INFORMATION TECHNOLOGY AT SEA

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ABSTRACT

With current advances in computer technologies and telecommunications, the maritime transport industry has finally plunged into the information age. This technological revolution is quite acceptable to those working in the sector, as a way of helping improve safety at sea and environmental protection, while improving the economics and efficiency of maritime transport.

The subject of this paper is to discuss the expected benefits and possible ways in which information technology can assist the major issues in modern ship management. IT strategies for shipping are also summarized.

Keywords: Information Technology, Safety, Quality Management, Maritime Transport

1. INTRODUCTION

Information technology or informatics is the keyword that relates three disciplines ; electronics, computer science and telecommunications. What we call information is something which is difficult to define and consequently hard to control. Information as such is now recognized as a wealth – producing resource, like energy. The reason is that information is not only helping to complete a human mental synthesis as in the past, but can be easily inserted for example in a programmable machine tool to produce a specific object or even substitute the human mind in decision making processes.

Computers as such are not something new. However, their cost has in the past been prohibitive for majority of day – to – day applications. The microelectronics revolution made computers so affordable that they permeated every aspect of our lives.

Up until the early eighties the benefits of information technology were only seen in large shipping companies that could afford the necessary investment. Even these large companies restricted the use of information technology mainly to accounting applications. It was only in the eighties that the ever increasing power of cheap mini- and microcomputers made inroads into all the fields of the shipping company and enabled everyone involved to reap the benefits of information technology.
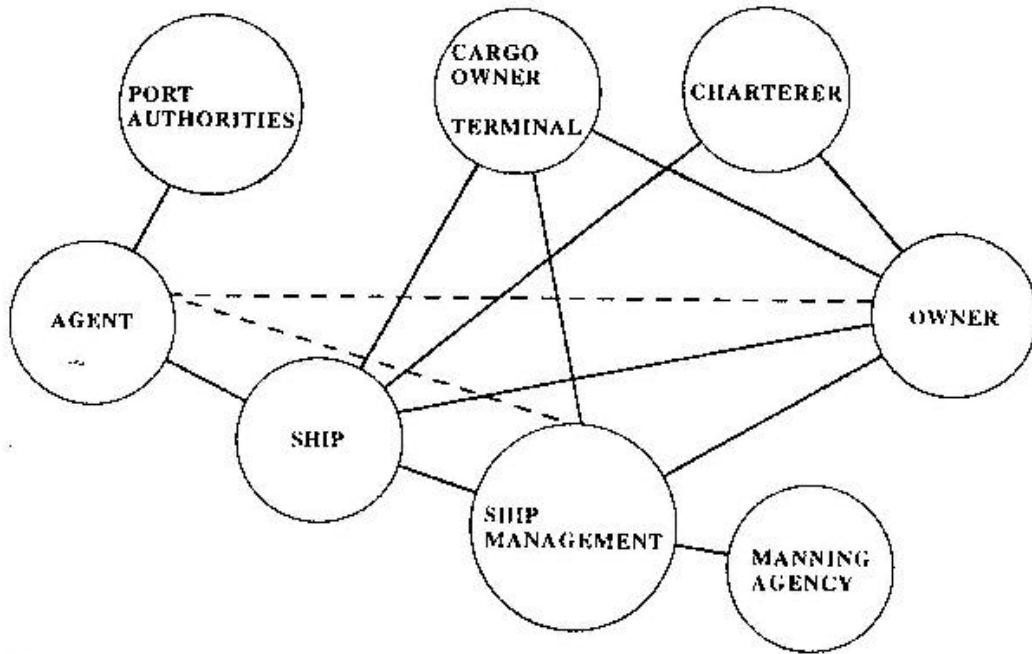
Figure 1. Examples of information flowchart for ship management and cargo operation.

The world of shipping is vast, widely distributed and complex. (See Figure 1.) The subject of this paper is to discuss the expected benefits and possible ways in which information technology can assist the major issues in modern ship management. These can be identified as; [1]

i) Cost control
ii) Human resources
iii.) Safety and quality management

2. COST CONTROL

Historical management has effected cost control through budgets and accounting results. Unfortunately this is a " post mortem " system . The final result will depend on the sum of a multitude of decisions. Therefore to achieve best result we have to optimize every single decision, using global company information.

The majority of decisions one is required to make in a ship management company are of a quantitative nature. In this respect historical information and the ability to cross-refer facts and figures provides good guidance. Quick computational ability is also of great assistance to enable various decision scenarios to be produced quickly and evaluated. This is the greatest advantage of information systems in cost

control, and they can be used, for example, in the following areas :

- Validation of the information arriving in the company on the basis of accumulated data so that costly errors are minimized.
- Retrieval of any information related to the problem in question.
- Decision support.
- Operational follow up.
- Auditable procedures.

The productivity gains out of information technology are enormous. However, introduction of such technology in shipping companies has brought surprisingly low reductions in personnel (with the exception of secretarial services). The reason for this is that the newly discovered computing power has been used to enhance dramatically the analysis of decisions. Cost control has been achieved by optimizing the decision process, not by reducing personnel.

A careful analysis of the results revealed that the overall shore management involvement was almost unchanged but information technology enabled people to handle cases more efficiently and correctly, and which would have otherwise been simply processed rather than evaluated.

Needless to say that the management using information systems has an immediate and accurate view on all aspects of the vessels. The required operational controls can be built into software so that errors or unauthorized initiatives can be intercepted.

The subject of cost control through information technology could merit a conference of its own. Here it was only intended to give a brief overview.

3. HUMAN RESOURCES

The most publicized problem of maritime industry is the one of human resources, both on board and ashore. The decline in standards is a reality and a trend that ship manager struggle to cope with. Competence in personnel is becoming more and more scarce. Everyone should plan how best to live with frequently changing crews who lack the appropriate level of training and competence to have control over all aspects of highly sophisticated equipment and be able to react correctly in unexpected critical situations[2].

How can information technology assist us ? We will differentiate between vessel and office personnel. The most important problem to recognize on a ship is that unlike shore – based units it has an inherent management discontinuity. The heads of every department, including the master and the chief engineer, will only be on board for a limited amount of time and may not return to the same vessel. How can this problem be overcome ?

Better training

Information technology can greatly assist by computer-assisted teaching methods, offering simulation of the various events on board which will render training more effective.

4. ORGANISATION AND DOCUMENTATION OF ON BOARD ACTIVITIES

Computer maintenance systems can assist in both recording the maintenance effected on board and scheduling the work to be done whilst monitoring class and statutory deadlines and requirements . Inventory control is kept by the computer and requisitions communicated immediately and accurately to the head office, minimizing lead times.

5. HEAD OFFICE INVOLVEMENT

Through access to shipboard computers, the head office can continuously monitor whether, for example, maintenance due is performed. Alternatively computers can perform the scheduling and inform those on the vessel of the jobs to be done. In an emergency, the expert, rather than traveling around, can obtain live data from the vessel and immediately assist by giving appropriate instructions whilst retrieving all the accumulated experience in the company computer. At the same time he can liaise with the classification society or manufacturer over the information received from and, if necessary, get their opinion. The advent of Narrow Band (NB) and Broad Band (BB) communications starts covering the various indicated tasks in a comprehensive way.

Looking now at the shore side, the shortage of experts is more and more acute, especially in smaller shipping companies who are unable to afford them. How can information technology assist ? First and foremost by increasing the productivity of such experts. This can be achieved by the following means : enrich the information system with as much know-how as possible so that the majority of quantitative decisions can be made automatically ; improve the presentation of data to the expert so that decision making is easier ; provide the expert with valuable accumulated experience and information instantaneously [4].

It is exactly in this area that the smaller company starts to benefit. Cheap hardware combined with off – the - shelf software can give the small all the organizational backbone that up to now has been prohibitive. Something worth noting is that software makes an inherent assumption about the company organization. Large companies can not use off – the – shelf software unless it matches their organization. They may be too large to adapt to the software and therefore they develop it inhouse. Such a process will result in a tailor made product, at a price which is higher than off – the – shelf software. However cost is not the most important factor. Off – the shelf software encompasses know-how drawn from a large variety of customers, hence it incorporates elements which are much more refined and continuously updated.

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By comparison, small company structure is very simple. Software can be readily implemented and provide immediate benefits.

6. SAFETY AND QUALITY MANAGEMENT

This subject has been debated for quite some time. Here we will not refer to certification requirements but to the concepts behind safety and quality. The concept of safety is closely related to risk. Risk is the extent to which exogenous factors affect the company. Information technology can help only to a limited extent in minimizing financial risk. However, it can offer a lot with respect to the organizational risk of the company.

The most important resource of a company is its structure, its know-how and its people. The implementation of a quality system requires as part of the shore based management manual the so called " Professional Manuals " (Figure 2). The professional Manual is a description of the procedures to be followed for various departmental tasks.

When this Professional Manual is an active information system, then training of new personnel on the job is much easier and any personnel " defections " can be much more readily overcome. The information system provides the necessary continuity of company procedures both on board and ashore. This advantage is of particular importance to the smaller companies when duplication of disciplines is not always economically feasible[1].

There is a danger in this approach which is worth mentioning . The introduction or development of information systems to assist safety aspects needs testing under strict rules, otherwise the outcome is unpredictable. We would strongly recommend introduction of information systems that have been developed and tested in accordance with ISO 9002 and if possible certified. Although available for some specific on – board computers (like LODICATORS) such certification schemes are only now becoming available through the leading classification societies, for ship management information systems. Safety is greatly enhanced by linking the vessel and office information systems in the case of an accident. Shore experts can assist by providing data and carrying out complex computations (e.g. damage stability calculations) . Simulation of on – board processes can be performed immediately [5].
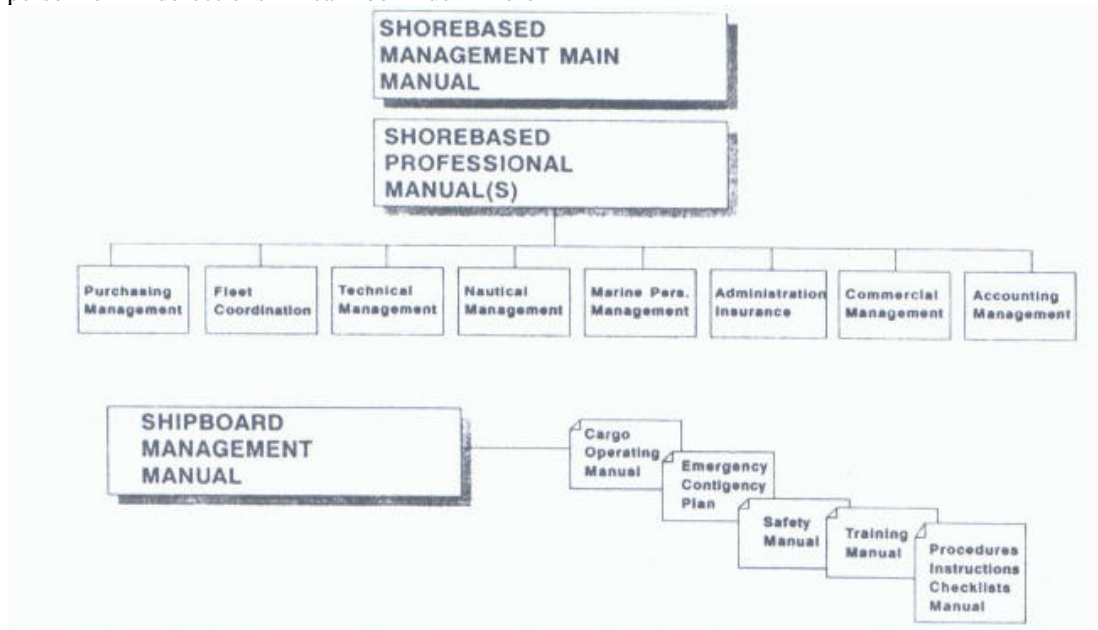

Figure 2. An example of manual overview in safety management

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The aspects of quality is something more intangible. The safety aspect requires the "existence" of procedures. Quality refers to the optimality of these procedures. We have already touched briefly on this point when discussing cost control. Are information systems optimal themselves ? The answer can not be given unless we define the criteria. Information systems should be parametric enough to allow for the changing needs and diverse goals. The management sets the goals. The information system can assist in achieving them and, what is more important, it can readily give the management information as to how well they are met. Reaction time is therefore minimized.

7. DEVELOPING IT STRATEGIES FOR SHIPPING

The evolution of information systems technology during the last years has resulted in a great deal of refocusing of IT strategies in shipping. Key developments are :

- E – mail, which offers the advantage of collecting in source a message which can then be processed further;
- Database replication and, in addition, file replication, which have provided the solution to synchronizing multiple locations (ship and office)
- Wide use of the Internet has enabled the spread of information in the form of news and also promises to be the solution for bridging the information systems of the different players in shipping (for example providing the connection between buyer and supplier) ;
- Microsoft's success has made the shipping industry realize that an alternative does not exist to the computer- to – human interface. This success can be attributed to the user - friendly environment, offered together with a range of popular, well- accepted tools that are available to the user at very low cost ; and
- Ship – to - shore communication systems have proved to provide reliable and low – cost solutions.

The shipping industry is also going through major change with regard to company infrastructure. The implementation of ISM and ISO 9002 has meant that the shipping company has had to become better organized. Information technology is the obvious solution with regard to the infrastructure supporting the organization, as the majority of shipping companies operate in networks and employ at least one IT person to support or even develop IT systems.

The majority of shipping executives today spend their whole working day in front of a computer screen . Furthermore, most of them use computers at home in order to keep with the pace of business requirements.

Although management has started to realize the importance of information systems, there are nevertheless still many cases where there is no planning (even short term) with regard to the shipping company's strategy in the information technology field [3].

The overall concept of computerization, including decision making in IT strategy, is becoming a very complicated task because technology is changing, and even higher educational establishments cannot brief today's students on the technology that will become available in the next three years when they will enter employment. Consultancy is limited to the general organizational issues, advice on hardware and traditional software specification sizing, and there are only one or two specialist magazines in this field.

The number of information systems solution providers specializing in shipping is reducing every year. One reason is that the shipping market is limited. A rough estimate of total market turnover in information systems, not including equipment, is about $ 45 million per year. The investment required to keep pace with technological change and market requirements is huge, especially in human resources, and the sort of expertise that is required to design systems for shipping can only be learned in the field.

Lack of functionality

In the majority of the cases, the off – the shelf packages were designed many years ago and therefore lack the functionality that is required today. To deliver the integrated system yearned for by the shipping company takes years of development.

In the current general environment, and while the shipping market is generally down, shipping companies are, on the whole, trying to do three things :

- implement networks in the office for document creation and sharing, e – mail and, to some extent, filing ;
- install computerized systems on board ships for the creation and remittance of electronic forms ; and
- create database systems to store information for future reference.

8. CONCLUSION

This paper does not intend to cover the unlimited potential of information systems and technology. It can only give a glimpse of the status quo and highlight the potential benefits. Maritime industry's image has been tarnished lately as a polluter of the environment. Information technology can help to implement better and tighter control of our operations to avoid accidents, not through added bureaucracy but by successfully assisting in critical procedures and bringing the manager and the vessel closer than ever before.

Today's technology can easily address all the above objectives. Human resources and organizational discipline are the main restrictions on implementing the system. From the statutory point of view, lack of standards is the biggest obstacle. There are no commonly accepted standards for item coding and no standards for electronic transactions.

The shipping company is definitely not looking for systems that will make executives richer and secretaries efficient. The main benefits of IT systems include the instant provision of information to support decision making, to guarantee established procedures and, of course, to automate tasks.

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