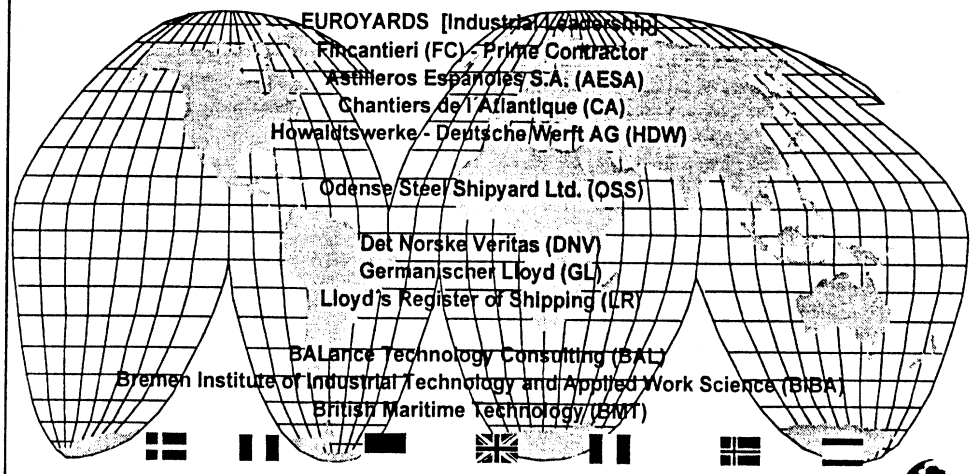

The MARVEL OUS Approach
user
Demo scenario for a maritime virtual enterprise
Existing standards
Available technology
Real business cases
BALance Technology Consulting
marvel ous


The MARVEL OUS Network
Internet Technology
also for the internal communication
Homepages at each partner´s site
provide relevant enterprise information but for the business partners only
Harmonised structure and standards
find and view
comment or edit
BALance Technology Consulting
marvel ous


Demo Scenario overview
pre-design consultant
CA
hull description
(owner)
BIBA
approval
LR
loading booklet
test results
BMT
towing tank
hull description
AESA
steel design consultant
DNV
steel design
steel design/ approval
component certificate
inclining test data
steel design / welding simulation
GL
supplier
BAL
order / order response
delivery form
OSS
steel production site
FC
HDW
outfitting production
outfitting design
outfitting design consultant
BALance Technology Consulting
marVelous

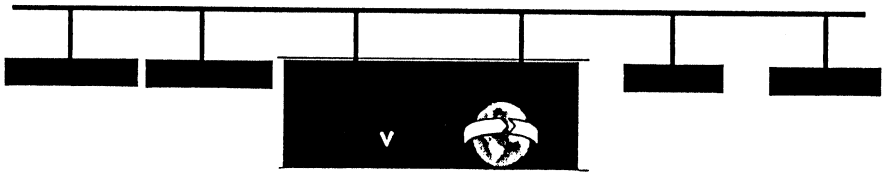

Results
The IDEF-0 model
The questionnaire
Demonstrator user feedback
BALance Technology Consulting
marVelous

MARVEL OUS partners



marVel ous

OUS - Open User Syndicate



- MARVEL OUS is an industrial project
- Users are commercial partners in the different process chains
- The kernel of the actual Euro-Project are shipyards and classification societies
- MARVEL OUS invites suppliers, shipping companies, model basins for an active own-cost participation
- Funding for additional projects depends on availability of programmes

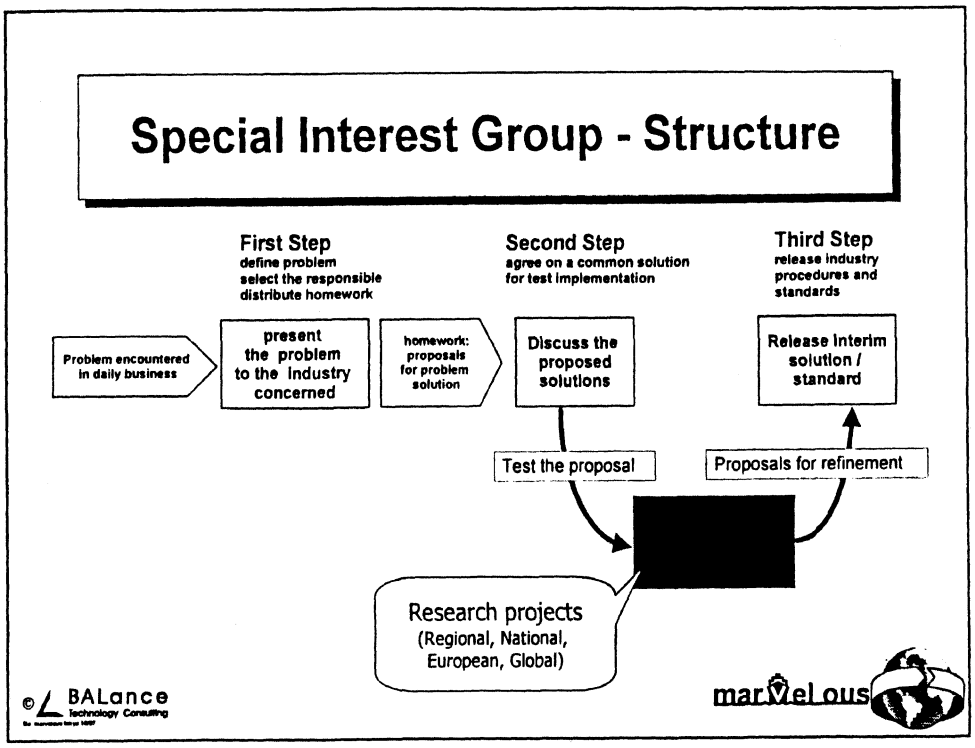
marVel ous

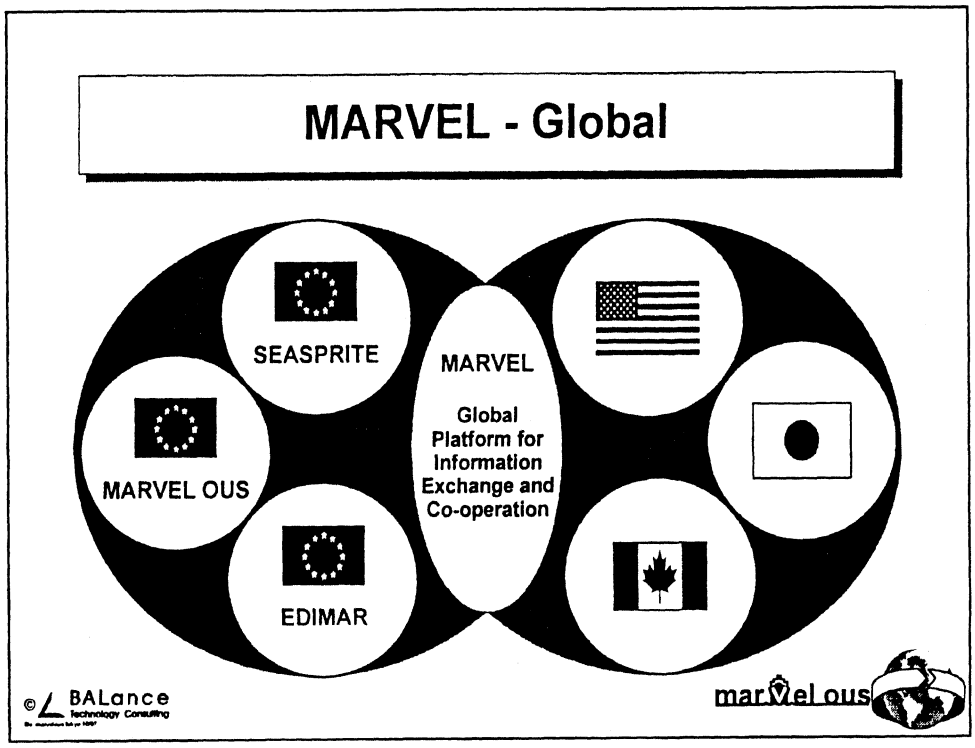
Conclusions on Standards

- Hundreds of standards exist, few used
  - ⇨ not relevant for today's needs
  - ⇨ need amendment or enhancement
  - ⇨ industry implementors not aware of them
  - ⇨ users not aware of the underlying standard
- ISO 10303 STEP has the greatest potential
- Internet/www standards and protocols are developing quickly and gaining acceptance
- De-facto/proprietary standards become established much faster than ISO standards

SIGs - Special Interest Groups

- Special Interest Groups are the forums to interlink the maritime community towards a successful team
- Three Thematic Special Interest Groups formed
  - ⇨ Marine Networks
  - ⇨ EDI
  - ⇨ Product Data Management
- Transition of Project Results into Real Life
- Broader Basis - Higher Acceptance
- Platform for Know How Transfer


Special Interest Group - Structure
First Step
define problem
select the responsible
distribute homework
Second Step
agree on a common solution
for test implementation
Third Step
release industry
procedures and
standards
Problem encountered in daily business
present the problem to the industry concerned
homework: proposals for problem solution
Discuss the proposed solutions
Release Interim solution / standard
Test the proposal
Proposals for refinement
Research projects
(Regional, National,
European, Global)
BALance
Technology Consulting
marVeLous


MARVEL - Global
SEASPRITE
MARVEL OUS
EDIMAR
MARVEL
Global Platform for Information Exchange and Co-operation
BALance
Technology Consulting
marVeLous

Reference 10

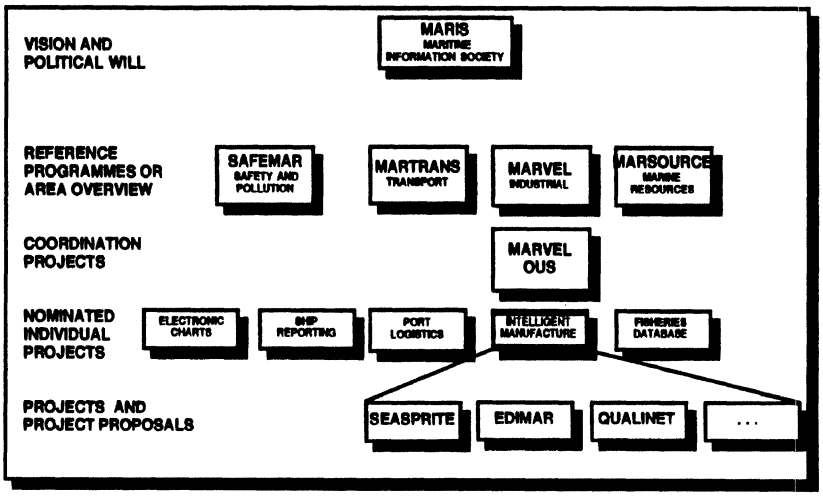
The SEASPRITE Project

Software Architectures for Ship Product Data Integration & Exchange

Jerry Goodwin
Lloyd's Register of Shipping
London, UK

SEASPRITE

MARIS



SEASPRITE

SEASPRITE

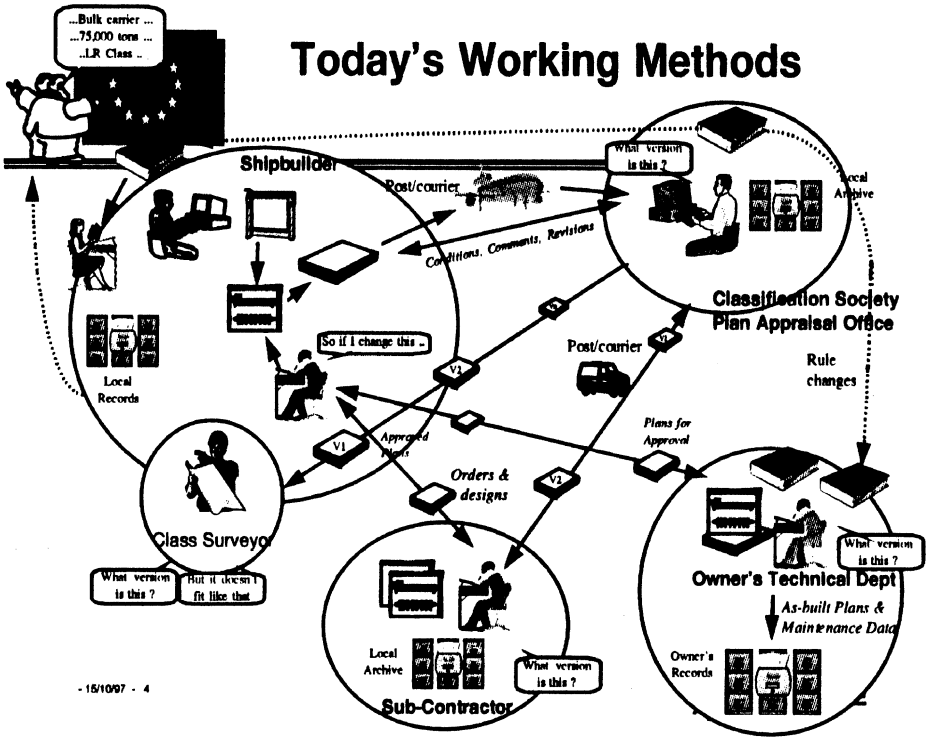
The way we work today!

- Ship plans are the main means of communication between business partners
- Manual re-entry of data is prevalent
- Many tasks are carried out sequentially
- Change control is labour intensive

- 15/10/97 - 3

SEASPRITE

Today's Working Methods



- 15/10/97 - 4

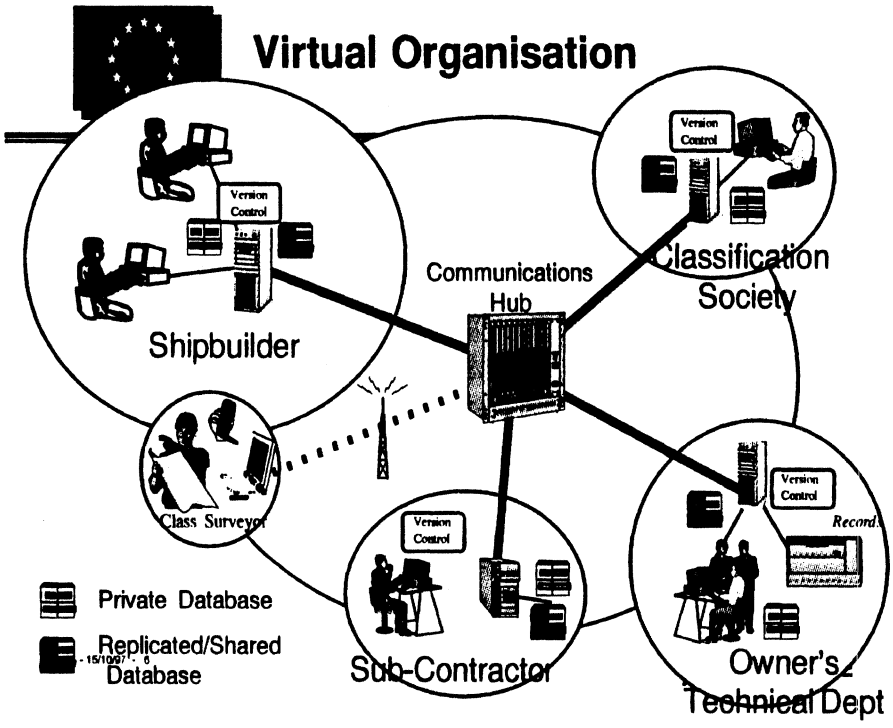
SEASPRITE Vision

A vision of the future!

- Using information technology to improve industry performance
- Virtual enterprise solutions with data sharing between business partners
- Re-use of ship design data in all ship life-cycle phases becomes possible

SEASPRITE

Virtual Organisation



SEASPRITE Project

Objectives

- Develop a ship product model to support the business needs of industry (STEP)
- Prepare state of the art software that supports electronic data interchange
- Demonstrate data exchange in specific business case scenarios
- Increase the competitiveness of the European shipbuilding industry

The SEASPRITE Consortium

Lloyd's Register, BMT, GEC-Marine
Kockums Computer Systems,
Kvaerner AS, DNV, SINTEF
MARIN
Odense Steel Shipyard, Maersk
Napa Oy
Instituto Superior Tecnico

SEASPRITE Status

Approved in principle:	January 1996
Technical Annex completed:	April 1996
Contract awarded:	June 1996
Project start-up:	July 1996
Project completion:	c. June 1999

SEASPRITE is 40% complete in October 1997

SEASPRITE

SEASPRITE Targets

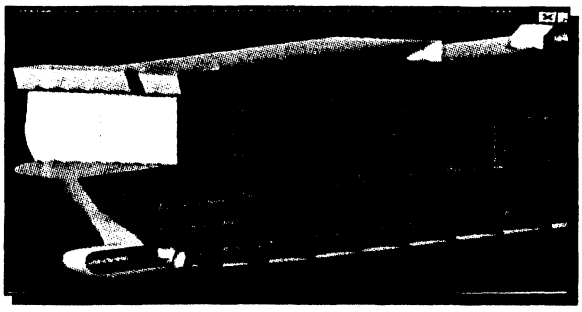
Application areas

- Hull definition data
  - hull form shape and topology
  - ship arrangements and compartmentation
  - structural arrangements and scantlings
- Data exchange/data sharing between
  - shipbuilder and model test basin
  - shipbuilder and classification society
  - shipbuilder and sub-contractor
  - shipbuilder, classification society and shipowner

SEASPRITE

SEASPRITE Standards Impact

- AP216 - hull form shape
- AP215 - ship arrangements and compartmentation
- AP218 - structural arrangements



SEASPRITE

SEASPRITE Business Cases

1 - Model Basin to Shipyard

- Hull Moulded Forms data

2 - Shipyard to classification society

- Hull Structural definition data - systems

3 - Shipyard to sub-contractor

- Hull Structural data - detail parts and assemblies

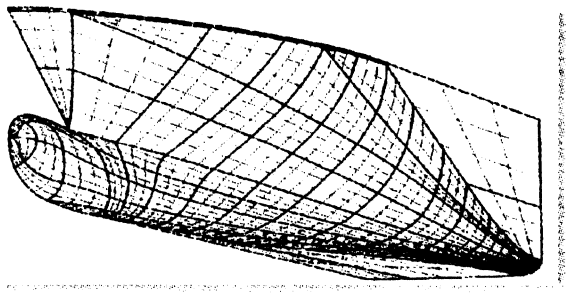
4 - Shipyard/classification/owner

- Hull Structural data, surveys and condition data

SEASPRITE

SEASPRITE Business Case 1

Model Basin / Shipyard Data Exchange



SEASPRITE

SEASPRITE Business Case 1

Moulded Forms Data Exchange

- Information Contents
  - Ship principal characteristics and basic propulsion data
  - Moulded form representation (lines or surfaces)
- Purpose
  - eliminate need for model basin to re-digitise hull form
  - reduce model construction time
  - shorten time for shipyard to modify the design
- Advantages
  - reduced costs
  - hull form completed earlier in overall design process

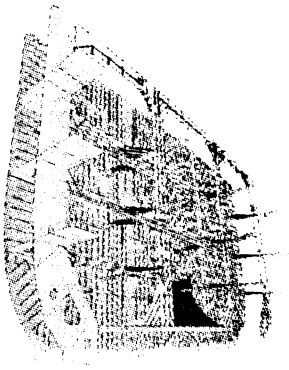
SEASPRITE

SEASPRITE Business Case 2

Shipbuilder to Classification Society

Hull Structural Definition Data Exchange

- Information Contents
  - Ship principal characteristics,
  - Environmental loads
  - Structures, plates, profiles,
  - Materials,
  - Spaces, design loads,



SEASPRITE Business Case 2

Shipbuilder to Classification Society

Hull Structural Definition Data Exchange

- Purpose
  - eliminate need for class to re-digitise model
  - reduce time for design assessment
  - faster approval of arrangements and scantlings
  - shorten time for shipyard to modify the structural design
- Advantages
  - reduced costs
  - steel ordering is possible earlier in overall design process

SEASPRITE Business Case 3

Hull structural data exchange with subcontractor

- Information Contents
  - Ship principal characteristics
  - Structures, plates, profiles, features, materials
- Purpose
  - eliminate need for sub-contractor to re-digitise model
  - reduce time for detail design/production engineering work
  - shorten time for shipyard to modify the structural design
- Advantages
  - reduced costs
  - cooperative working is enhanced

SEASPRITE

SEASPRITE Business Case 4

Shipyard/Owner/Class data exchange

- Information Contents
  - Structural definition data from shipyard
  - Survey status information (owner and class)
  - Structural condition and defect information
- Purpose
  - re-use of design definition for hull condition monitoring
  - provided a mechanism for management of hull condition data
  - shorten time for maintenance and repair
- Advantages
  - reduced costs and increased safety

SEASPRITE

SEASPRITE DEM

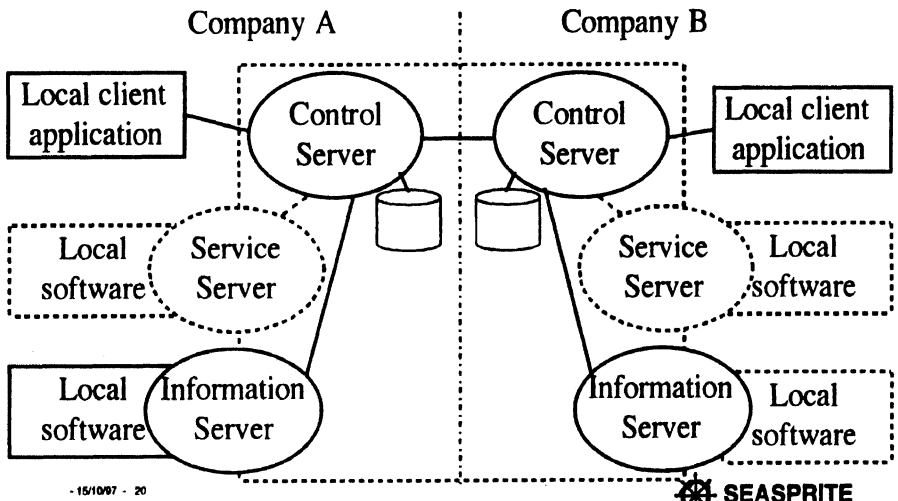
Data Exchange Management

Objective

- Develop and test a software architecture for managing the exchange of ship product data between cooperating companies

SEASPRITE

SEASPRITE DEM Architecture



SEASPRITE

SEASPRITE DEM

DEM functionality to be provided

- User and access control
- Product data organisation by projects
- Information object browser (web technology)
- Event notification
- Inter-sever communication
- Data encryption and compression

SEASPRITE

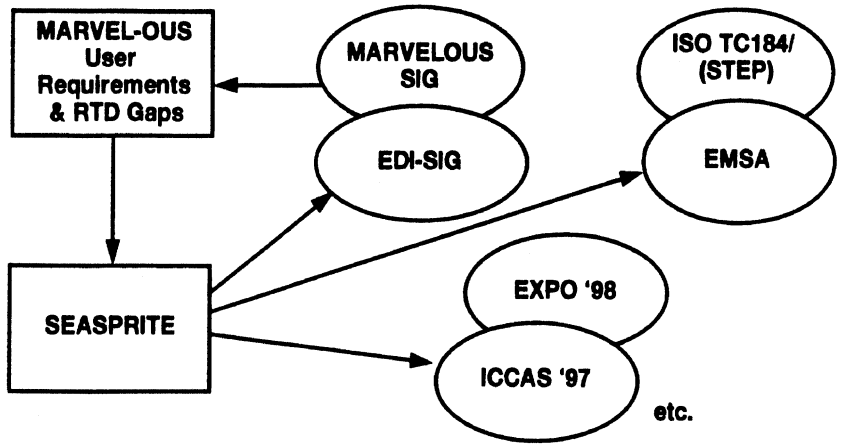
SEASPRITE Summary

Summary of Overall Benefits

- Reduced costs due to more efficient use of data
- Reduction in time taken for design
- Faster approval by classification society
- More efficient use of resources
- Better and more effective change control
- More competitive shipbuilding industry
- Reduced costs and increased safety in ship operation

SEASPRITE

Dissemination of results



SEASPRITE

SEASPRITE

For more information please contact:
Jerry Goodwin
Senior Principal Surveyor,
Systems Development Group,
Technical Planning and Development Dept.
Lloyd's Register of Shipping,
100 Leadenhall Street,
LONDON EC3A 3BP.
Tel: +44-171-423-2634
Fax: +44-171-423-2061

SEASPRITE

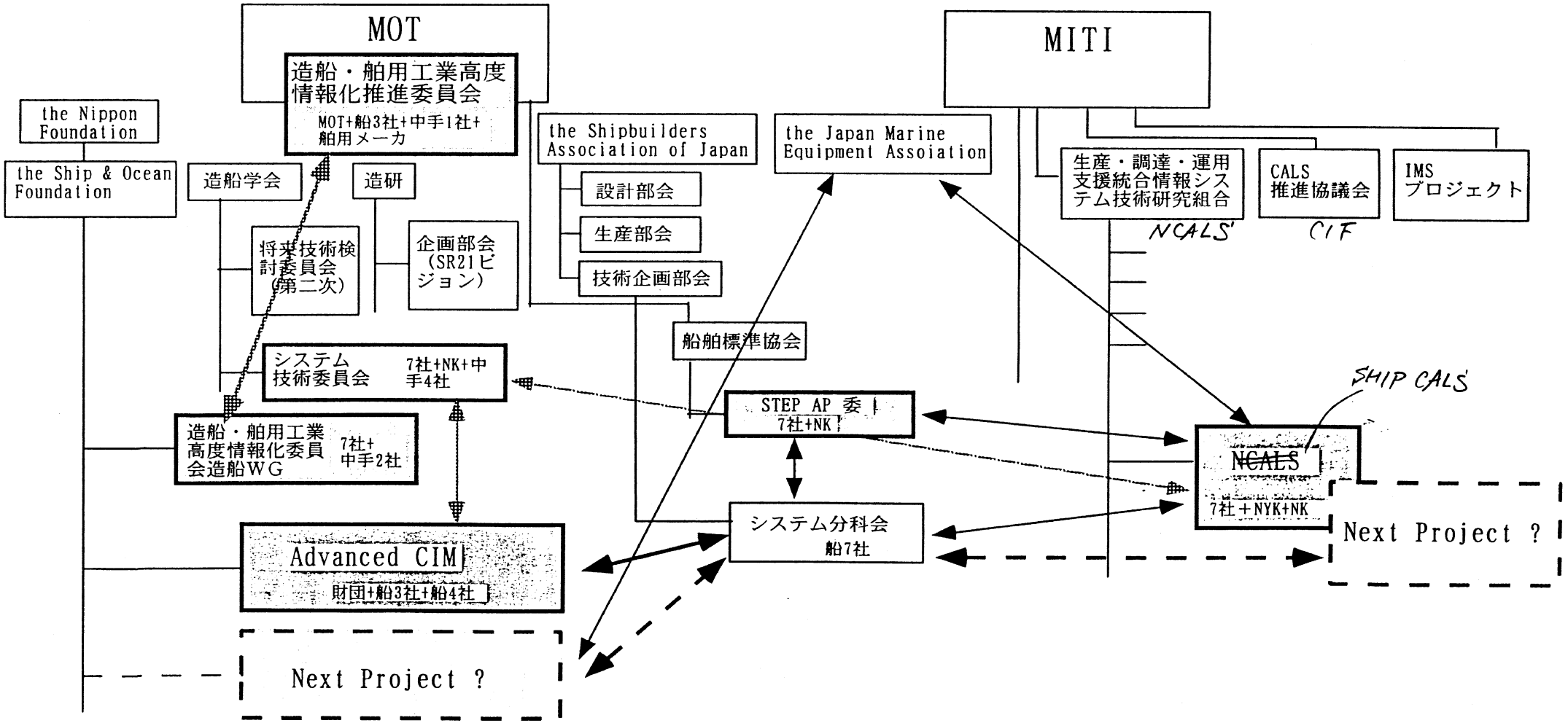
Reference 11

State-of-art of IT within the Japanese shipbuilding industry

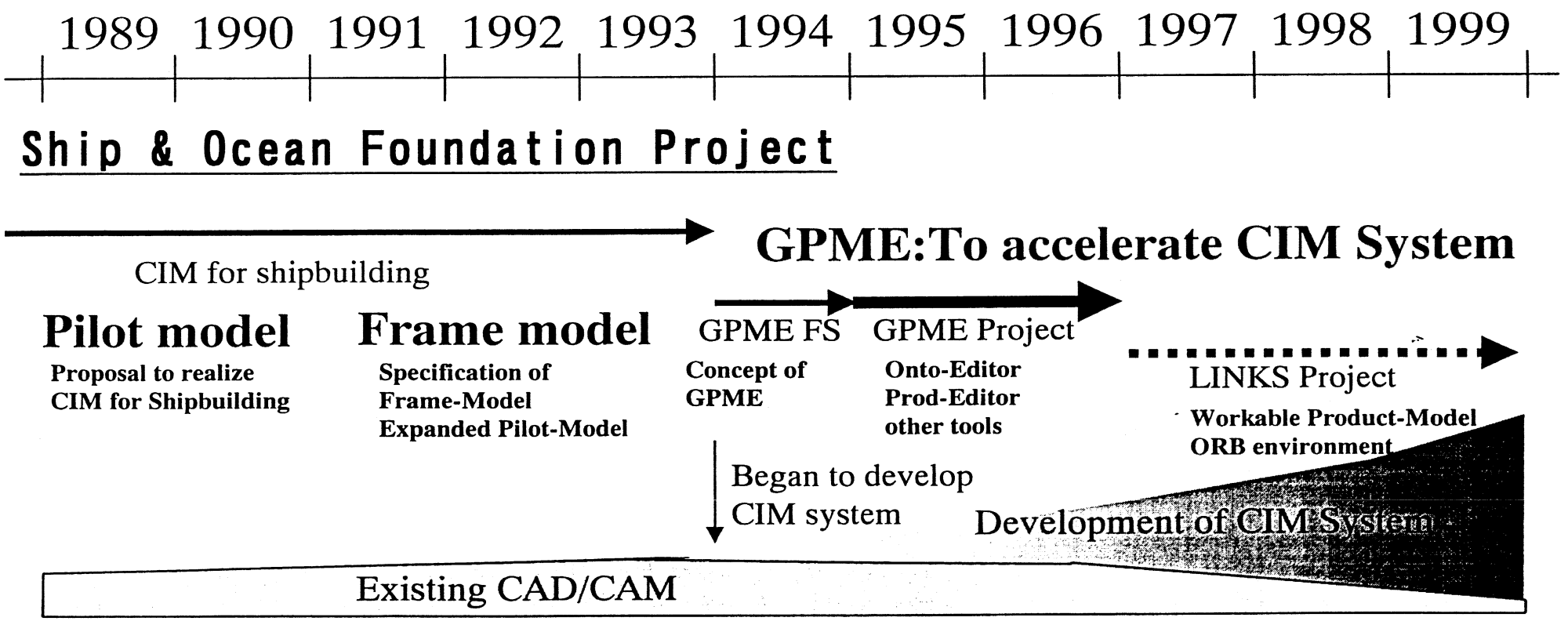
Ken Ito
Mitsubishi Heavy Industries, Ltd.

1997/10/20

Projects and Organizations for CALS・STEP・CIM in Japan



Schedule of CIM Project



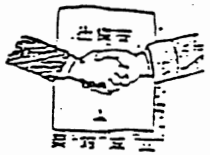
Construction Process of a Ship

Inquiry

- Basic Specification
- Offer Price

Contract

- Settle Price
- Specifications
- Guarantee Items



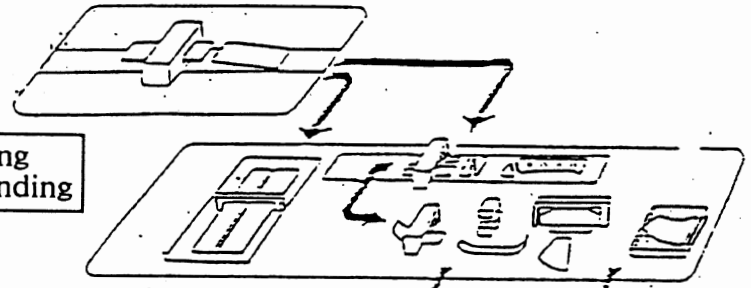
Model Test

- Confirm Performans

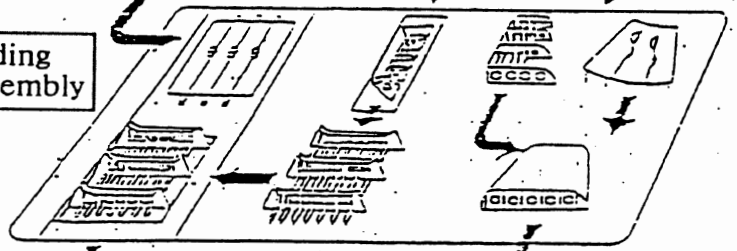
Design

- Basic design
- Detailed design
- Production design
- Approval of Classification Society
- Procurment

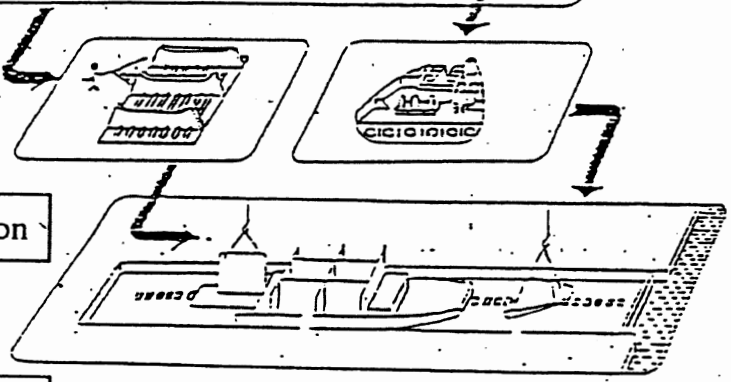
Cutting Bending



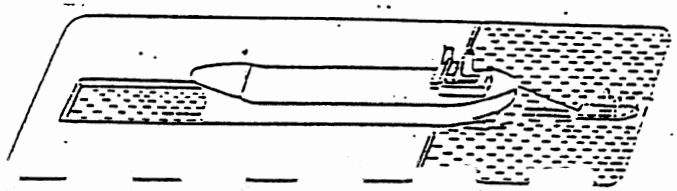
Welding Assembly



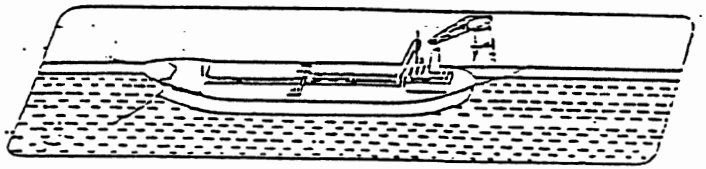
Construction



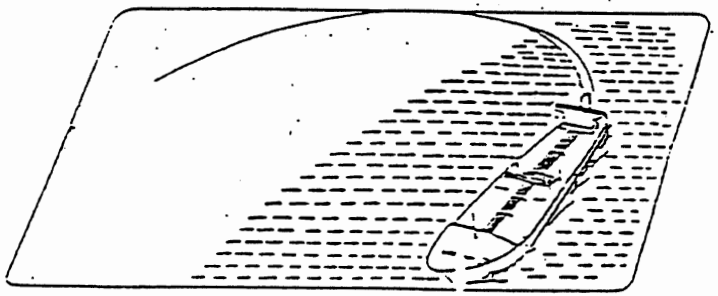
Launching



Outfitting/Maintenance



Sea Trial

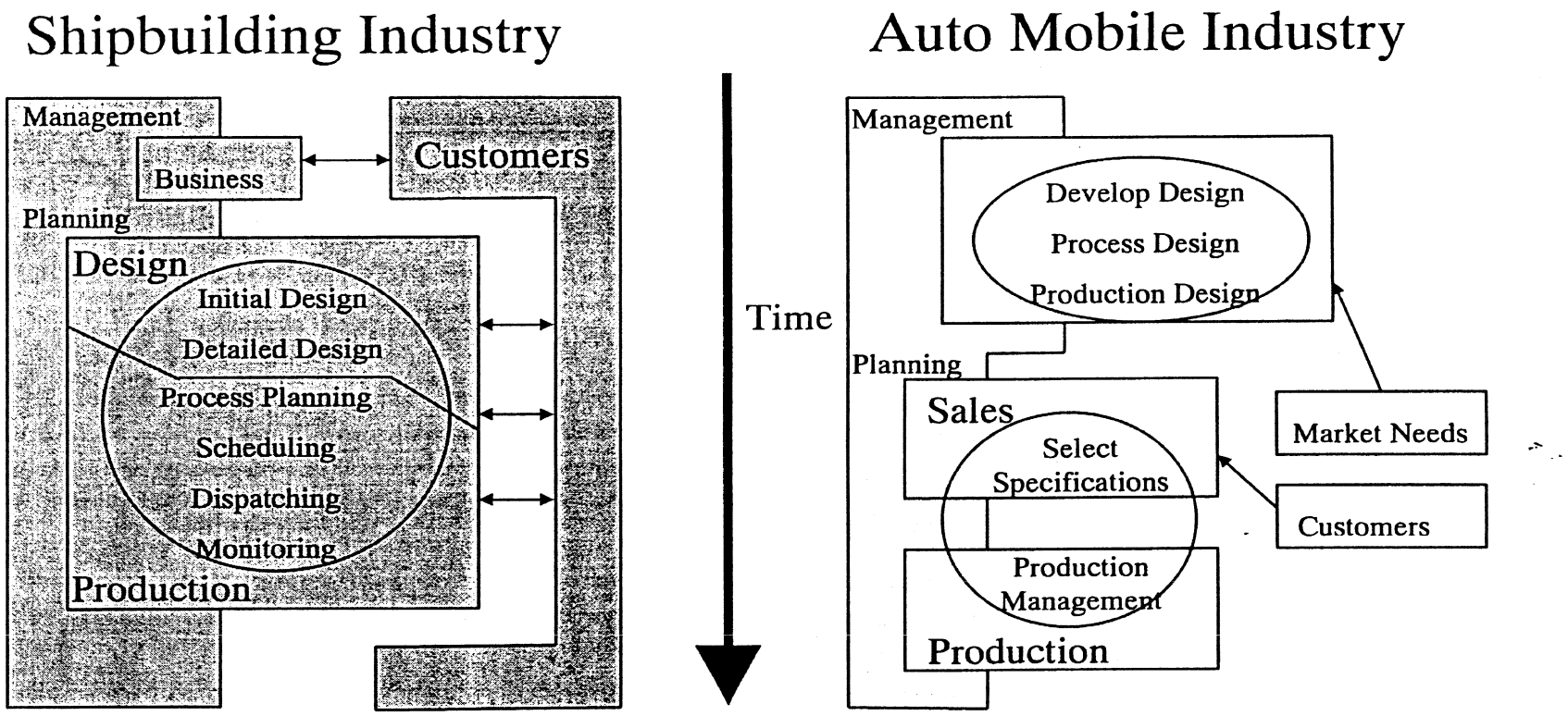


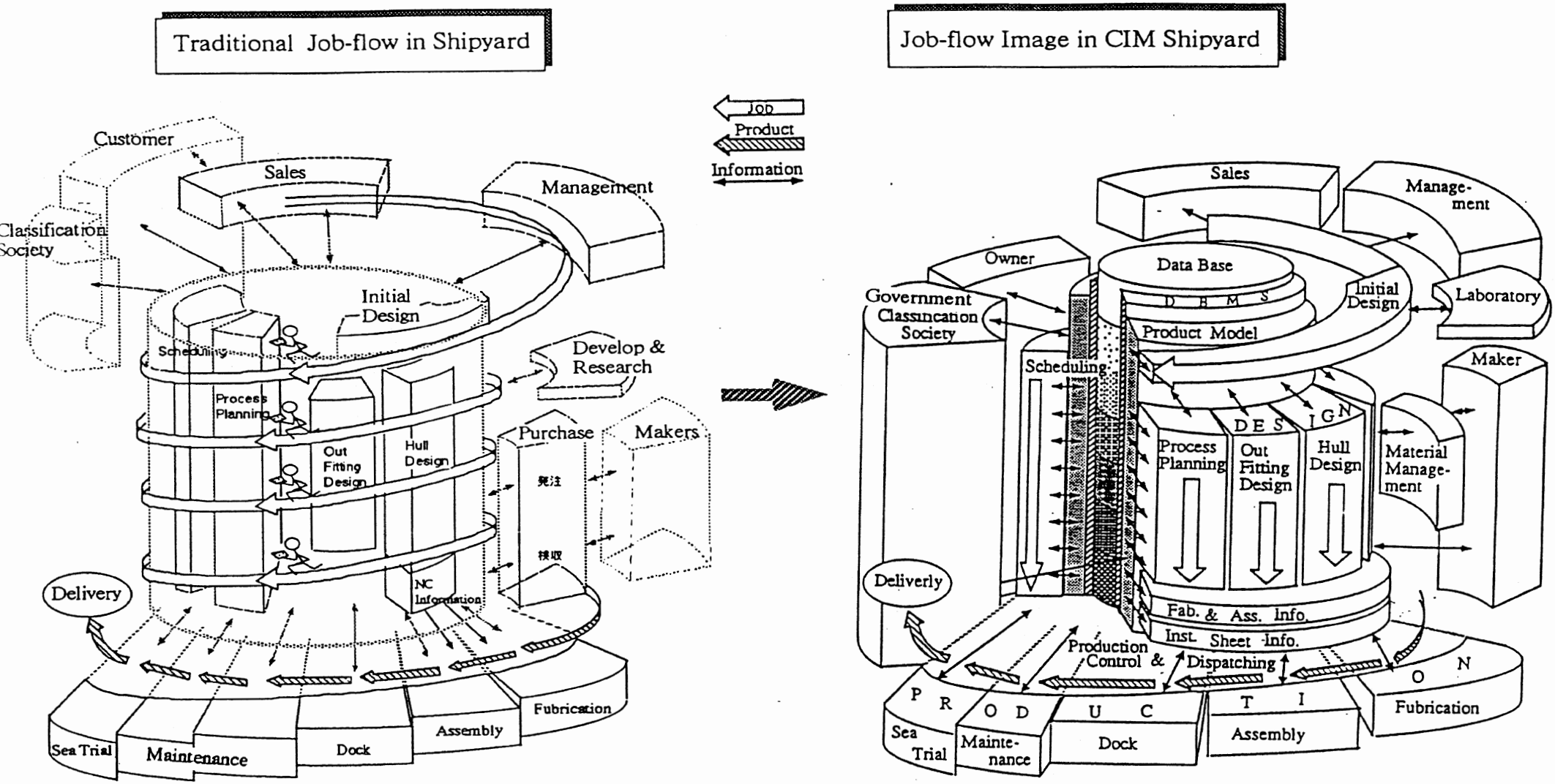
Delivery

- Guarantee Items

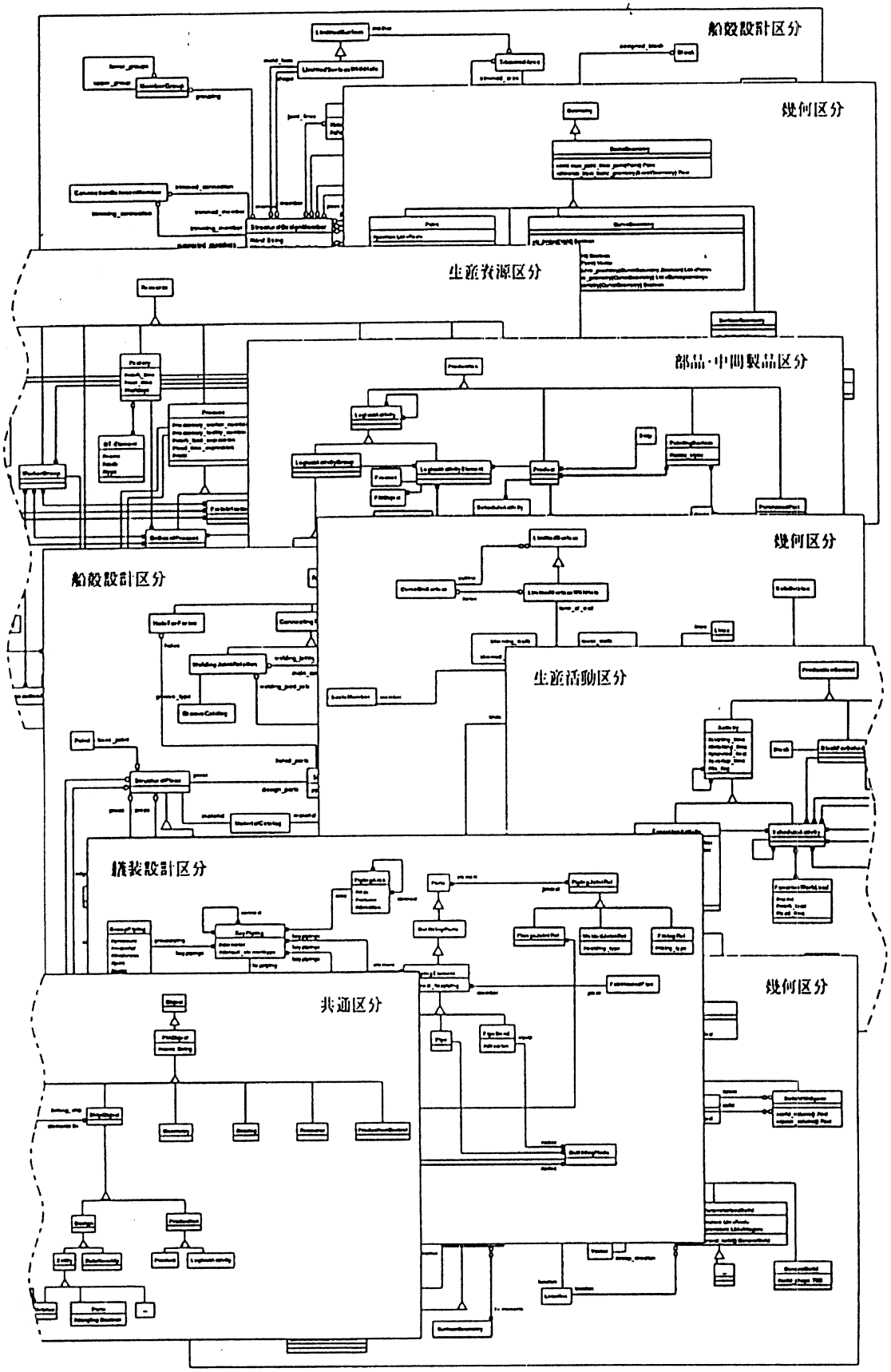
After survice

Comparison of CIMS
between Shipbuilding and Auto Mobile Industries



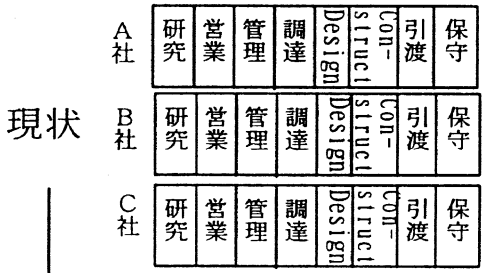


Comparison of Job-Flows



Sample of Product Model
(Specifications of Ojects)

Grand Designs for
造船・舶用工業の高度情報化　(for reference)



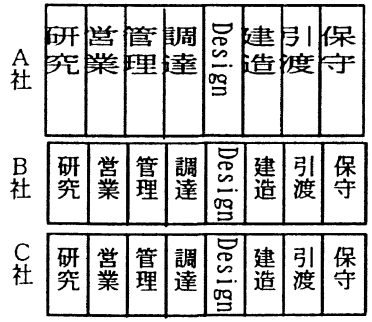
現状

Common issues for all ideas are

- knowledge sharing、
- product model for translate process information

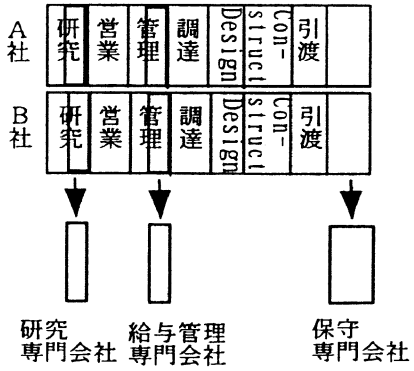
現状発展拡大型

現状の枠組みのまま、企業内の高度情報化により効率化を目指す。



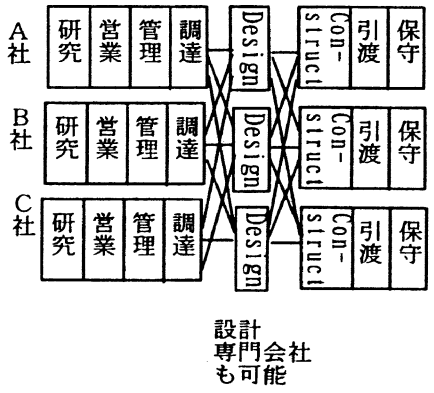
アウトソーシング推進型

間接部門や研究・保守等の分野は情報化技術の活用で社外を活用。



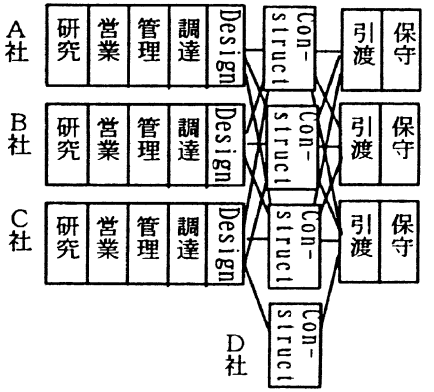
企業間協調型(設計協調)

設計業務について本格的かつ継続的な企業間協調を行う。



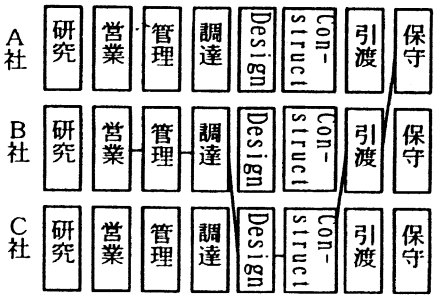
企業間協調型(建造協調)

建造分野について本格的かつ継続的な企業間協調を行う。

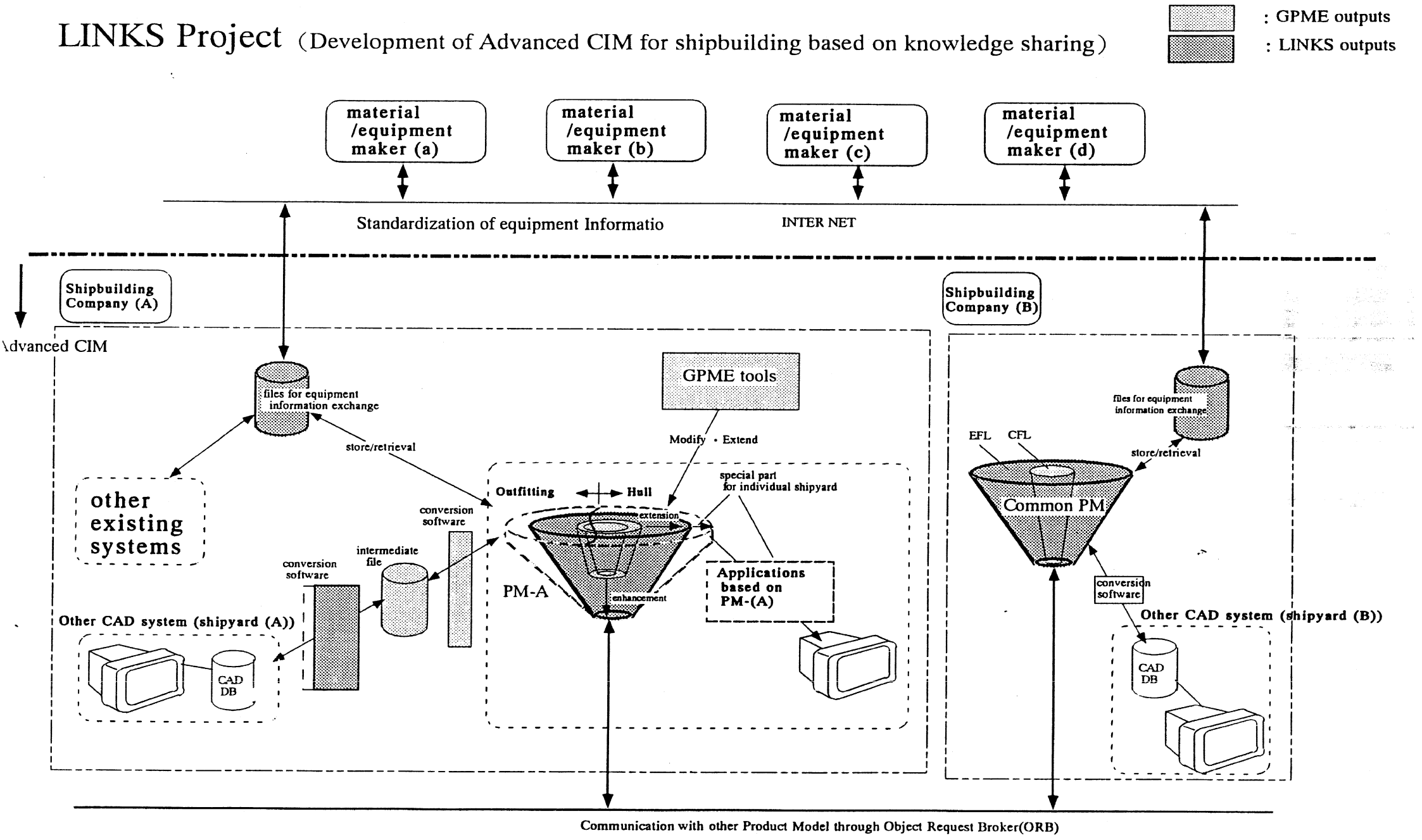


バーチャルエンタープライズ型

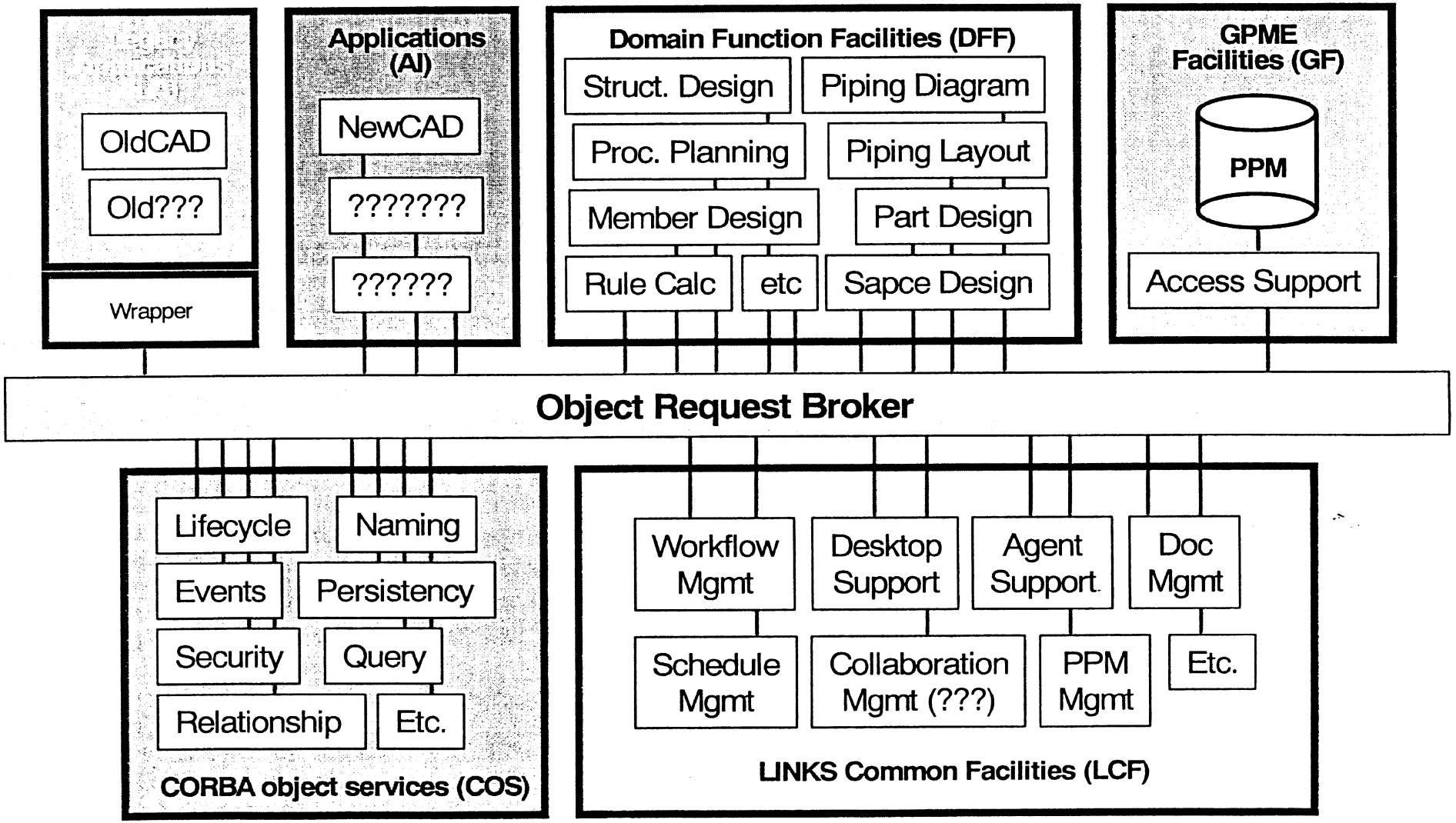
企業が機能毎に細分化され、プロジェクト毎に離合集散する。



LINKS Project (Development of Advanced CIM for shipbuilding based on knowledge sharing)



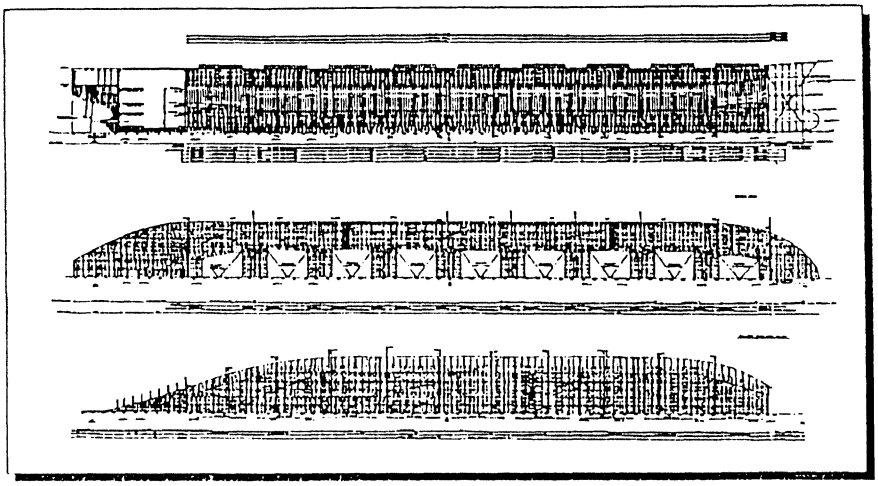
Reference Architecture



Reference 12

NCALS

DRAWING FOR EXCHANGE



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この図は、船の代表的図面で、大きさはA0サイズであります。
このような図面を例に、先ほど紹介しましたような実験を行っております。

NCALS

2. EXCHANGE OF DRAWING (WG 2)

1) Reproduction of drawing at client terminal
- Compression methods and resolution of raster data

2) Peproduction using IGES bet. different CAD
- Ship-specific data
- Partitioning of large size drawing

3) Management information
- Cnvertion of information on the covering sheet into SGML

本実験は、各造船所が保有するCADシステムで作成された、船舶用図面を複数の造船所間で交換し、図面データの有効な交換方法を明らかにする実験です。

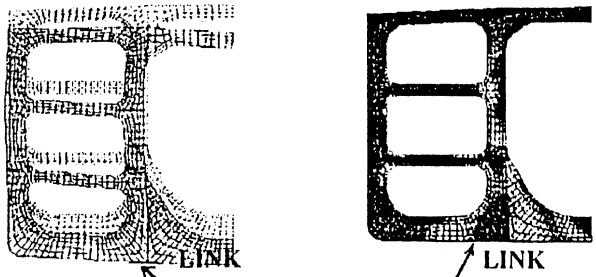
(1)ラスタデータの解像度・圧縮方法
CADデータをラスタデータに変換し、図面クライアントで再現する場合の必要な解像度や圧縮方法(gzipなど)の検証

(2)CADデータとIGESデータの双方向変換・図面データの分 割実験
異種CADデータのIGESでの交換による再現性の検証や 船舶用大型図面その分割割方法の検証

(3)図面の管理情報のSGML化
船舶用図面の交換を行う場合に、図面の表紙に含まれる管理情報(ブックレット方式)をSGML化する有効性の検証

NCALS

TRANSVERSE STRENGTH CALCULATION SHEETS USING HTML



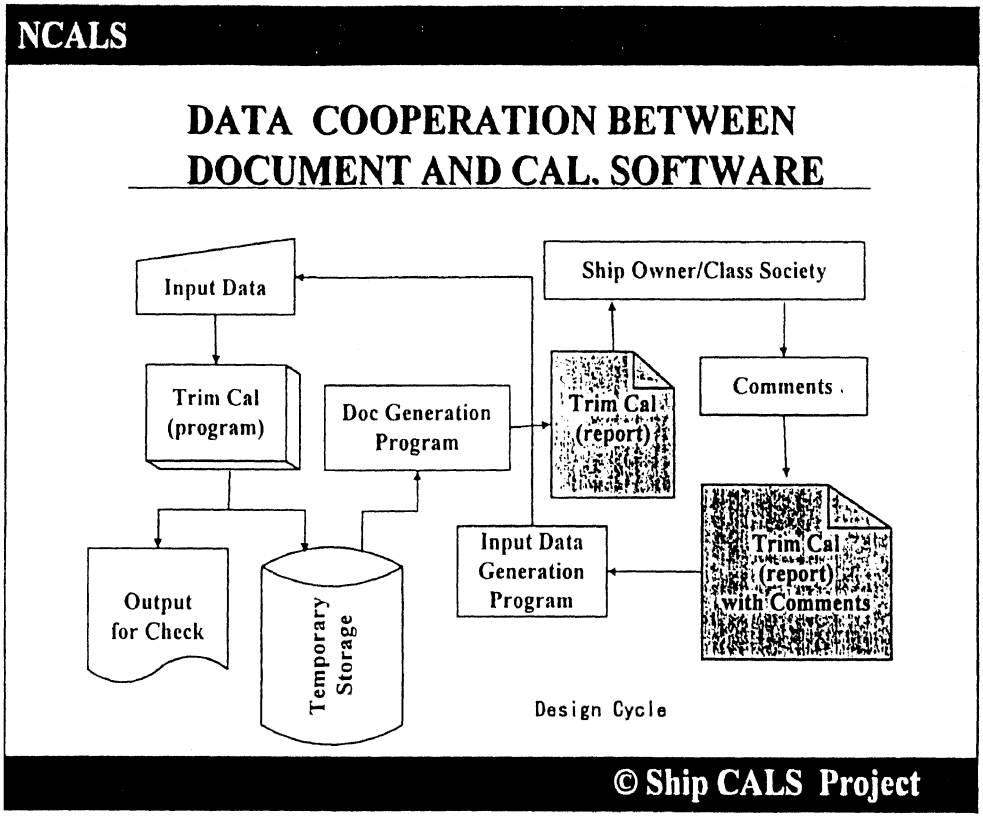
No	Scantling	LC-1	LC-2	LC-3	LC-4	LC-5	LC-6	Max	Allow	Judge
1	150 HT32	58	207	87	84	116	108	21	268	OK
2	180 HT32	55	196	79	75	107	103	20	268	OK
3	250 HT32	76	226	131	174	158	113	23	268	OK
4	125 MS	54	99	129	19	154	114	15	209	OK
5	125 MS	06	50	78	04	76	76	08	178	OK
6	150 HT32	188	185	69	114	94	211	21	268	OK
7	150 HT32	174	174	101	91	142	163	17	229	OK
8	150 HT32	229	124	130	74	182	127	23	268	OK
9	140 HT32	160	167	107	87	151	98	17	268	OK
10	160 HT32	110	153	78	13	111	132	15	229	OK

横強度計算書と言うのは、船の構造の強度計算書で、ここに示しますような特

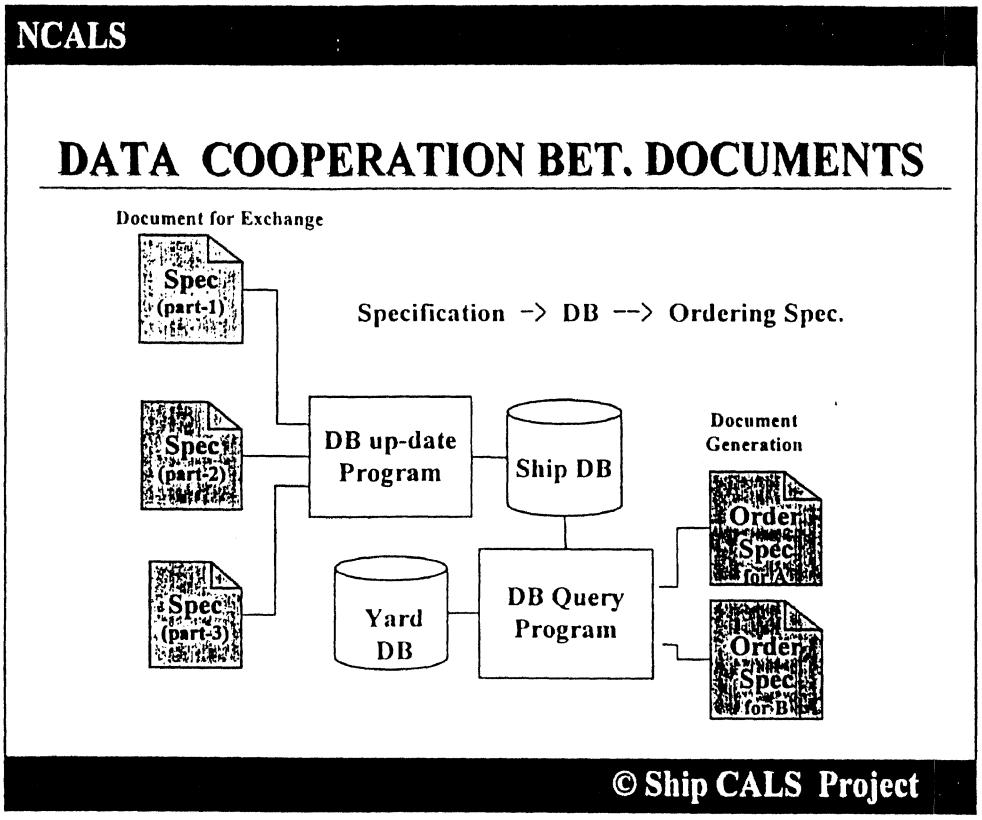
徴があります。何千ページにも及ぶ膨大なものですので、表と絵のリンク設定

のやり方が閲覧のしやすさを左右します。

そこで横強度計算書DTD標準を用いて作成した、SGML形式の横強度計算書をHTML形式に変換し、リンク設定方法をいろいろ変えて実験を行なっています。



SGMLトリム計算書とトリム計算ソフトとのデータ交換機能の検証と、その機能を実際に用いて、計算条件の変更や追加した実験にて、その有効性を検証しています。

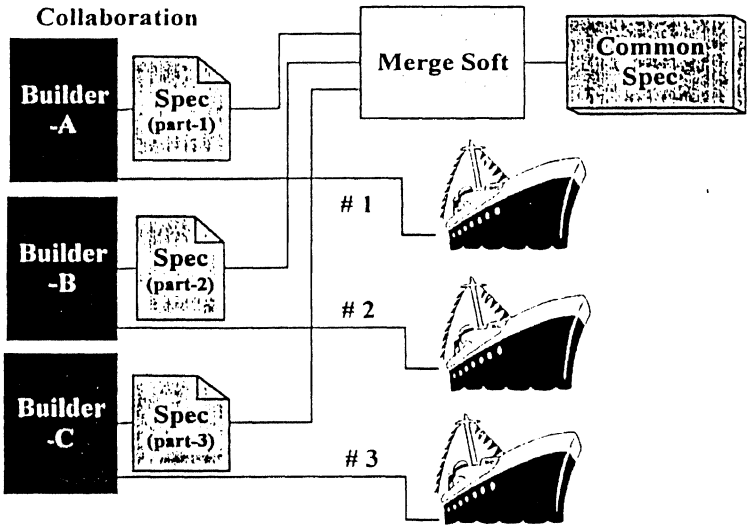


すでに紹介しましたSGML文書とDBとのデータの双方向更新機能は、ここに示していますDB更新ソフトおよびDB検索ソフトが、それに当たります。

この機能の検証と、その機能を用いたDBを経由した建造仕様書と注文仕様書間の連携の実験を行なって、その有効性を確認しています。

NCALS

COLLABORATION FOR COMMON SPEC.



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これは、共同設計や共同受注を想定して、企業間で建造仕様書の共同執筆

している例です。

3つの造船所が建造仕様書を、分担して執筆し、それらをマージして3社共通の建造仕様書を作成する実験を行なっています。

NCALS

1. EXCHANGE OF TECHNICAL DOCUMENTS (WG 1)

1) Verification of representation function
- Joint writing
- Linking drawings and tables
- Part revision

2) Verification of linking with DATABASE
- Updating of RDB and SGML document

3) Verification of linking with calculation software
- Updating of CAL software and SGML document

4) Convertion of SGML Trans. str. cal. into HTML
- Verification of link and easiness of browsing

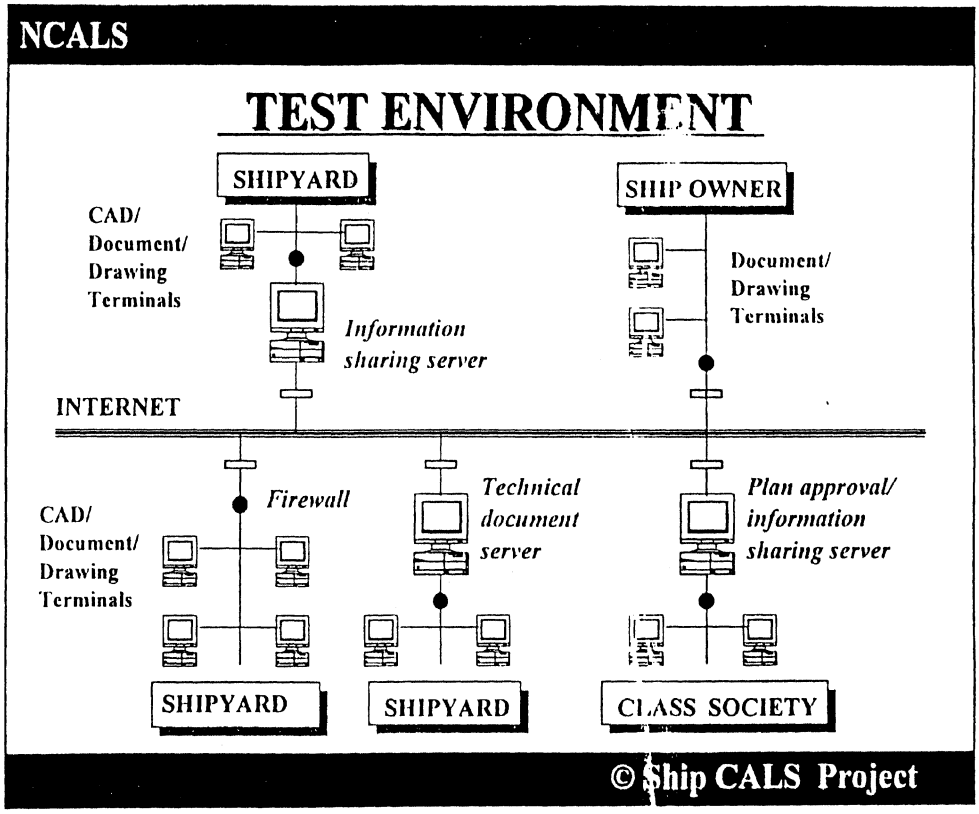
まず、文書類の交換実験について紹介します。
技術文書は建造仕様書・注文仕様書・トリム計算書および横強度計算書を対象としています。
実験の内容は下記の通りです。

(1)技術文書・計算書のSGML化とれを用いた交換実験
・建造仕様書を2社以上で分担作成・併合
・SGML注文仕様書の記述方法や関連事項とのリンク設定
・トリム計算書や横強度計算書の本文と表・図とのリンク設定
・建造仕様書の改訂部分の差分情報のみの交換

(2)技術文書とRDBとのリンク機能の検証
文書内のデータとRDBとの双方向更新機能の開発と実験
・建造仕様書や注文仕様書のデータと文書DB

(3)技術計算書と計算ソフトとのリンク機能の検証
トリム計算書中に含まれるデータとトリム計算ソフトの入出力データとの双方向更新機能の開発と実験

(4)技術計算書のHTML化
SGML形式の横強度計算書をHTML形式に変換し、技術文書サーバ(WEB)を介して閲覧



実験は、設計承認、情報共有、また文書交換用の3台のサーバ、および各社のクライアント端末をインターネットで接続した状態で行なっております。

1.サーバ環境の機能

(1)設計承認／情報共有サーバ

・Webサーバ機能、FTPサーバ機能、文書管理機能、
セキュリティ機能、Webアプリケーション実行機能
データベース機能、Webサーバ／DB連携機能

(2)技術文書サーバ

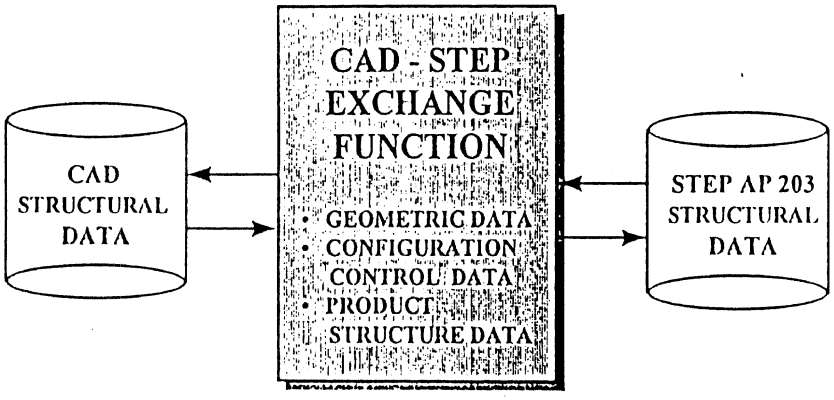
・Webサーバ機能、FTPサーバ機能、データベース機能

2.クライアント端末の機能

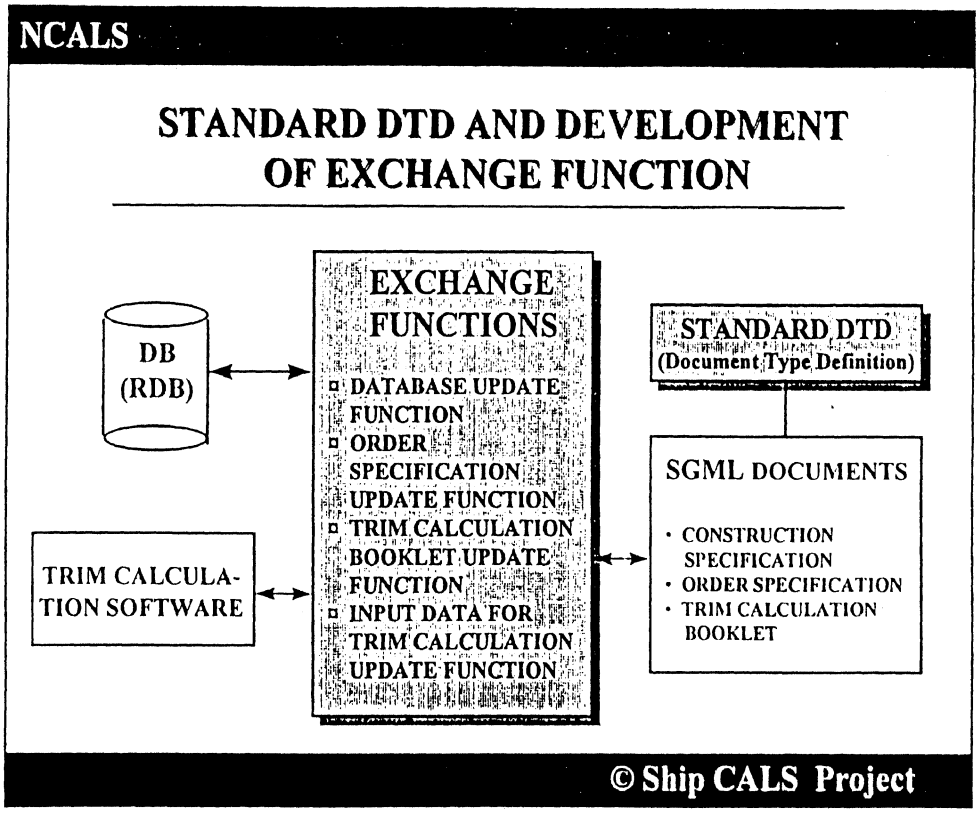
・Webクライアント機能、FTPクライアント機能、
SGML文書表示／編集機能
・IGES／ラスタ表示機能、注記機能
・STEP AP203データ表示機能

NCALS

DEVELOPMENT OF CAD-STEP EXCHANGE FUNCTION USING AP203



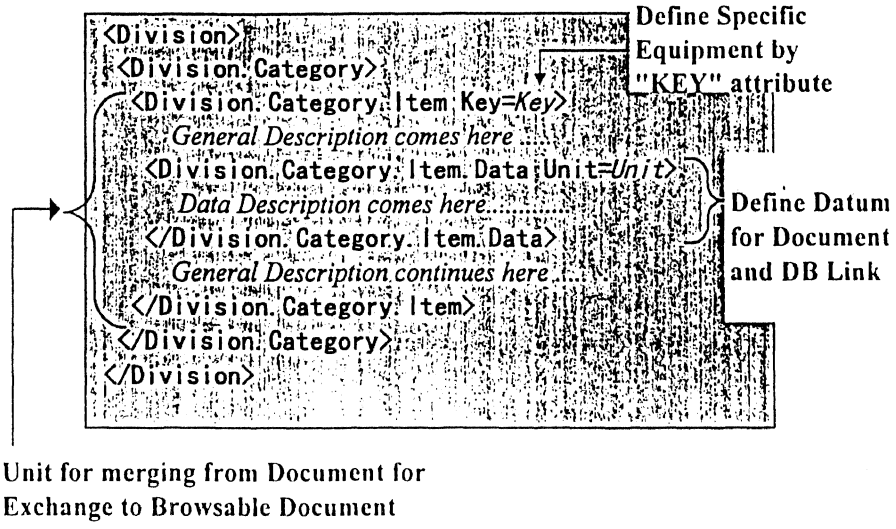
現在、国際規格としてSTEP(プロダクトモデルの交換規約)が進められています。
船用にも5種類のAP(アプリケーション・プロトコール)の制定が進められていますが、
まだ審議中ですので、ここでは既に国際規格としてリリースされているAP203を用いて異種CAD間で船殻構造データを交換するための双方向変換機能を開発しています。
STEP AP203はCC2(Conformance Class 2)を取り扱っています。



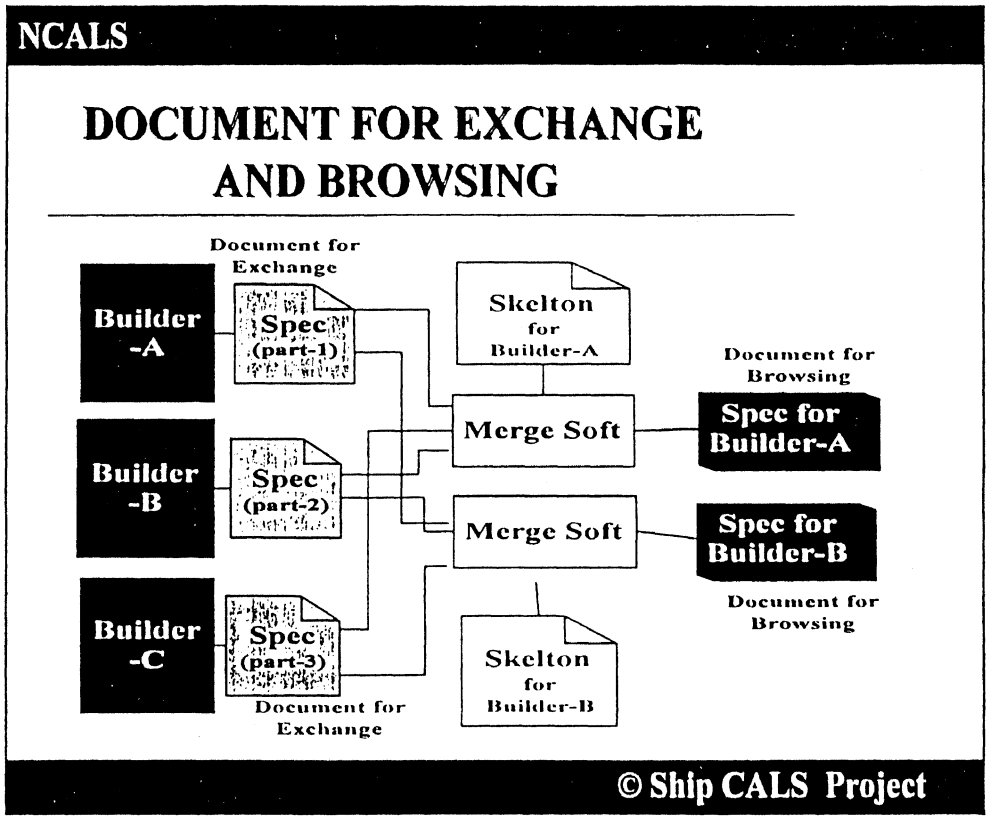
今まで紹介してきました、SGML文書とDBや計算ソフトのデータの相互変換機能の詳細です。

NCALS

SPECIFIC DTD STRUCTURE



具体的なDTD構造の例を示しています。

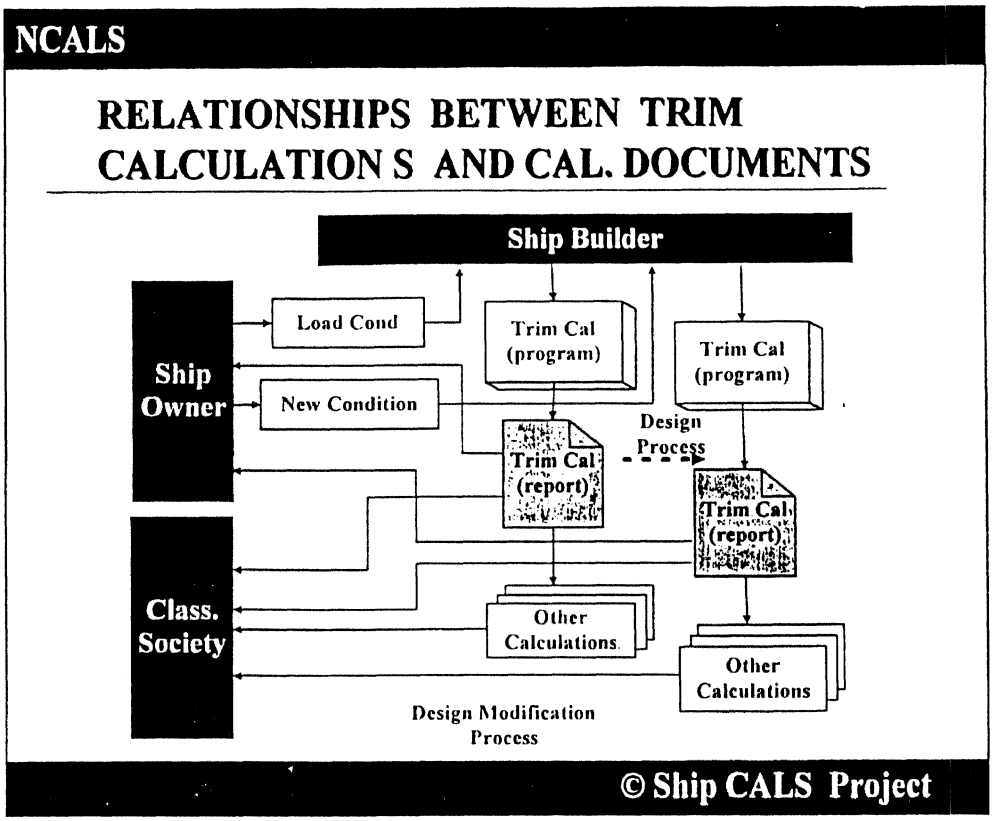


今回開発しました技術文書交換用DTDは次の特徴を有しています。

1) 交換用と閲覧用を区別している。

2) データベースや計算ソフトとのデータの連携を考慮している。

3) 文書の分担執筆および、それらのマージを考慮している。



トリム計算書の詳しい説明は、ここでは省略しますが、この計算書は船の積み

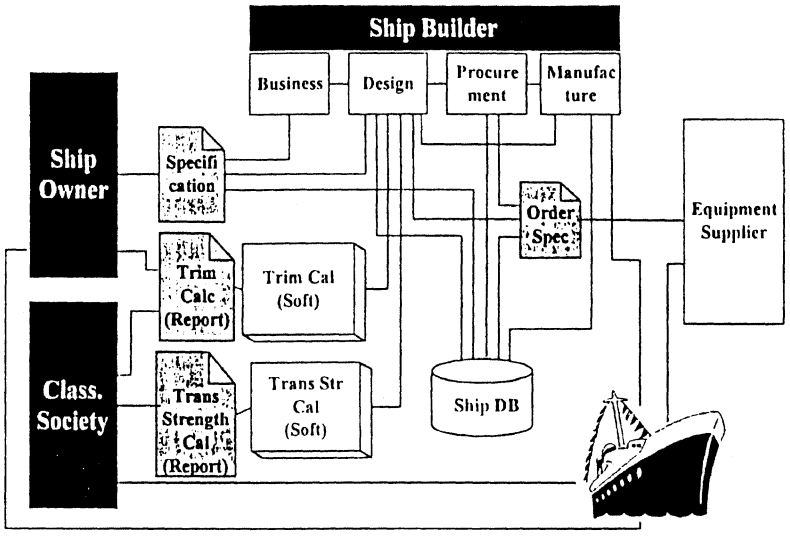
付け条件や、設計の進捗によりたびたび変更されるという特徴があります。

そこで、トリム計算書(SGML)中に含まれるデータとトリム計算ソフトの入出力

データとの双方向更新機能を開発し、それらの連携をとろうと言うのもです。

NCALS

TECHNICAL DOCUMENTS



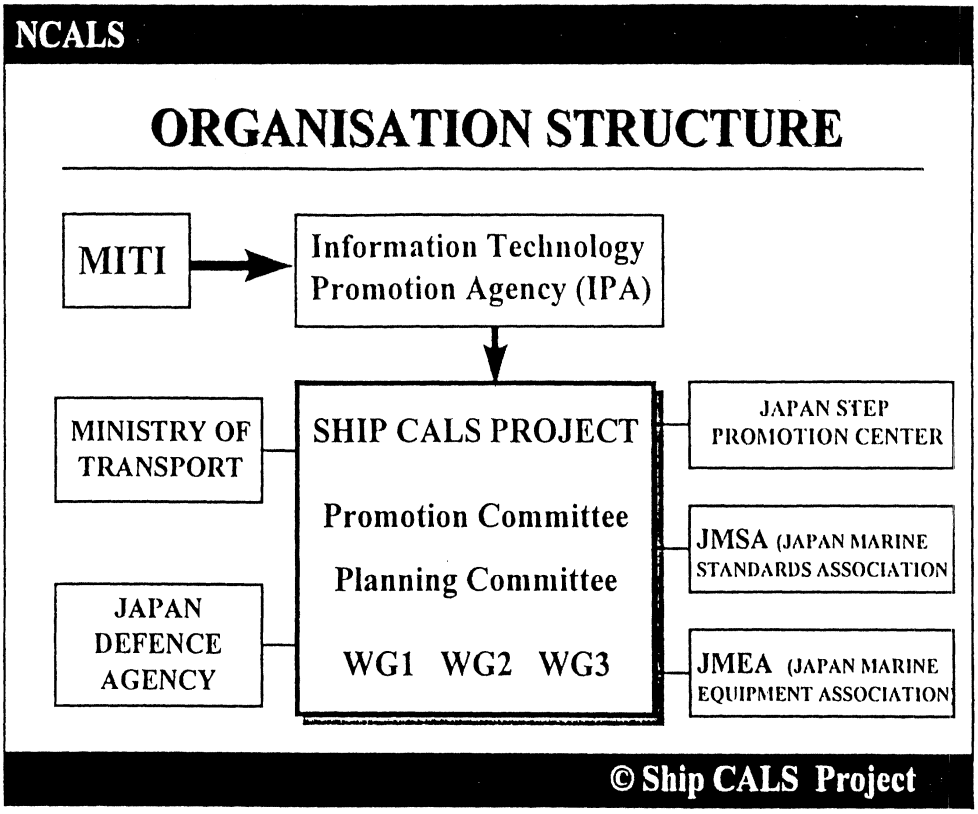
今回取り上げております、4種類の対象文書の位置づけを簡単に紹介します。

建造仕様書は、造船所と船会社の間で、

注文仕様書は、造船所と舶用機器メーカ間で、

トリム計算書は、造船所と船会社および船級協会間で、

横強度計算書は、造船所と船級協会間でやりとりされます。



実験実施体制は次の通りです。

・推進委員会(委員長:IHI)では、実験実施に関する基本方針の決定を行なっています。

・企画部会(部会長:IHI)では、基本計画の決定とWGへの指示とWGの進捗状況の管理を行なっています。

・ワーキンググループ(リーダ、WG1:HZ、WG2:IHI、WG3:NK)
3つに分かれて、それぞれ次の実証実験を行なっています。

WG1:技術文書の交換実験

WG2:図面および異種CAD間のSTEP AP203による
交換実験

WG3:設計図書の承認業務の電子化実験
船舶関連情報の共有化実験

なお、運輸省や防衛庁また、日本船舶標準協会や日本舶用工業会などがオブザーバとして参加していただいております。

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PROJECT OUTLINE

- Exchange of technical documents
- Exchange of drawings
- Exchange of data among different CAD systems using STEP AP 203
- Testing of electronic plan approval
- Testing of sharing of ship-related information

詳細は後程紹介しますが、実証実験項目は以下の5項目です。

(1)技術文書の交換実験
船舶の代表的な技術文書のDTD標準の作成と、その標準を用いたSGML
文書の作成。またこれらのSGML文書と既存のデータベースや計算書ソフト
との相互変換機能の開発と、これらの検証実験。

(2)図面の交換実験
各造船所が保有する異種CAD間で図面データの交換実験。

(3)異種CAD間のSTEP AP203による交換実験
各社保有のCADとSTEPとの相互変換機能を開発と、各社間で製品モデル
データの交換実験。

(4)設計図書の承認業務の電子化実験
造船所と船社や船級協会で幾度となく往復する設計図面や文書に対する
効率的な電子承認の仕組みを検討。

(5)船舶関連情報の共有化実験
造船所や船社また船級協会間で紙ベースで互いに関連なく提供されている船舶関連情報を電子化しネットワークを利用して共有化する実験。

NCALS

PARTICIPANTS

◆ SHIPYARDS

- Ishikawajima-Harima Heavy Industries (IHI)
- Hitachi Zosen (HZ)
- Kawasaki Heavy Industries (KHI)
- Mitsubishi Heavy Industries (MHI)
- Mitsui Engineering and Shipbuilding (MES)
- NKK Corporation (NKK)
- Sumitomo Heavy Industries (SHI)

◆ CLASSIFICATION SOCIETY

- Nippon Kaiji Kyokai (ClassNK)

◆ SHIP OWNER

- Nippon Yusen (NYK)

このプロジェクトには、造船所より7社、船級協会として日本海事協会、
船会社より日本郵船が参加しています。

NCALS

Ship CALS Project

Industry specific R&D Project for the testing of electronic exchange of technical information related to shipping and shipbuilding

船舶のライフサイクルの内でも、特に設計過程においては、膨大な技術情報
(A4換算で約15000枚)が、造船所と船級協会や船社の間でやりとりされています。
これらの技術情報は文書・計算書・図面・製品モデルデータなどでありますが、大部分は電子的に生成されているにも拘わらず、最終的には紙の形で伝達・保管されているのが現状であります。
結果として多大の間接費用を発生させております。
ご存知の通り造船業界は、まだまだ厳しい状況にありますが、今後とも国際競
争力を維持・向上させるためには、これらの間接費用の削減によるホワイトの
生産性の向上が重要なポイントとなっております。
~~一方、CALSは世界共通のビジネスシステムとして定着し始めています。~~
このような背景から、今回の実証実験では、電子的な技術情報の共有化を企
業内のみならず企業間でも可能とするための電子データ交換に関する基盤技術を確立することを目的としています。

NCALS

CALS PROJECT

- Motor Vehicles CALS
- Iron and Steel CALS
- Electronics CALS
- Software CALS
- Industrial Plant CALS
- Construction and Engineering CALS
- Aircraft CALS
- **Ship CALS**
- Satellite CALS
- Iron and Steel EC

業種別CALSのプロジェクトは、自動車、鉄鋼、電気、プラントなど10業種で
おこなっております。業種別CALSは、平成8～9年度('96～'97)の2年間
のプロジェクトですが、NCALSでは、これとは別に電力業界を対象とした実
証事業を平成7年～9年度('95～'97)の3年間のプロジェクトとして行なっています。

発表原稿 10/20.21

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Nippon CALS Research Partnership

Ship CALS Project

Ishikawajima-Harima Heavy Industries
Ship & Offshore Dept.
Norio HATA

石川島播磨重工業の秦です。
NCALS(Nippon CALS 研究組合)で行なっております、業種別CALSの
プロジェクトの一つである船舶CALSプロジェクトの概要や活動状況を
紹介いたします。

NCALS

4. ELECTRONIC PLAN APPROVAL (WG3)

1) Verification of security

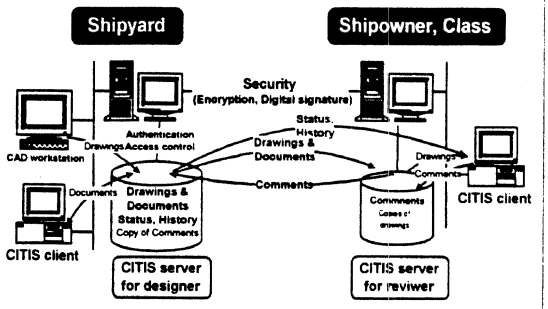
2) Verification of status and version history information

3) Electronic design review,commenting and approval

4) Utilize CITIS system developed by NCALS

NCALS

ELECTRONIC PLAN APPROVAL



NCALS

5. SHARING OF SHIP-RELATED INFORMATION

1) Representation (SGML, PDF, HTML,VRML)

2) Data management (RDB,Doc.file)

3) Security level

4) Effective link among information

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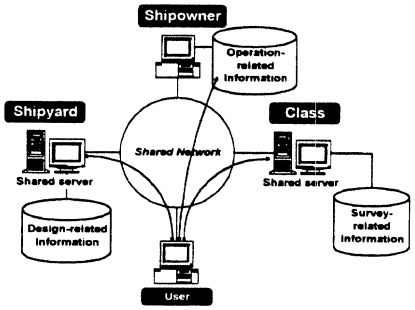
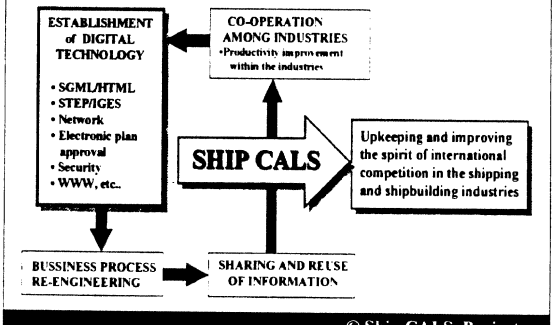
SHARING OF INFORMATION



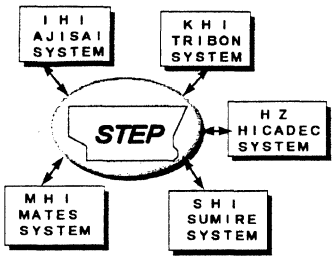
NCALS

SIGNIFICANCE OF THE PROJECT



NCALS

DATA EXCHANGE OF HULL STRUCTURE

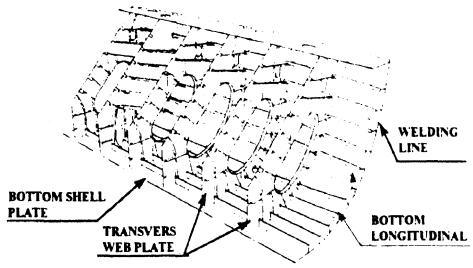


- DEVELOPMENT OF EXCAHNGE PROGRAM BETWEEN 3D-CAD SYSTEM AND AP203 CC2level
- EXCAHGE EXPERIMENT OF HULL STRUCTURE AMONG 5 SHIPYARDS

© Ship CALS Project

NCALS

HULL STRUCTURE FOR EXCHANGE



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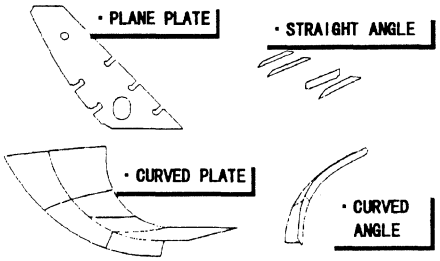
GEOMETRIC DATA



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CONFIGURATION CONTROL DATA

- configuration
- product definititon
- product category
- document
- approval
- person and organization
- date and time
- units

:

:

```
design_context
application_context
product_context
document

cc_design_organization_assignment
person_and_organization
person
organization
person_and_organization_role
product_definition_with_associated_documents

cc_design_date_and_time_assignment
date_and_time
date_time_role
calendar_date
local_time
coordinate_universal_time_offset
```

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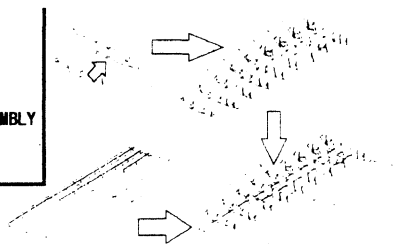
PRODUCT STRUCTURE

- BLOCK
- ASSEMBLY
- SUB-ASSEMBLY
- PARTS



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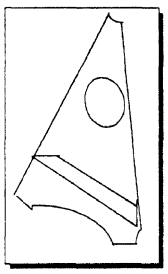
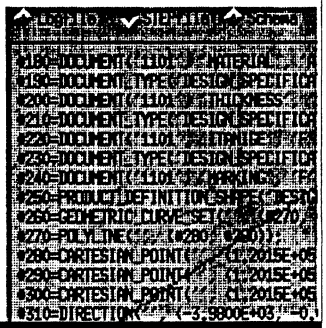
REPRESENTATION BY STEP





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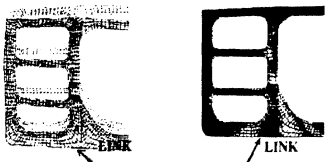
TRANSVERSE STRENGTH CALCULATION SHEETS USING HTML



No	Loading	LC=1	LC=2	LC=3	LC=4	LC=5	LC=6	Max	Allow	JUDGE
1	150 HT32	58	20	57	64	11.6	10.8	21	268	O.K.
2	180 HT32	55	187	79	75	10.7	10.3	20	268	O.K.
3	150 HT32	76	204	131	174	15.8	11.0	23	268	O.K.
4	104.3 MS	54	99	129	139	13.4	11.4	19	268	O.K.
5	125 MS	0.6	50	78	0.4	7.6	7.6	0.8	178	O.K.
6	150 HT32	185	182	89	114	24	21	23	268	O.K.
7	150 HT32	174	174	101	91	14.7	19.5	19	268	O.K.
8	150 HT32	220	124	130	74	18.2	13.7	23	268	O.K.
9	140 HT32	160	167	107	87	15.1	8.8	17	268	O.K.
10	160 HT32	110	153	78	131	11.1	13.2	15	268	O.K.

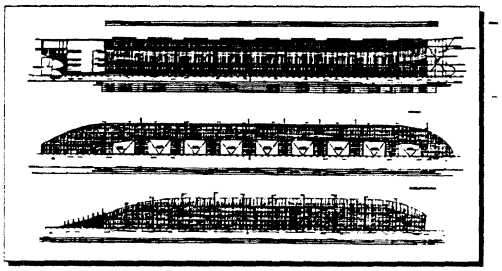
NCALS

2. EXCHANGE OF DRAWING (WG 2)

1) Reproduction of drawing at client terminal
   - Compression methods and resolution of raster data
2) Peproduction using IGES bet. different CAD
   - Ship-specific data
   - Partitioning of large size drawing
3) Management information
   - Cnvertion of information on the covering sheet into SGML

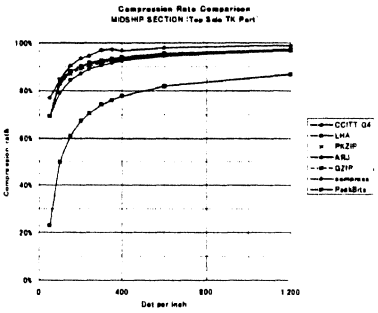
NCALS

DRAWING FOR EXCHANGE



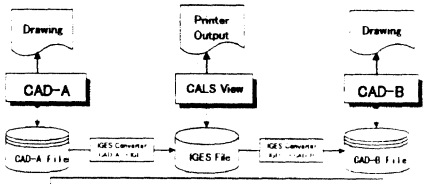
NCALS

COMPRESSION RESULT OF RASTER DATA



NCALS

EXCHANGE USING IGES



	CAD-A		CAD-B
Test Case :	MicroCADAM	→ IGES →	MicroCADAM (Loop back)
	MicroCADAM	→ IGES →	AdvanceCAD
	MicroCADAM	→ IGES →	TRIBON
	AdvanceCAD	→ IGES →	AdvanceCAD (Loop back)
	AdvanceCAD	→ IGES →	MicroCADAD
	AdvanceCAD	→ IGES →	TRIBON

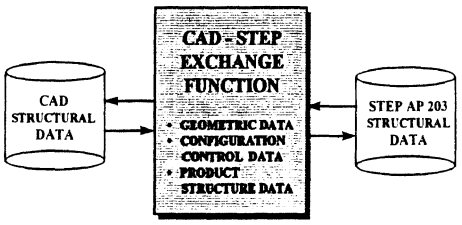
NCALS

3. EXCHANGE OF 3D-CAD DATA USING STEP AP203 (WG 2)

1) Geometric data
   (External and internal structure)
2) Configuration control data
   (CAD system used,version no.,etc.)
3) Product structural data
   (Assembly tree and their relationships)

NCALS

DEVELOPMENT OF CAD-STEP EXCHANGE FUNCTION USING AP203



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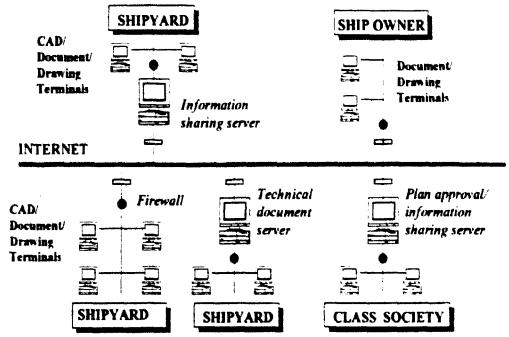
TEST ENVIRONMENT



NCALS

1. EXCHANGE OF TECHNICAL DOCUMENTS (WG 1)

1) Verification of representation function
- Joint writing
- Linking drawings and tables
- Part revision

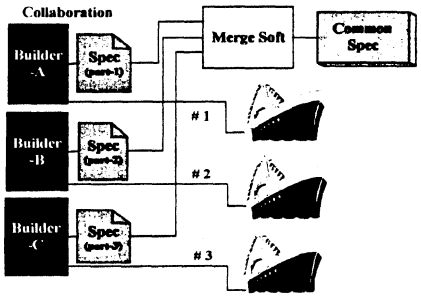
2) Verification of linking with DATABASE
- Updating of RDB and SGML document

3) Verification of linking with calculation software
- Updating of CAL software and SGML document

4) Convertion of SGML Trans. str. cal. into HTML
- Verification of link and easiness of browsing

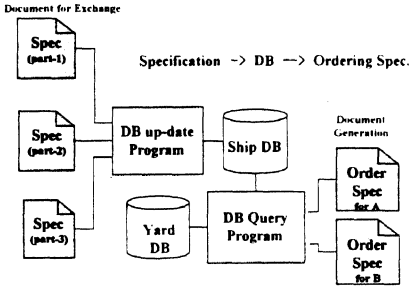
NCALS

COLLABORATION FOR COMMON SPEC.



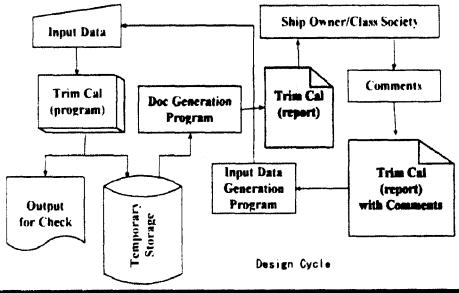
NCALS

DATA COOPERATION BET. DOCUMENTS



NCALS

DATA COOPERATION BETWEEN DOCUMENT AND CAL. SOFTWARE



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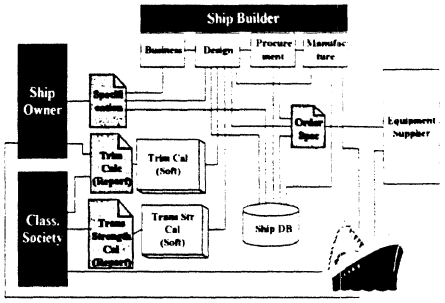
DEVELOPMENT OF EXCHANGE FUNCTION

1)Technical Document
- DTD for typical 4(four)documents
- Mutual exchange programs between SGML technical documents and RDB/Calculation software

2) 3D-CAD and STEP AP203
- Mutual exchange programs between 3D-CAD system and STEP AP203

NCALS

TECHNICAL DOCUMENTS



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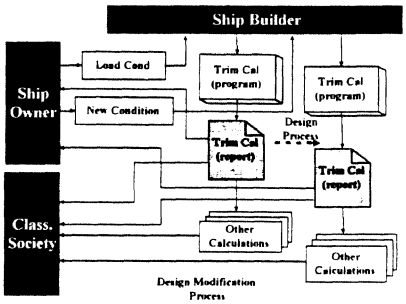
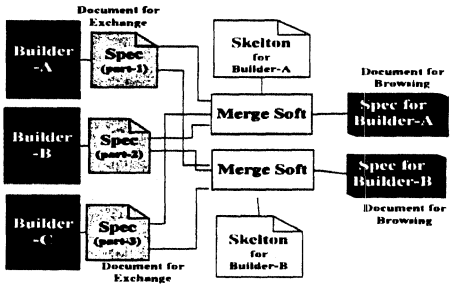
RELATIONSHIPS BETWEEN TRIM CALCULATION S AND CAL. DOCUMENTS



NCALS

DOCUMENT FOR EXCHANGE AND BROWSING



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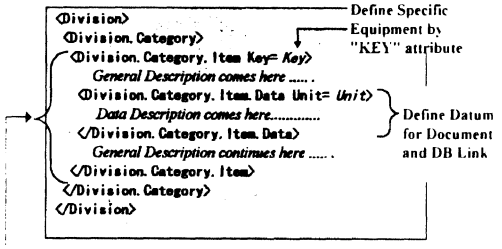
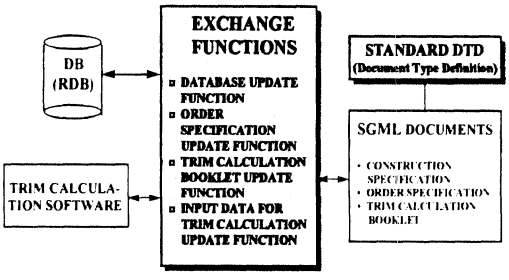
SPECIFIC DTD STRUCTURE



Unit for merging from Document for Exchange to Browsable Document

NCALS

STANDARD DTD AND DEVELOPMENT OF EXCHANGE FUNCTION



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Nippon CALS Research Partnership

Ship CALS Project

Ishikawajima-Harima Heavy Industries
Ship & Offshore Dept.
Norio HATA

CALS PROJECT

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- Satellite CALS
- Iron and Steel EC

Ship CALS Project

Industry specific R&D Project for the testing of electronic exchange of technical information related to shipping and shipbuilding

PARTICIPANTS

- **SHIPYARDS**
  - Ishikawajima-Harima Heavy Industries (IHI)
  - Hitachi Zosen (HZ)
  - Kawasaki Heavy Industries (KHI)
  - Mitsubishi Heavy Industries (MHI)
  - Mitsui Engineering and Shipbuilding (MES)
  - NKK Corporation (NKK)
  - Sumitomo Heavy Industries (SHI)
- **CLASSIFICATION SOCIETY**
  - Nippon Kaiji Kyokai (ClassNK)
- **SHIP OWNER**
  - Nippon Yusen (NYK)

PROJECT OUTLINE

- Exchange of technical documents
- Exchange of drawings
- Exchange of data among different CAD systems using STEP AP 203
- Testing of electronic plan approval
- Testing of sharing of ship-related information

ORGANISATION STRUCTURE