

# Information Systems (ERP) for Shipping Companies

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**Abstract—** The purpose of this paper is to analyze concepts which are related to the Information Systems used in enterprises and to place the emphasis on the Information Systems of the shipping companies. Concepts and terms of shipping and categories of shipping companies are referred. They are also analyzed the responsibilities of some shipping departments and examples of the ERP modules that they use. A brief reference is made to the supply chain, specifically to the ship supply and the way it is related to the concept of Information Systems. Additionally, is analyzed one of the most important areas of ERP for the shipping industry called «e-maritime».

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## I. INTRODUCTION-ERP SYSTEMS

Generally, Information Systems consist of several files and each file contains information related to the needs of a business. All files are interconnected with logical relationships and constitute a database that can be used by various users and applications. The concept of "information systems" was started in the 1960s, by industries that wanted to manage their materials and thus implemented firstly a system called "MRP" (Material Requirements Planning), which could record the materials data and specify the time required to produce items in the desired quantities. However, due to the large amount of information that needed to be collected beyond those related to the materials we were led at the beginning of the 21st century to create Enterprise Resource Planning (ERP) Systems that provide us with a complete view of real-time business data by integrating all of its departments and giving us additionally the ability to access them by spending just a few time. Today, it is necessary to use ERPs - at least the main software applications that each business need in order not to pay a lot of money - because almost all businesses have various versions of information systems installed on their computers in order to "survive" as having the Information Systems is one of the most important factor in market success [1], [2], [3].

ERP systems can provide many important features to their users that other systems neither cover to the

same degree point nor are fully organized in terms of the user interface with the system. For instance, businesses have the opportunity to check for any deficiencies in goods and raw materials. First of all, it is worth noting that ERP Systems are created in such a way, that is, with a common database, so that we can take decisions for each of the business segments. In this way, communication between the business segments is possible and also any processing of the information can be made visible to anyone who has access to it. Furthermore, ERP can make the businesses have significant profits by just increasing production through automated processes. On the other hand, ERP Systems have surely many negative points. One of them is that the installation of the program is very costly and the businesses have to pay monthly or an annual subscription fee. Another one is that mistakes can be made during use (for example typing a sale price for an item with an extra digit such as €3000 instead of €300) [3], [4], [5].



Fig. 1. Cloud ERP

Nowadays, more and more businesses are using a new form of ERP called "Cloud ERP" which requires only a browser and internet access for the processes it provides without the need to install it on their computers. Cloud ERP is highly recommended for small companies as they have to pay a low cost and specifically they will be charged according to the duration of this software that is being used (Pay as you go). Its use is also recommended to multinational companies that wish to supervise whatever happens in their branch offices which are located in other countries [6].

II. 1ST METHODOLOGY – ERP SYSTEMS USED IN SHIPPING COMPANIES

A. Definition of shipping - Reasons for creating an information system for a shipping industry

"Shipping" can be defined as the branch that is engaged in the transport of all kinds of goods and services and of people to a destination via sea. This sector is an important element of the international trade, as 90% of cargo is transported by various types of ships travelling via sea and it is thus considered to be a catalyst for the transport sector. This, in turn, makes shipping an integral part of the economic development of the countries and helps them to have a significant progress through global trade [1], [7].

The need to create information systems in shipping lies in the fact that there is a great deal of information that has to be managed as shipping companies have to manage their ships and these ships may be too far from them or even on another continent. Therefore, in any case it is important to be informed of the ship's position from the moment it begins its journey to the time it arrives at the ports. Another one reason, could be for example the need to record maritime accidents at research level in order to find the causes as well as ways to deal with them in the future. Apart from this, it is equally important to record the data of the occupants who are on board both for their identification but also for the need to control migration or dangerous activity. All these that were mentioned can be done by using shipping IT Systems [8], [9].

B. Ways of communication of the departments in a shipping industry

It is certain that all shipping companies have a common organization concerning the management of their processes and of their departments. It is also important to be referred that although each department has a different scope of work, it is usually dependent on the progress of the other departments. Most of the companies adopt what is known as a LAN which is a local network which is usually encountered in a relatively short range wireless state in order to connect all of the departments to it. The LAN includes clients which are all computers that are connected using shared resources and servers, which are machines or hosts that provide the resources required for a successful connection. In that way each department can communicate with other departments and each of them has its own processes. All the business processes are stored on the server and this is also done to support all databases that are installed on the server used by clients and applications for specific case such as printing the results of the business data.

There are several departments in a shipping industry but the most common departments are the Management, Technical, Accounting, Human Resources, Crew, Supply, Chartering, Information Technology, Legal, Insurance, Operations, Safety and Quality Department. Of course, in order for a business to run smoothly in the marketplace, there must be

irreproachable collaboration between its employees, teamwork, methodicality, immediate information for any problems that may arise and finally a clear record of its data with the help of its information systems [7].

C. Examples of applications used by some departments of shipping industries

Shipping companies' information systems vary according to their use. Examples of systems used by shipping companies are these: crew management, charter management, procurement management, financial accounting and more. There are different modules for each business that may be useful and the number of them varies depending on the number of employees and the resources it has, whether they are related to budget or if the appropriate infrastructure is in place such as if its operating system can run specific modules and if there is of course plenty of free hard disk space for the installation [7], [9].

Below are some examples of applications used in shipping companies:

- Shipping Accounting

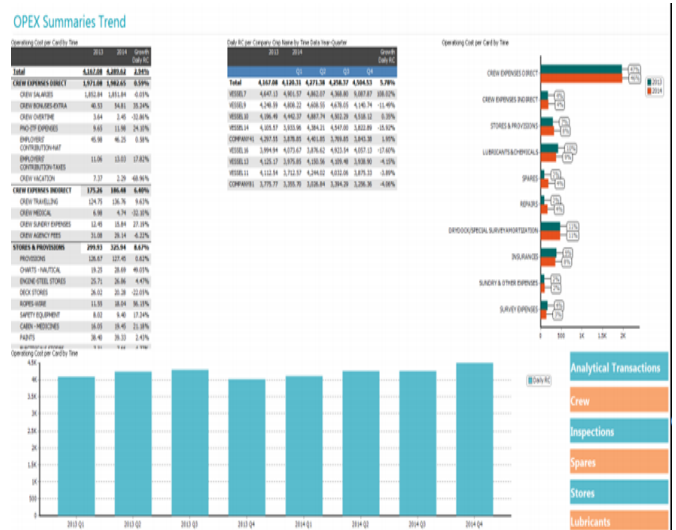


Fig. 2. OPEX Summaries Trend - Overview of company and ship operating voltage trends

This module is used by accountants or economists. It is possible through this application to record any company's sales as well as purchases or expenses, so it is related to the company's financial data. Employees of this department or accountants' assistants have to manage various documents such as sales or purchase invoices, credit invoices etc. which are usually related to value added tax exemption and the employees undertake to pass them on to the system [7].

- Crew Management

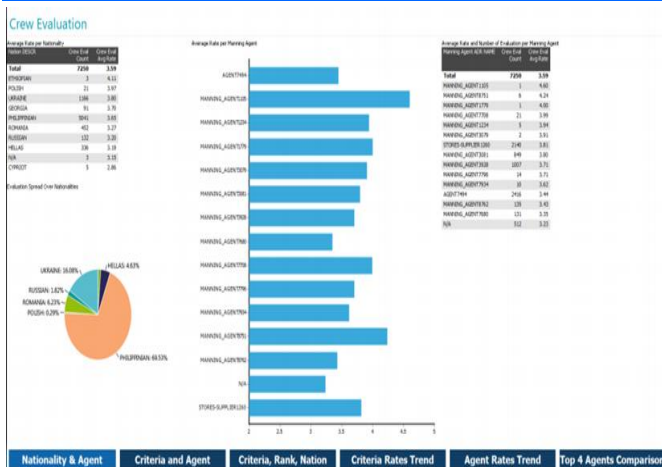


Fig. 3. Crew Management Analysis

The crew management module which in addition to the crew, is often used for the management of the staff by the HR Department. In this module, there are personal data about employees such as gender, age, nationality but also information about work experience - past service -, company work hours, etc. It is possible through this application to determine all employees, calculate their payroll and evaluate their work, etc. [7], [10].

- Planned Maintenance System – PMS

Through the following module is given the opportunity to the observation and the maintenance of any industrial or marine plant. Furthermore, specific reference is made to the parts that require maintenance and it is suggested to use some spare parts in a calculated quantity. Indeed, we can create and review semiannual statistics about maintenance and make also a forecast about future spare parts required or scheduled maintenance on a regular basis. Once the data needed is created, it is stored in a single file that is given to the company and it is usually processed by a chief engineer working in the technical department. Then in conjunction with the "Spare Parts Control System" we can have complete control over the stocks of spare parts we are interested about both those in shortage and also those in need of repair [7], [11].

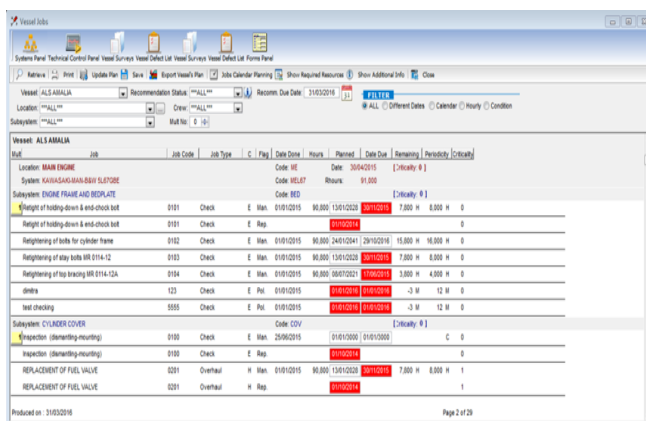


Fig. 4. Planned Maintenance System – Vessel Jobs

#### D. Logistics and Supply Chain – Ship Supply Information Systems

The meaning of supply chain and logistics are different. The supply chain encompasses all those processes that are followed for the flow and the transformation of goods not only from the process of collecting and processing raw materials but also from the way that the customer will be satisfied with the quality, cost and delivery time. On the other hand, the "logistics" term refers to all processes involved in the transportation and storage of goods throughout the supply chain. Logistics has also a supporting role by providing the necessary flow of information needed by the supply chain [9], [12].

There is a ship supply chain module that is used by the supply department and in this module all company's ship products are imported with specific codes, each of them is separate even if there is a product available in different sizes or colors etc., which helps us to have complete review of supplies and check for any shortage. Apart from them, it is possible to define a "security stock" so that when there is an uncertainty of supply or demand or delivery times, a message will be displayed informing us that the supplies must be ordered immediately. For example, products as above mainly include general ship supplies such as deck, engine, cabin and crew stores or fuel-lubricants and spare parts, all these essential for the safe navigation of ships as well as for the appropriate terms of living on board of the whole crew [9], [13].

### III. 2ND METHODOLOGY – E-MARITIME

#### A. Introductory elements of e-Maritime

By the term "e-Maritime", we mean the ability to instantly exchange messages, information or even internet data between those related to the processes required by a ship such as the shipping company, brokers, ship owners, agents, etc.

E-maritime consists of the following 2 categories:

a) *E-navigation, which helps us provide information about the enhancement of the crew's safety in the marine environment and find ways to protect it.*

b) *Commercial, which is related to all the services and applications that e-ports, shipping companies or other service providers need.*

E-maritime has a lot of advantages. One of them, is that e-maritime has a great contribution to the supply chain as it makes smoother the connection to other sectors (such as the airline sector) when combined shipping is required. Another one is that the accidents at sea can be reduced as there is an ability to monitor and guide the ship's course at any time. Furthermore, through e-Maritime the procedures required for moving or acquiring a ship are now simplified. E-Maritime has also drawbacks that are mainly limited to those arising from the human factor such as incorrect data entry into the system. Additionally, the use of a network is



required and its speed is not always constant, so there may be some delays [8], [14], [15].

#### B. e – Navigation

e-Navigation consists of satellite systems that help us enhance security and enable us to detect and control ships at any time. Examples of e-Navigation are as follows:

- **GPS**

It was very important to find a way to locate the position of ships and whatever is around them at all times not only on behalf of the ship's company but also to help the reception ports of the ships. Thus, around the 1990s, GPS - the Global Positioning System - was used to serve the above purpose. The GPS works wirelessly using 24 satellites to track the position of a cell within a radius of about 15 meters [8], [14].

- **AIS – LRIT**

AIS (Automatic Identification System) is a system that helps us to locate and extract information about ships such as speed, cargo carrying, IDs, departure or arrival port in order not to have congestion problems etc. This system achieves these goals by sending digital signals automatically between different ships or by land-based stations.

All of the above is done for the identification of mainly commercial ships at a specific GRT (Gross Register Tonnage) 300 -, otherwise at a larger scale the LRIT (Long Range Identification and Tracking) system is applied. The LRIT system can locate cargo ships with GRT of over 300, passenger ships and even high-speed boats while these vessels are required to report their position periodically to those running their Flag [8], [14].

#### C. e – Commerce



Fig. 5. e – Commerce

E-commerce can be defined as a concept that consists of any means of communication intended to serve business transactions or online trading of products and services. E-commerce is divided into 4 categories of transactions that depend on the business-consumer relationship. More specifically the most widely known category is 'business-to-business (B2B)', in which several companies electronically

upload their products for sale with the purpose to sale them to other businesses. Apart from the B2B category, there are also the following categories: B2C (business to customer), C2C (consumer to consumer) and C2B (consumer to business) [2], [14], [15].

#### D. e – Procurement

Product and service supplies are one of the most important pieces of trade on a global scale and especially for each business separately as they are primarily used for the operation of their ships. Supply websites support online marketplace or powerful procurement. Specifically, in the first case not only all the marine products of the companies with a lot of information about them are posted, but also the ways of communicating and negotiating with the businesses. These products are aimed at businesses (B2B e-commerce) and may include for their convenience, a prominent directory containing the products that are most often sold or even a variety of offers that are usually posted periodically. In the second case (powerful procurement) customer can be informed immediately about the real time of their order from the order stage until the final delivery. This is possible, as there are complete reports such as if the order is in the billing stage or if the distribution process has started or if the parcel delivery has been completed etc. [8], [15].

#### E. e – Chartering

It is very important for any shipping company to increase their profit, something that can be done through the efficient management of their vessels or by their successful transaction or chartering. Regarding to the chartering of ships, this can be achieved through the mediation of a ship broker who is required to bring the ship owner and the charterer in contact in order to conclude a contract for a particular maritime transport. At this point, it is good to be emphasized that the ship owner and the charterer cannot address on their own behalf to the same broker but each of them has to find their agent in different ship-brokerage offices.

Nowadays, online chartering is possible through the internet without requiring physical presence of the customers in the shipping agencies. For this purpose, there are specially designed websites in which 'virtual organizations' (i.e. companies engaged in electronic chartering), support online purchases made between ship owners and charterers by bringing them in contact and providing them with a multitude of negotiation mechanisms. They can also have an access to these websites and the data that they contain thus giving them the opportunity to have a comprehensive view so that they can take the best possible decisions according to their own requirements [8], [15].

#### IV. CONCLUSIONS

As the time passes, the needs of shipping companies are interestingly being increased in order to be competitive and have the best 'purchasing power' possible. So, they are trying in various ways to increase their revenue and reduce their operating

expenses while keeping their productivity and the quality of the services they provide to their customers stable. One of the most important ways to achieve this, is to use new technologies of Internet and information or communication technologies in general.

The use of an ERP information system is now considered to be essential for the smooth operation of all departments of businesses so that they can meet their requirements and manage their amount of information better. By using information systems, every ship company can automate its processes saving valuable time and at the same time having a complete view of its operations both in the office and on its ships. In addition to this, through the results arising from the information systems companies can check for any shortages of raw materials or material goods and make important decisions that can increase their sales. Information systems have a particularly positive impact to the management of the ship processes and these combined with the utilization of satellite communications, have given us the opportunity to communicate with the crew and monitor the ship's real-time operation.

Recently, electronic navigation has been developed which is distinguished in electronic navigation (e – navigation) and its commercial part. Through online shipping, businesses can post a lot of information about them on specially designed websites such as their products, payment methods they support for the purchase of their products and they can also search online for information about the data and the results of other companies. In this way, businesses can freely search the internet for new suppliers and there is also a possibility to create new collaborative relationships for partial or full use of their ships, often with the help of online shipping brokerage offices.

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