Data Mining and Business Intelligence applications in Shipping Industry

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Abstract: Shipping firms nowadays are in operation with extremely competitive and challenging environment. Vast volume of knowledge is generated from various operational systems and these are used for determination of several business issues that needed imperative handling. This knowledge represents purposeful areas of maintenance, voyage, safety and quality processes, inventory, purchase, document management and more. Data processing strategies and business intelligence technology are widely used for handling the business issues in this trade. This paper is predicated on the idea of knowledge mining and business intelligence and to propose architecture for the shipment (export and import) in the competitive business surroundings.

Keywords: Data Mining, Business Intelligence, Shipping, CRM, Fraud Detection.

I. INTRODUCTION

The concept of Data Mining has gained a well-known market acceptance. Shipping is one of the most demanding industries in the world towards export/import. Shipping industries are also nowadays adopting towards Data Mining and BI. Companies in the shipping industry are making use of Data Mining technologies to improve their marketing techniques, for identification of customer fraud and for the better management of their networks. The popularity of Data Mining in the shipping industry can be viewed as an extension of the use of expert systems in the shipping industry [1]. The major problem with the expert systems is that they are expensive to develop. The three approaches that the shipping industry has been geared-up to ensure are:

• Clients to enjoy predictable service levels within acceptable response time.
• Routine operations to be supported cost-effectively through remote support infrastructure, thereby freeing on-site resources for critical eventualities
• Providing clients with sustainable and efficient support to facilitate unhindered operations

Data Mining can be viewed as a technique that automatically generates the knowledge from the data available. The technology focuses on “informed decision making” as a core element for empowering mariners and marine managers, it also leverages on Business Intelligence in creating its technology framework to provide key deliverables to the shipping industry in the form of vessel and fleet monitoring.

II. OVERVIEW

The Data Mining & BI applications in any industry depend on two main factors: the data that are available in the industry and the business problems that are to be solved with the BI and Data Mining technologies. Shipping management enhances operational efficiency, provides business intelligence and fleet & vessel monitoring to the management ashore and seafarers on board. The industry focuses on Linerships, containers, global trade and industry issues, which emphasis on working to promote sound environmental stewardship, with a particular focus on reducing vessel air emissions and managing vessel discharges. Security, safety and infrastructure are part of the industry issues. The industry services includes Ocean Freight Forwarding, Air Freight Road/Inland Freight, Intermodal, Custom Clearance, Marine Insurance, Dismantle and Consolidation.
services, Heavy Lift Cargo and other value added global logistics services.

The shipping industry faces a number of challenges in Data Mining. This is because of the great volume of data belonging to the companies. One issue is that the data is in the form of transactions, which is not at the proper level for semantic Data Mining. Another issue faced by the industry is that the data generated by the applications like fraud detection and network fault identification need to be processed in real time.

<table>
<thead>
<tr>
<th>Data Mining Applications</th>
<th>Business problems addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRM</td>
<td>Measure customer value and retain profitable customers</td>
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<td></td>
<td>The ISM-Code add up to an effective policy measure for shipping safety.</td>
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<td></td>
<td>Acquire new customers.</td>
</tr>
<tr>
<td>Fraud Detection</td>
<td>Identification of fraudulent users, freight forwarders are a possible sign of bad behavior by looking at velocity of orders going to that address.</td>
</tr>
<tr>
<td>Network Management</td>
<td>Identification of network fault and its predications.</td>
</tr>
<tr>
<td></td>
<td>Management of system workload and resources usage.</td>
</tr>
</tbody>
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### III. SHIPPING PROCESS CYCLE

Imports – The great volume of data belonging to the companies include the complete detail of the shipping vessels that inboard the shore. To improve the shipping efficiency and shipping safety, this paper proposes a ship scheduling process which integrates Data Warehouse (DW), On Line Analysis Process (OLAP) and Data Mining (DM) technologies. The first and foremost step of shipping process for an import goods is to file an IGM (Import General manifest) by the liners before the vessel berth/arrival to the customs. The IGM indicates the details about the container.

Imports: The Clearing and forwarding agent carried out by the following steps:
1. To collect the data from the importer and file the same to the customs house for bill of entry with correct chapter (RITC).
2. Assessing officer (AO) assess the bills and forwarded to the next level for payment of duty, then the bill is forwarded to the CFS Examination officer (EO).
3. The Delivery order is received from the shipping liner after the submission of ORIGINAL BILL (Bill of Lading) and payment of Inland charges.
4. The EO examines the goods with stored data and issues the delivery order.
5. Clearing agent is now ready to send the container to the importer’s warehouse.

The above steps of accessing the goods are carried out in 14 free days; else a separate charge is measured for the above data processing.

Import Cargo Processing Chart

Exports – During an export process the clearing and forwarding agents initiates the process as below:

![Figure 1](image-url)
1. To collect the data from the exporter and attain the permission from the respective export promotion council, and file the data for shipping bill.

2. Assessing officer (AO) assess the bills and forwards to the CFS Examination officer (EO) for cargo inspection.

3. EO inspects the cargo with the data and loading order is issued to stuff the cargo to the container.

4. The sealed container is now handed over to the shipping liner for shipment.

5. The day before the voyage the container is loaded with the vessel, and an EGM (Export General Manifest) is stored in the data warehouse.

The industry mainly concentrates on Linerships, containers for global trade.

Liner shipping is the service of transporting goods by means of high-capacity, ocean going ships that transfer regular routes on fixed schedules. Most liner ships are containerships, capable of moving thousands of truckloads of cargo on a single voyage. International liner shipping is a difficult network of regularly scheduled services that transports goods from anywhere in the world to anywhere in the world at low cost and with greater energy efficiency than any other form of international transportation. Liner shipping is the most efficient mode of transport for goods which connects countries, markets, businesses and people, allowing them to buy and sell goods on a scale not previously possible with low environmental impact.

IV MAIN COMPONENTS OF SHIPPING MANAGEMENT

- Management Information System for mariners and managers ashore
- Standard Reports from Ships
- Planned maintenance
- Purchase & Inventory
- Repair & Breakdown Management
- Safety & Security Management
- Voyage Performance Management
- Dry Dock Management
- Document and Manuals Management
- Fleet Personnel Management
- Budget & Accounting
- TMSA Compliance Module
- Risk Management System

V. DATA MINING AND BI APPLICATIONS

The two main factors on which Data Mining and BI applications relay on include the availability of the problem that has to be approached and solved by the Data Mining and BI technologies and the availability of Data for implementing the technologies. Data mining technology can be used to in modern CRM to greatly enhance it function and efficiency.[2]
## VI MONITORING, ANALYZING AND PRESENTING DATA

Every business user needs to have access up-to-date, relevant data. This data is to improve productivity and increase the effectiveness of business decisions and process changes. It must be presented in a way that is meaningful to the user. With BI, every organisation can enable end-users, managers and executives to create and use OLAP and present data in summary and detail form with immediate, dependable results.

The end-users could operate in a self-serve environment, with minimal training and access the right information to meet their needs without waiting for the assistance of a programmer. Users could automate publication and delivery of information via email, thereby improving productivity and ensuring that information reaches the right people at the right time using data mining.

To improved Business Intelligence and accessible method by which to gather and analyse information using OLAP.

Applying Data Mining to Fleet Management Shipping agencies and transportation companies would be interested in the occurrences of some particular kinds of situations. For example, a company would want to know if a driver follows the stipulated routes, or if the driver observes traffic rules, or if a driver takes a break longer than the allotted time-interval etc. Several factors including efficiency of delivery, attendance rate, observation of traffic rules etc. may be used to judge the driver’s performance. The two broad sections of fleet management are operational management and the management of abnormal conditions. Primarily, data mining and other advanced information techniques are employed in order to improve efficiency of operations. During several occasions, the compensation or financial loss arising out of accidents or delayed deliveries amounts to dozens of millions. Hence, it is imperative that transportation vendors learn from prior operational experiences and take steps to reduce financial loss due to abnormal occurrences. Data mining is used to locate hidden patterns in the data by calculating the frequency of occurrence among the items while running the permutations and combinations. The main pattern is identified upon detecting a frequency that is higher than the standard frequency of that particular item set. Vehicle behavior is characterized by a large proportion of vehicle records that contain details of speed, location etc. Abnormal conditions like over-speeding or route deviation constitute only a little proportion of the whole. In order to obtain operation statistics and other related operational details the normal vehicle records can be analyzed. Analysis to locate abnormal records like those of illegal parking or over-speeding may be complicated and hence will be studied with many sequential records.

## VII. CONCLUSION

Data Mining and BI applications play a major role in the shipment industry as a necessity of data for the customers and the exact competition in the sector. The primary application areas include marketing and Customer Relationship Management, Fraud detection and Network Management. The recent developments in the Data Mining and BI fields had enhanced the customers with complete data which help them in executing the business of import and export in knowledge based manner. The implementation and enhancement of existing techniques and methods ensure the continuous growth and compatibility of shipping companies that make use of them.

## VIII REFERENCES:


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