THE ROLE OF ELECTRONIC DATA INTERCHANGE IN CONTAINER TERMINAL OPERATIONS:

"A CASE STUDY OF ALXANDRIA INTERNATIONAL CONTAINER TERMINAL"

By

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Supervised
by
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DECLARATION

I hereby certify that the material in this research project report that is not my own work has been identified, and that the contents of this research project report reflect my own personal views, and are not necessarily endorsed by the Academy.

(Signatures)

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Supervised by:

Associate Prof. Dr. Mohamed Shafik El Sawy Mira

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ABSTRACT

Title of dissertation report: The role of Electronic Data Interchange in the container terminal operation, A case study of Alexandria International Container Terminal.

Degree: MSc of Foreign Trade Logistics

Information Technology now a day becomes very important issue in the maritime industry. Electronic data interchange (EDI) is the electronic movement of data between or within organizations in a structured, computer-retrievable data format that permits information to be transferred from a computer program in one location to a computer program in another location without rekeying. Electronic Data Interchange become as a backbone of any container terminal operation in because due to its usage the flow of the whole such operation will be facilitated in each stage and that guaranteed in this research by a case study of Alexandria International Container Company.

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ABBREVIATIONS

AGVs	Automated Guided Vehicles
AICT	Alexandria International Container Terminal
ANSI	American National Standards Institute
ASCs	Automated Stacking Crane
ASN	Advance Shipping Notices
B.O.T	Build Operate Transfer
BAPLIE	Bayplan/Stowage Plan Occupied and Empty Locations Message
COARRI	Container Discharge/loading Report Message
CODECO	Container gate-in/gate-out report message
CTMS	Container Terminal Management Systems
CUSCAR	Customs Cargo Report Message
E-Business	Electronic Business
EDI	Electronic Data Interchange
EDIA	Electronic Data Interchange Association
EDIFACTS	Electronic Data Interchange for Administration, Commerce and Transport
GTDI	General-purpose Trade Data Interchange standards
HPH	Hutchison Port Holdings
IFF	Identify Friend or Foe
ISO	International Standard Organization
ISPs	Internet Service Providers
IT	Information Technology
MOVINS	Stowage instruction message
PC	Personal Computer
RFID	Radio Frequency Identification
TDDC	Transportation Data Coordinating Committee
TEU	Twenty Equivalent Unit
TPFREP	Terminal performance message
UNECE	United Nations Economic Commission for Europe
UN-JEDI	United Nations Joint European and North American working party
VAN	Value Added Network
XML	eXtensible Markup Language

Chapter one

Theoretical framework of the research

1.1 Introduction

Information Technology reduces the cost of doing business by raising the efficiency of Customs controls while ensuring the uniform application of legislation, and promotes transparency in the assessment of duties and taxes and predictability of clearance times. Increased facilitation of trade, by way of ensuring optimal use of IT, should result in improved economic growth for countries and improved competitiveness for their industries by reducing unnecessary bureaucratic requirements and harmonizing relevant process; at the same time, it should ensure that each country has the right to protect itself from unlawful trade practices. In recent years, the idea of trade facilitation has expanded to include the modernization and automation of foreign trade (exports and imports) procedures in order to make the adoption of international standards easier. Trade facilitation involves the reduction of transaction costs for all parties in the enforcement, regulation and administration of trade policies. By nature, trade facilitation is very technical and detailed, with the underlying objective of reducing various forms of non-tariff barriers that impose significant loss of time and costs in conducting trade, including an excessive number of **documents**, involvement of agencies, and complexity in data reporting and processing.

While electronic contracting has become especially relevant as a result of the Internet revolution since the mid-1990s, electronic business has existed before in a business-to-business context through the use of **Electronic Data Interchange (EDI)**. EDI consists of standard business messages being transmitted from one computer to another computer. It differs from the use of

regular e-mail in that it is based on a standard or code that is agreed upon by two parties, enabling the automated processing of the content of a message without human intervention.

1.2 Research Objective

The objectives of this research are:

- To explain the role of Information Technology such as Electronic Data Interchange in reducing waiting times at border crossings and at ports, secure appropriate processing of fees and Customs duties, simplifying formalities, and provide timely information to transport.
- To discuss the Electronic Data Interchange benefits that save money by making personnel more efficient and it improves business capabilities by speeding up throughput, streamlining inventory, and enabling the automatic processing of documents.

1.3 Research Question

This research investigates whether the application of EDI on Container Terminal Management would improve its flow and facilitate its operation or not?

1.4 Research Tool

This research depends on:

- Information gathered from different resources such as; Books, Researches, Conference proceeding and specialized Web-Sites.
- Information results from several interviews with key persons of Alexandria International Container Terminal (AICT).

Chapter Two

Container Shipping Industry

2.1 Introduction:

The use of containers is to unitize cargo for transportation, supply, and storage. Containerization incorporates supply, transportation, packaging, storage, and security together with visibility of container and its contents into a distribution system from source to user. The containerization has many benefits such as, door to door service and economies of scale. The container terminal structure consists of quay side, land side and stacking area.

2.2. Containerization:

2.2.1. Definition of Containerization:

Containerization is an inter-modal system of transporting the general cargo or product in lots which are too small for the traditional break bulk transport system, using standard containers of ISO. The goods can be easily moved from one location to another in these containers which can be loaded intact onto the container ships, trucks, railroad cars and planes. Using containers caused a huge reduction in port handling, thus lowering costs and helping lower freight charges and, in turn, boosting trade flows. Consumer goods are stuffed and transported by Containers. *(Yehuda, 2005)*

2.2.2. History of Containerization:

Many people think the Shipping Container was invented in China which is not true. The first shipping container was invented and patented in 1956 by an American named Malcolm Mc Lean. Mc Lean was not an ocean shipper, but was a trucker and by 1956 he owned the largest trucking fleet in the South and the fifth largest trucking company in all the United States. He saved his money and bought his first truck in 1934. During those years all cargo was loaded and

unloaded in odd sized wooden crates. The process was very slow and certainly not standardized.

After observing this slow and inefficient process for 20 years, he finally decided to step back and develop some standardized way of loading cargo from trucks to ships and warehouses. Mc Lean then purchased Pan Atlantic Tanker Company, which owned a bunch of fairly rusted tankers. He re-named the new shipping company **Sea-Land Shipping**. With this shipping company he could finally experiment with better ways to load and un-load trucks and ships. After many experiments, his final design is what is known now as the Container Shipping. *(ISBU, 2010)*

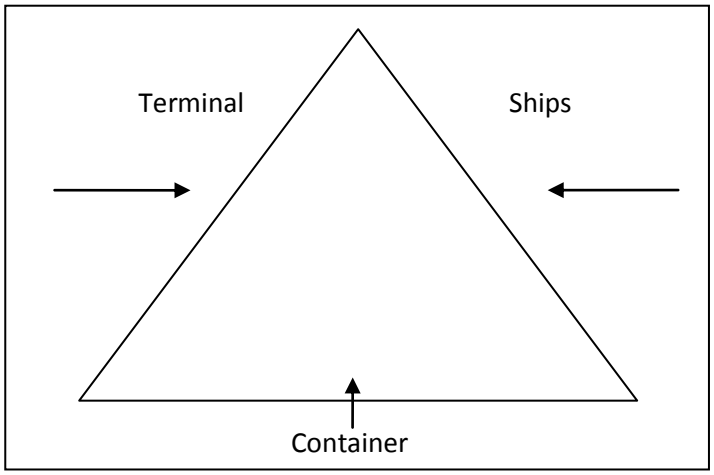

Fig. (2 – 1) Model of Containerization System.

Source: (Mira, 1993)

The figure above shows that since the time of Mc Lean the system is known as 'Containerization System' which is composed of the main three sub-systems:

Containers: They are built to standardized dimensions, and can be loaded and unloaded, stacked, transported efficiently over long distances, and transferred from one mode of transport to another.

Fully Cellular Ships: Ships fitted for container carriage in all available space. Ships are fitted with vertical cells for container placement both below and above deck. No provisions are available for cargo other than containers.

Container Terminal: It is an agglomerate of several buildings, stacking areas, circulation roads, crane rails, different equipment and labor, all chosen to specify the container handling.

Therefore the three main sub-systems must be in accordance to each other to operate the containerization system.

2.2.3. Benefits of Containerization:

- Door –to- Door:

The greatest benefits of Containerization are realized when the shipper use the container to carry goods directly from his or her premises to his or her customer's location. Perhaps the only time the container will be opened while enroute is for Customers inspection. Reduced susceptibility to pilferage and theft, elimination of multiple handling of individual items of cargo and the least possible exposure to the elements are all attractive features of Door-to-Door service. In utilizing this type of service, the shipper accepts the additional responsibility' of ensuring that cargo is properly stowed and secured in the container, precluding damage to the cargo, container or transport vehicle. The tendency to reduce packing protection of cargo destined for Door-to-Door container shipment must be resisted. The ocean leg of the voyage will still subject the cargo to severe motion stresses, considerably greater in force than during highway or rail movement. Reduction of packing protection must be carefully evaluated and implemented only after due consideration of the hazards of ocean transport, including the lifting force at transshipment points. *(Shipping exchange, 2010)*

- Port-to-Port:

When cargo volume does not provide for a full container load (less than container load or LCL) or when the shipper or consignee does not have the facilities to load or un-load the containerized cargo at his premises, he or she can utilize the services of forwarders, consolidators or the carrier to stow the goods in containers at the port of departure. This service is less attractive than Door-to-Door service. Since the cargo is not in a container for the entire journey, it is subject to the same degree of exposure to weather, handling and stow-age damage and theft/pilferage as break-bulk cargo. *(Shipping exchange, 2010)*

- Economies of Scale:

Containerization has benefited substantially from economies of scale, particularly for maritime shipping. The container confers few differences in scale economies for a producer as each container is a unique transport unit and since containerized shipping networks are fairly ubiquitous. Barriers to entry are thus quite small as each container is independent load units that can accommodate lower volumes without many drawbacks as long as other containerized volumes are present, economies of scale are very important for terminal operators and maritime shipping. *(Rodrgive and Noffeboon, 2011)*

- Door-to-Port:

Combinations of Door-to-Door and Port-to-Port service are possible, depending on the desires of the ship-per and the facilities available. While these combinations are more advantageous than Port-to-Port service, the cargo will still be exposed to the hazards of theft, weather and additional handling during part of the journey. *(Shipping exchange, 2010)*

- For High value cargoes:

Containerization is best option for high-value and delicate cargo as it provides safety from human and natural factors. *(Rodrgive and Noffeboon, 2010)*

- Time and labor cost savings:

As containers are moved intact, substantial amount of time and labor cost is saved which would otherwise have incurred in loading and unloading goods. Container ships provide regular service to overseas ports, thus it minimizes the waiting time. Also, containerization reduces the transit time which not only offers a means of marketing for the producer that bulk systems cannot provide, but also helps to reduce the inventory costs and increases reliability. *(Richert, 2000)*

2.3. Container Terminal

Container terminal is a facility that provides a package of activities and services to handle and control the flows of transport from vessel to rail road or road and vice versa. The container terminal is a physical link between oceans and land modes of transport and a major component of containerization system. *(Shy, 2007)*

2.3.1. Container Terminal Structure:

Container terminal in general terms can be described as open system of material flow with two external interfaces. These interfaces are the **quay sides** of loading and unloading of ships, and the **landsides** where containers are loaded and unloaded on/off trucks and trains, Containers are stored in **stacks** thus facilitating the decoupling of quayside and landside operation. *(Hans and Howan, 2006)*

- Quayside:

At the quay wall, special container gantry cranes perform the actual discharging stacking area and loading of containers. Feeding the container cranes with containers can be performed by straddle carriers multi or single trailer system or robotized automatic guided vehicles (AGVs) all specially designed container transport vehicles.*(Abdullah, 2006)*

- Landside:

At the land side of the terminal the direct import and export containers are handled, originated from destined for terminal's hinterland. At the entrance of the terminal for road containers delivered or received by trucks, the paper work has to be handled at the administration desk or remote check in area. After this the containers have to be physically checked at the gate for damage, seals, stickers etc. In or at the border of the stack, road trucks can be used to load and discharge rail wagons with special rain cranes or straddle carriers. The wagon on the rail trucks can be entire rail shuttles or be consolidated into one train. Intra and Inter-terminal transport equipment, such as reach stackers and multi-trailer systems, may perform necessary internal movements or transport of containers.

- The stacking Area:

It is very important to any container terminal where the containers are stored, received from the landside or from feeders and waiting for loading on the deep sea vessel or discharging from the deep-sea vessel for delivery. The size of the storage yard for an estimated average number of containers depends on a high degree on the stacking and the kind of equipment to be used. The equipment used in the container yard or/and the stack can be straddle carriers, reach

stackers, rail mounted or rubber tired yard cranes or automated stacking cranes (ASCs).

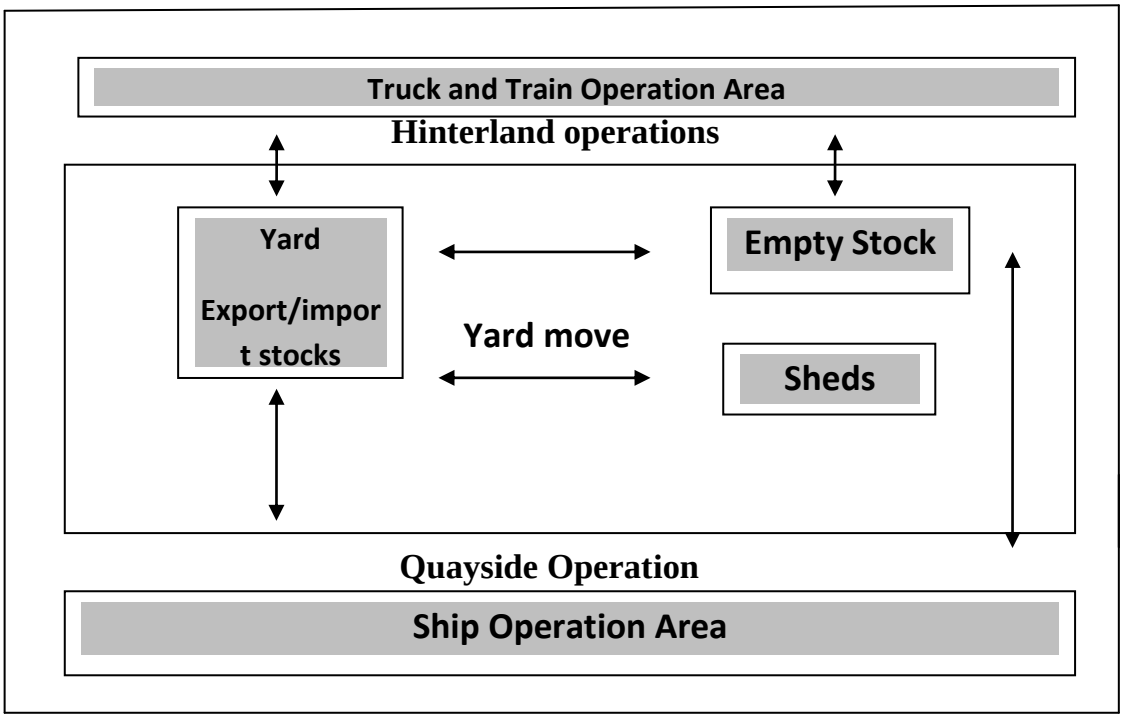

Figure No. (2-2) Operations areas of a seaports container terminal and flow of transport.

Source: (Kim, Hwan and Hans , 2005)

The figure above shows that the Container terminal could not perform its job without communication. Container vessel after arrival at the port is assigned to a berth equipped cranes to load and unload containers. Unload import container are transported to a yard positions near to the place where they will be transshipped next. Containers arriving by road or rail at the terminal are handled within the truck and the train operation areas. They are picked up by the internal equipment and distributed to respective stocks in the yard. Additional moves are performed if sheds and/or empty depots exist within a terminal; these moves encompass the transport between empty stocks, packing centers, and import and export container stock.

2.3.2. Container Terminal operation and Information Technology:

A marine container terminal is a complex facility that involves a variety of different parts and processes. The physical plant consists of berths for ships, cranes for transfer of containers between the terminal and the ship, yards for storage of the containers, gates for entrance, exit and checking of containers, several other smaller subdivisions for equipment and administration. *(Koster. 2003)*

Container terminal operators support a very intense communication with external parties like shipping lines, agents, forwarders, truck and rail companies, governmental authorities like customs, waterway policy and others. The electronic communication is based on international standards called EDIFACTS (Electronic Data Interchange for Administration, Commerce and Transport) and this will be discussed later on the next chapter. Container stay-time is affected by other factors that cause congestion within the terminal and longer ship's time at berth and that’s also reduced by using the Information Technology: *(Kia, 1999)*

- Inadequacy in container handling from ship-to-shore and within terminal;
- Container through-put (total TEU/year/area of the terminal
- Height of stacked containers
- High ratio of imported containers against exported ones
- Ratio of empty/full containers

Every change in container status is communicated between respective parties. From the point of view from the terminal operator the most important message are: the container loading and discharging lists, which specify every container to be loaded and unloaded to/from a ship with specific data; the 'bay plan' which contains all containers of ship with their precise data and position

within the ship (it is communicated before arrival of the port) ; the 'stowage instruction' which describes the positions where export containers have to be located in ships and which is the base for the stowage plan of the terminal; container pre-advices for delivery by train and truck , and schedule and loading instructions for trains. Although only some of these messages especially the stowage instruction for the ships and trains interfere directly with the operation activities of the terminal. They are very important because they serve for completeness and correctness of container data which is necessary to optimize the work flow. A great variety of Container terminals exists mainly depending on which of handling equipment is combined to form a terminal system. All terminals use gantry cranes, either single or double trolley, manual or semi- automatic. The transport between quay and stack can be performed either by trucks with trailers, multi-trailers, AGVs or straddle carriers. These vehicles can also serve the landside operation except the AGVs which nowadays are exclusively engaged to the quayside. Container stacking is either performed by gantry cranes or by straddle carriers. *(Ghotb, 2000)*

2.3.3. The types of data processing systems required in port terminals:

Depending on the number of containers handled, three types of data processing systems are also required in port terminals: off-line central system, online multi-point system and online multipoint system with direct telecommunication to yard mobile equipment. *(Koster, 2003)*

- **The first type:**

It records the container movements centrally, usually in the operation centre of the terminal, i.e. the point of loading on train, the length of transportation and the terminal that the containers are to be unloaded. Basically, the information is recorded in the computer system rather than using the old methods of board or card file system. One of the advantages of such a system over a manual one is that data can be automatically validated during data entry.

- **The second type:**

It consists of a multipoint system giving direct access to the computer from the points where movements of containers take place (e.g. portto- inland depots). This system provides updated information on the status of the train/truck such as travelling time, departure time and the time of arrival at destination. This is the area that provides necessary information to the freight forwarders.

- **The third type:**

It offers the possibility for communication of yard operations via computer, particularly between the operator of the crane and container management personnel. The cabin of the crane operator is equipped with visual display units (VDU) and simplified keyboards. The driver receives on the VDU an order to move a container. Confirmation of the execution of the order on the keyboard causes automatic updating of the container layout. This solution makes it possible to follow container movements very closely and also facilitates execution of loading or discharging operations.

The above data process systems are currently in place in several US (e.g. Long Beach), European (e.g. Rotterdam) and Asian (e.g. Singapore) ports.

2.4. The Ship Planning Process

Ship planning consists of three partial processes which are very important to be known by the terminal authority as well as they affect the terminal operation at all, they are: Berth planning, Stowage planning and Crane split. *(Hans and Howan, 2006)*

2.4.1. Berth planning:

Before arrival of the ship the berth has to be allocated to the ship. The schedules of large oversea vessels are known about one year in advance. They are transferred from the shipping lines to the terminal operator by means of EDI. Berth allocation ideally begins from the arrival of the first containers

dedicated to this ship on average two to three weeks before the ship's arrival. Besides technical data of the ships and quay cranes not all quay cranes are operated at all sips – other criteria like the ship's length and the length of the crane have to be considered. Several objectives of optimized berth allocation exist. From a practical point of view the total sum of shore to yard distances for all containers to be loaded and unloaded should be minimized. This corresponds to maximum productivity of ship operation. Automatic and optimized berth is especially important in case of ship delays because then a new berthing place has to be allocated to the ship whereas containers are already stacked in the yard.

2.4.2. Stowage planning:

Stowage planning is the core of ship planning. The planning process mainly first done by the shipping line. The shipping line stowage plane has to be designed for all ports of a vessel's rotation. Stowage planning of a shipping line usually doesn't act with specific containers identified by numbers, but on categories of containers, such as: length or type of containers, the discharge port and the weight or weight-class of container. The objective of optimization from the shipping line point of view is to minimize the number f shifts during port operation and to maximize the ship's utilization. The stowage plan of the ship transferred to the terminal operator by EDI (Electronic Data Interchange). The stowage instruction of the shipping line is field into the terminal's system and serves as a working instruction or pre-plan for the terminal's ship planner. The stowage planning systems of a container terminal display both the ship's section to be planned and the yard situation. Some of the systems allow foe automatic assignment and optimization. Different objectives of optimization are possible, such as; maximization of crane productivity, cost minimization, and minimization of yard reshuffle. To achieve a high productivity for the

crane operation containers have to arrive at the quay in the right time and in the order of the loading system and that’s depends on well plan.

2.4.3. Crane split

The third step of ship planning is the allocation of the quay cranes to the ship's section. Depending on the ship's size commonly three to five cranes operates at one oversea vessel. Feeder ships are operated with one to two cranes.

Chapter Three

Information Technology Aids

3.1. Introduction

Information Technology plays an important role for the container terminal management operation as well as reducing time, cost and effort. The information technology that occurs in the container terminal operation specifies in the Electronic Data Interchange that deals with the electronic documents and then when the Information Technology had been upgraded the Radio Frequency Identification had been occurred but it deals with tracing and tracking operation systems for the cargo itself.

3.2. Information Technology

Information Technology is the area of managing technology and spans wide variety of areas that include but are not limited to things such as processes, computer, software, programming languages, and data constructs. In short, anything that renders data, information or perceived knowledge in any visual format whatsoever, via any multimedia distribution mechanism, is considered part of the domain space known as Information Technology (IT). Information technology has become an essential part of the rapid and accurate transfer and processing of enormous volumes of data processed in international transport firms and port organizations as they used to use the manual system at the past which was Card- System for tracking which was causing long time and large effort but the information technology facilitate that by the occurrences RFID and ED I that will be discussed next in this chapter. The proper management of systems, which process this information and communicate it to those who

manage port operations, is vital for efficient transport. (Sander and Premus, 2005)

3.3. The importance of information technology in supply-chain management:

Information technology plays an important role in the process of supply chain management and that depend on the usage of the Electronic Commerce, so it is important first to differentiate between the supply chain and the E- commerce.

Supply-chain management can be defined as: All processes concerned with the enhancement of movement and handling of goods from point of production (supply) to point of consumption (demand). Supply-chain management is a process responsible for development and management of the total supply system of a firm, both the internal and the external components.*(Burt, 1996)*

During the past two decades, the **maritime industry** has witnessed the evolution of one of the most important trends in the history of port community: "The increasingly sophisticated use of computers".

Although these devices and electronic commerce have found applications in port/transport industry, the business sector is a major beneficiary.*(Burt, 1996)*

Electronic commerce (EC) may be defined as the use of technology to facilitate the exchange of information in commercial transactions among enterprises and individuals, enhancing growth and profitability across the supply chain. *(Heffernan, 1998)*

As a transaction payment method and delivery medium, the cost-effectiveness of the Internet and EC is now disputable. It is in the business-to-business application of EC that the Internet is beginning to transform the global supply chains of international trade. In **international transportation** and logistics services, the already vigorous growth in the volume of global trade is likely to be further accelerated as EC facilitates new connections of buyers and

suppliers. The terminal operators and port/transport industry intend to develop a longer-term approach to EC to improve the efficiency of operations, aiming to enhance the competence of their existing operational system. *(Gox, 1999)*

The supply chain is very complex, with multiple participants, so there is sufficient opportunity to increase efficiency and reduce costs by EC, which enables integration of the increasingly tighter links in the supply chain. The efficient usage of EC in **shipping and cargo** distribution could provide transportation management, including optimizing the choice of carriers based on service requirements and freight rates; logistics management, including the tracking of containers from the port of origin to the port of, on the rail track and between origin and the final destination and flexible routing, storage and distribution as necessary; trade and transportation documentation, including the electronic development and transfer of shipping documents, customs clearance and other regulatory requirements; international trade finance; and insurance.

3.4. RFID (Radio Frequency Identification):

3.4.1. Definition of RFID:

RFID tags part of a tracking system that uses intelligent bar codes to track items in a store. It is a generic term that is used to describe a system that transmits the identity (in the unique serial number) of an object or person wirelessly, using radio waves. It's grouped under the broad category of automatic identification technologies. *(Spektam, Robert and Patrick, 2006)*

3.4.2. History of RFID:

RFID nowadays replaces the Barcode; It is not a "new" technology. It is fundamentally based on the study of electromagnetic waves and radio, which was rooted in the 19th century work of Michael Faraday, Guglielmo Marconi and James Clerk Maxwell. The concept of using radio frequencies to

reflect waves from objects dates back as far as 1886 to experiments conducted by Frederick Hertz. Radar as we know it was invented in 1922, and its practical applications date back to World War II, when the British used the IFF (Identify Friend or Foe) system to distinguish friendly aircraft returning from missions on mainland Europe from unfriendly aircraft entering British skies. In 1948, Harry Stockman published a paper titled “Communication by Means of Reflected Power,” in which he outlined basic concepts for what would eventually become RFID. There was some activity in the 1960's and 1970's in the application of RFID technology, with a fundamental patent filed in 1973 by Charles Walton, a former IBM researcher who left IBM to form his own company, Proximity Devices, in Sunnyvale, California. Walton’s patent was for a radio operated door lock, where a "dormant tag" was sent a small electrical current by a radio transceiver to recognize the key it was attached to. His idea was bought by the lock-making firm Schlage to make electronic locks that could be opened by a user waving a keycard in front of a reader the fundamental idea behind the **access cards** used today. *(Rfident,2005)*

3.4.3. RFID Operation:

A basic RFID system has three principal components:

- An antenna or coil.
- A transceiver (with decoder)
- A transponder (RF tag) electronically programmed with unique information.

Each tag has the capacity to hold a variety of data such as a serial number, color, model number and place of manufacture. When a tag passes the reader, its radio transmissions prompt an answering transmission from the chip, which registers the details held on the tag .The microchips in the tag can either be read-write or read only. If the tag is read-write, then information can be added to the chips and reused. These are more expensive than the read-only tags that

can only be used for the one product that the original information is written for. Based on a review of explanation, RFID seemingly offers many potential benefits if implemented. *(Sanjay, Stephen and Daniel, 2002)*

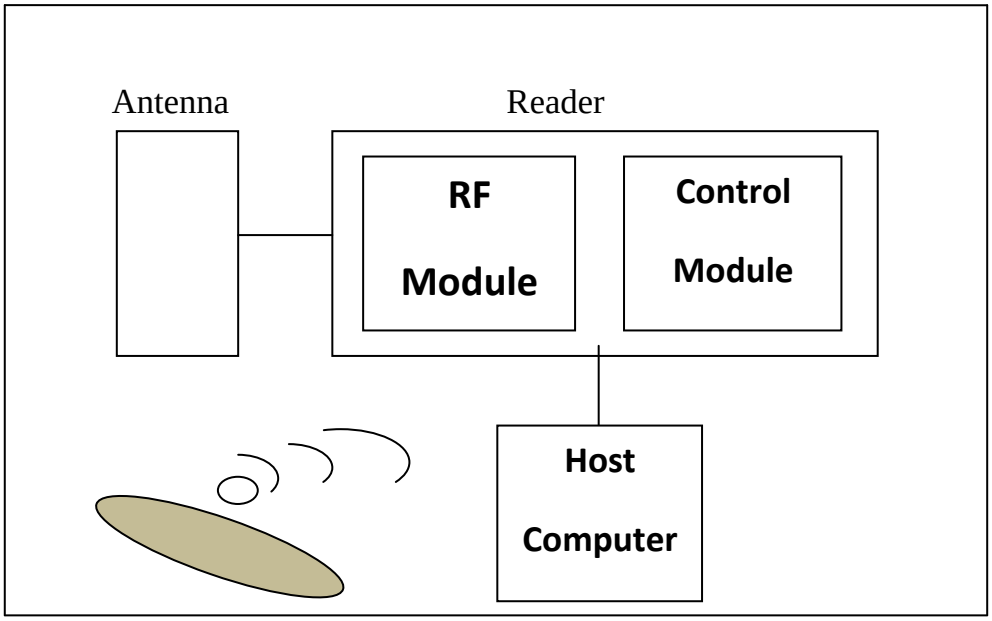

Fig. (3-1) Components of RFID

Source: (Rundh, 2008)

3.4.4. Different Types of RFID:

There are several versions of RFID that operate at different radio frequencies. The choice of frequency is dependent on the business requirements and environment – it is not a technology where 'one size fits all' application. *(Sanjay, Stephen and Daniel, 2002)*

- Low frequency (125/134 KHz): Most commonly used for access control, animal tracking and asset tracking.
- High frequency (13.56 MHz): Used where medium data rate and read ranges up to about 1.5 meters are acceptable. This frequency also has the advantage for not being susceptible to inference from the presence of water or metals.

- Ultra High frequency (850 MHz to MHz): Offer the longest read ranges of up to approximately 3 meters and high reading speeds.

3.4.5. Uses of RFID:

- Asset management:

RFID tags can be automatically read at the dock door as they leave with an outgoing shipment. By matching the reading with specific shipment information in a database, manufacturers could automatically build a record of what specific shipping containers were sent to each customer. This information could be used to document cycle times, improve returns and recoveries and aid in disputes with customers about lost or damaged assets. *(Banerjee and Kumar, 2006)*

- Production Tracking

The Auto-ID Center study found manufacturers can reduce their working capital needs between 2% and 8% by taking advantage of RFID to provide greater visibility into work-in-process tracking and materials inventory. By applying RFID tags to subassemblies in the production process, rather than to finished goods, manufacturers can gain accurate, real-time visibility into work in process in environments where bar codes are unusable. Industrial control and material handling systems can integrate with RFID readers to identify materials moving down a production line and automatically route the items to the appropriate assembly. *(Banerjee and Kumar, 2006)*

- Inventory Control

Readers covering warehouse racks, shelves and other storage locations could automatically record the removal of items and update inventory records. If an item was misplaced or needed urgently to complete an order, fixed-position readers or a worker with a mobile computer and RFID reader could automatically search for the item by reading for its specific ID number. To

secure inventory from theft and diversion, readers could be set to sound alarms or send notification if items are placed in unauthorized areas of the facility or removed from storage without prior approval. Direct store delivery (DSD) and other remote sales and service personnel could take advantage of RFID readers integrated with mobile computers to quickly and accurately count inventory held in stores or in the vehicle. *(Gao, 2011)*

- Shipping & Receiving

The same tags used to identify work-in-process or finished goods inventory could also trigger automated shipment tracking applications. Items, cases or pallets with RFID tags could be read as they are assembled into a complete customer order or shipment. The individual readings could be used to automatically produce a shipment manifest, which could be printed in a document, recorded automatically in the shipping system, encoded in an RFID tag, printed in a 2D bar code on the shipping label, or any combination. Manifest information encoded in an RFID tag could be read by the receiving organization to simplify the receiving process and to satisfy requirements like those for Advance Shipping Notices (ASN). Complete shipment data available in an RFID tag can be read instantly without manual intervention. Incoming shipments can be automatically queried for specific containers. If a sought-after item was present, it could be quickly located and selected. *(Gao.2011)*

- Returns & Recall Management

Companies could supplement the basic shipment identification information by writing the specific customer and time of shipment to the tag immediately prior to distribution. In the event of a recall, companies could trace specific shipments to specific customers, which would enable a highly targeted notification and return operation and avoid a costly general recall. For general

returns, companies could verify that the customer returning merchandise is actually the customer who received it, which would deter counterfeiting and other forms of return fraud.

- Supply Chain Management

RFID technology has been used in closed loop supply chains or to automate parts of the supply chain within a company's control for years. As a standard emerge, companies are increasingly turning to RFID to track shipments among chain partners. *(Angeles, 2005)*

- Container Terminal:

One application for RFID systems is in monitoring the movement of containers and their status in the terminal. This is the area that assists the terminal operator to produce prompt reports for importers/exporters and other relevant agencies. The system can also track containers entering and leaving the terminal through the gate or as they pass the scanning points in the yard.

3.4.6. The goal of using RFID in container depots:

The goal of using RFID in container depots is to enhance efficiency, thus providing better customer services while lowering the cost of operations: *(Bitkom, 2005)*

- With the RFID-based system, the drivers can access the system anywhere inside the container depot via handheld devices. Information on the containers will be updated and sent to the system via a wireless system to the backend computer system. This reduces human errors, and drivers no longer have to wait for the system computer operator in the depot control office to become available.
- The system can determine where to put the containers based on developed algorithms and prescheduled orders. The system can inform workers where to

put and get the containers. The time needed to train new staff is shortened. Dependence on the experience of staff to pick up and deal with the containers is greatly reduced.

- All of the containers are identified by RFID tags.

Workers can access detailed information about the containers easily via their handheld devices. The system can inform the workers where the containers of the customers are located. In case mismatch containers are found, an alert can be sent to the operators.

3.4.7. Benefits of RFID:

RFID technology as a key component of an enterprise mobility solution, combined with appropriate business process improvements, can result in clear benefits in the following key areas: *(Twist, 2005)*

- **Automation**: reducing manual processes through automated scanning and data entry improves productivity, allowing resources to be reallocated to higher value activities.
- **Integrity:** improving the integrity of real-time supply chain information with increased authentication and security and tracking capabilities reducing errors, shrinkage, and counterfeiting while improving customer satisfaction information is only valuable if it is correct.
- **Velocity**: reducing workflow issues by minimizing the time spent finding and tracking needed assets, in turn increasing product flow and handling speeds.
- **Insight:** providing the real-time information needed to make faster, better and more informed decisions and the ability to be more responsive to the customer.
- **Capability**: providing new applications and quality to meet supply chain partner demands and enhance customer experiences.

3.4.8. Advantages of RFID versus Barcodes:

- Barcode readers require a direct line of sight to the printed barcode; RFID readers do not require a direct line of sight to either active RFID tags or passive RFID tags. *(Angeles, 2005)*

- RFID tags can be read at much greater distances; an RFID reader can pull information from a tag at distances up to 300 feet. The range to read a barcode is much less, typically no more than fifteen feet.

- RFID readers can interrogate, or read, RFID tags much faster; read rates of forty or more tags per second are possible. Reading barcodes is much more time-consuming; due to the fact that a direct line of sight is required, if the items are not properly oriented to the reader it may take seconds to read an individual tag. Barcode readers usually take a half-second or more to successfully complete a read.

- Line of sight requirements also limit the ruggedness of barcodes as well as the reusability of barcodes. (Since line of sight is required for barcodes, the printed barcode must be exposed on the outside of the product, where it is subject to greater wear and tear.) RFID tags are typically more rugged, since the electronic components are better protected in a plastic cover. RFID tags can also be implanted within the product itself, guaranteeing greater ruggedness and reusability.

- Barcodes have no read/write capability; that is, you cannot add to the information written on a printed barcode. RFID tags, however, can be read/write devices; the RFID reader can communicate with the tag, and alter as much of the information as the tag design will allow.

- RFID tags are typically more expensive than barcodes, in some cases, much more so.

3.5. EDI (Electronic Data Interchange):

3.5.1. Definition of EDI:

The introduction of Electronic Data Interchange (EDI) was specifically meant to satisfy the need for information. Simply, EDI is the combination of telecommunications and data processing technologies which facilitate faster, more accurate exchange of information by using electronic versions of standard business documents in place of paper. EDI involves using the computer to process the interchange of standardized electronic documents. In order to facilitate the exchange of information globally among business organizations, it was imperative to translate information to standard transmission formats. This standardization process was worked out by the United Nations and became known as United Nations Electronic Interchange for Administration, Commerce and Trade (EDIFACT) message formats. *(Mira, 1993)*

3.5.2. History of EDI.

In 1968, the transportation industry recognized that the abundance of paperwork was beginning to present a problem. Transportation companies were forced to process tremendous amounts of paperwork in order to conduct their businesses. The time-consuming nature of this paperwork was slowing the movement and consignment of shipments. The transportation industry decided to correct this problem by organizing a committee, called the Transportation Data Committee (TDCC), to develop standard formats for exchanging business information. TDCC organized an industry wide program for data standards, message formats, standard codes, communications

protocols, and other details that would support the new concept of computer to computer electronic data interchange; and eliminate paperwork altogether. In 1975, TDCC released the first EDI documentation: Rail Transportation Industry Application. Soon the transportation industry's success spread to other industries. More and more companies began communicating via EDI within their industry. Unfortunately, all the standards that were developed at this time supported only transportation related issues. *(Guid,2005)*

3.5.3. The difference between EDI and E-Business:

E-Business can be the electronic exchange of information in any format; EDI is done through a standardized format and is particularly useful for a large volume of repetitive documents such as bills-of-lading or purchase orders commonly exchanged between business partners. *(Sander and Premus, 2005)*

3.5.4. Requirements to apply EDI:

- EDI management software: For optimum performance, the translation software should be on the same platform as the business application.
- Mapper: Levels of mapper information or integration vary greatly from translator to translator.
- Communications software: Can be a module to the translator, a programming tool that enables the user to write communications protocols, or a separate application.
- Internet connection: Ideally, the faster the connection, the better.
- Access to a VAN: The value-added-network acts as a gateway between business partners. *(If4it, 2008)*

3.5.5. Advantages of EDI:

EDI Provides Speed: Using EDI will provide specific and measurable increases in the speed of document transfer, with accompanying decreases in document cycle time. Sending an electronic message across the country or around the world requires only seconds or minutes as opposed to days. Data is available immediately for use in internal applications. Data, once received, needs only to be translated internally into the specific format required by the receiver's application software, and it is immediately ready for use. Reduced business cycle times provide a competitive edge in any business.

EDI Improves Accuracy: Electronic transfer of data eliminates the need for copying data from one paper document to another, or for keying the data into a business application screen. Every time data is transferred, there is opportunity for error to be introduced to the process. In the typical manual purchase order, a person enters or copies information from the paper form at least once. With EDI, improved accuracy is obtained in several different ways:

- Electronic data is usually derived from a database, where data has been subject to prior validation
- Electronic documents are transferred accurately regardless of size. If transmission of a large document is not successful, users can invoke re-transmission procedures rapidly.
- Even if several different parties process the electronic document, with each party adding data to the existing document, none has the ability to alter previously entered information.

EDI Reduces Costs: Any company may obtain a variety of cost reductions as a result of implementing EDI. These reductions can include both cost savings and cost avoidance. These points summaries just a few of the more general types of savings you can expect:

- Reduction of overhead costs, eliminating human handling in such areas as mailroom sorting and circulation, clerical document preparation and data entry.
- Upon implementing EDI, costs for paper, envelopes and mailing materials decrease as well as those for telephone and courier services used to support transmission of orders and paper documents. Additionally storage space for paper and supplies is freed thus reducing costs still further
- Substantial cost savings can result from reduced error rates, these savings include those such as labor costs normally used to search for errors, and in lowered expediting costs
- Reduction of inventory costs through shortening order processing and delivery cycles, and generally lowering inventory levels. As goods can be delivered more quickly the buying company need not order new products as often and can lower or eliminate its level of inventory safety stock. Lowered inventory levels also results in corresponding reductions in carrying costs. Inventory costs can, in some businesses, account for as much as 90 percent of total product cost, so even modest reductions in this area can result in dramatic savings
- If a company can receive an electronic invoice in a timely manner, the buyer can take advantage of discount terms, effectively paying less for the product. The seller, in turn, can receive payments sooner, improving its cash position and allowing it to pay less for its supplies by taking advantage of discount terms

EDI Improves Operational Efficiency:

- Increasing awareness of data throughout the business cycle. Significant use of EDI gives an organization visibility outside of its ‘four walls’. Although EDI is not a reporting tool, a thorough implementation of EDI makes everyone aware of abilities to monitor the customer’s customer, track vendor or

transportation carrier performance, better understand product availability from vendors and distinguish among activities by distributors and customers

- Improved planning and processing. In an electronic environment, rapid receipt of accurate and complete business transactions is the norm. Suppliers can process orders quicker and shipments can be scheduled accordingly, while the manufacturer can anticipate quicker receipt of goods and schedule manufacturing tasks accordingly
- Finally, EDI can improve cash flow. As more of a company's applications are integrated into EDI, its cash flow will improve due to overall efficiencies that EDI provides. This enables managers to plan cash flow more precisely by receiving and making payments sooner, thus allowing them to take advantage of net discounts. *(Malton and Marucheck, 1997)*

3.5.6. The role of EDI in ports management:

In fact, information technologies offer the most effective means of achieving the desired standards in ports. A specific example is (EDI) electronic data interchange, which can not only speed up throughput of goods but also cut the administrative costs associated with handling. The **speed** with which goods are shipped depends largely on the efficiency and flexibility of administrative and documentation procedures, which can be improved by electronic data interchange in any of its many forms, such as EDI, fax, audio text, Internet or electronic mail. EDI is the exchange of structured messages between computers, with no human intervention in the reading or recording of these messages. The boom it is enjoying at present is a logical outcome of the information load companies now labor under. A glance at the procedure for sending a bill of lading, for example, or a bay plan, shows that in most cases all the data the documents contain are output from the forwarder's computer onto paper or some other medium and sent by post, e-mail, fax, courier or

other means to the consignee, who reads the message and immediately inputs the relevant information into a computer. Thus, the main difference between EDI and e-mail or fax is not the means of transmission but the fact that EDI avoids the slowest, most error-prone procedures, namely those involving human intervention. However, if two computers from different companies are to be able to understand one another without human intervention, the format of the messages to be transmitted needs to be agreed upon beforehand. This is relatively straightforward in two-way communications, but when a large number of people, including some from different countries, wish to communicate, it is a more complicated matter. In order to solve this problem, the United Nations developed its "rules for Electronic Data Interchange for Administration, Commerce and Transport" (EDIFACT), now the most widely used language for standardizing EDI messages relating to commerce and transport. Many documents that are commonly used in goods transportation, such as cargo manifests (IFCSUM), customs declarations (CUSDEC) and bay plans (BAPLIE), etc.., have now been standardized. Electronic document exchange can of course take place using either EDIFACT or any other language the parties may agree upon, but as mentioned above EDIFACT is the most widely accepted standard in commerce and transport. *(Ghotb, 200)*

Providing reliable service to the interacting elements of the transportation chain is a major objective of any container terminal. Within a port community, the effective flow of information is considered to be an important variable. For example, in an eight-berth terminal where eight ships are berthed for loading/ unloading some 6,000 containers simultaneously, a highly sophisticated information technology is required to provide reliable and timely information for hundreds of people within the port/transport community. Among them are freight forwarders, transport companies, rail operators, crane operators and container carriers in terminals.

To carry out an effective data management, appropriate electronic devices must be used. However, despite the fact that several devices are available in the market, they are not employed in every container terminal. Whilst they can operate as individual devices in ports and outside terminals (e.g. rail track), they should be integrated to the port and transport network communications via a computer system. Only a few international ports have taken maximum advantages of the existing devices to improve their operational efficiency, minimize terminal congestion and establish a fully integrated system. A brief description of the following devices aims to explain their importance in container tracking, recording, movements and segregation of imported/exported containers.

Figure no. (3-2) shows that each member of the port community has to sort out one interface, this interface depend on the EDI service provider. The service provider then takes responsibility for forwarding each message to other members of the port community, as appropriate and this issue became as a benefits for ports as will discussed next.

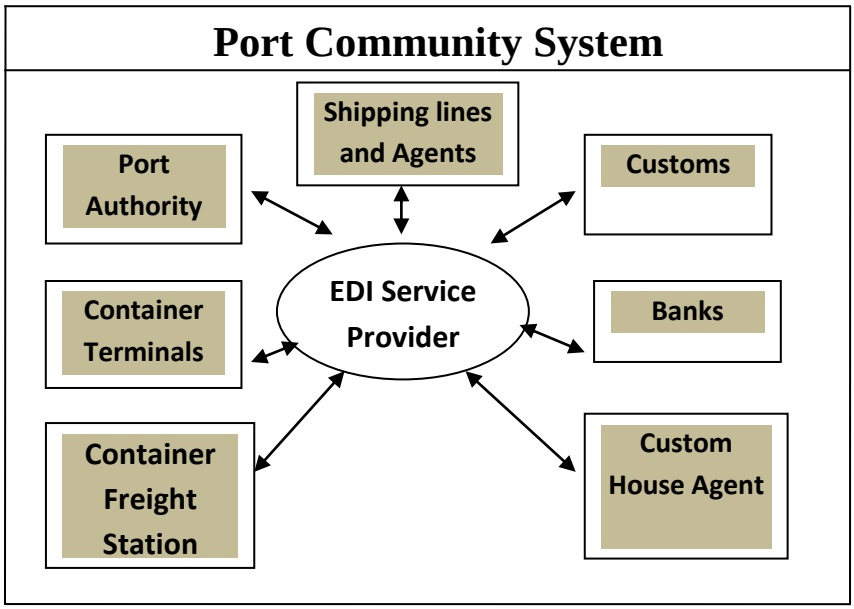

Figure no. (3-2) EDI in Port Community System

Source: (Vinecnt. 2003)

3.5.7. The benefits of EDI for ports:

The EDI approach treats the port community as large virtual organizations whose members have commercial links and yet retain their independence. For the various "departments" of this organization, EDI is an appropriate tool for organizing information flows so that they can perform their tasks. Hence, the development of containerization is accompanied by the application of computerized tele-transmission of manifest and stowage plan details from the port of loading to the port of discharge. Transmitted data are used to plan discharging operations, as well as to print required report documentation. Container terminal equipped, for example, with ship-to-rail technique, accurate and current information on all container operations is vital. A properly-designed, computerized container control system **increases** the operating efficiency of the terminal. In addition, EDI allows the final user (importer or exporter) an unobstructed view of all those involved in the process, which is vital now that transport aims increasingly at "door-to-door" service. Attitudes change, too, as each participant in the process comes to perceive itself as simply one element in a chain whose slowest or least efficient link affects the whole outcome. The process is one of cooperation among all the links, even though some are in fact competitors. This is perhaps one of the most important characteristics of EDI.For procedures relating to handling of dangerous goods or booking, however, EDI is considered the most suitable document-interchange medium. However, the main benefits provided by such a system are the following: *(Orial, 1997)*

- Faster discharging and loading of containers;
- Increased productivity through faster turnaround of containers;
- Better monitoring of the storage of containers
- High level of accuracy of information; and

- High level of consistency of the information given to various parties in the chain of transport.

3.5.8. The obstacles of EDI regarding ports:

EDI has proved an effective tool for speeding up the port's merchandise-shipping procedures. Nevertheless, the newness of the technology and the change in mentality required by the lack of paper has made its introduction anything but simple. The main technical and organizational obstacles encountered in implementing EDI in ports are described below. *(Orial, 1997)*

Organizational problems: The first and possibly the most important problem are getting the parties involved to agree on message and procedure definition. This is particularly difficult for ports communities since they include very different groups and companies with different times, opposing-- interests and no clear customer-supplier relationship. Agreements should therefore be the product of a harmony.

Another obstacle is the change in company or organization behavior that EDI requires. Some see EDI as a threat to particular jobs; others see it as a solution. This is due to lack of knowledge of the technology and to the fact that suppliers and the media have created false expectations as to what EDI really is.

Furthermore is the legal aspect: how to draw up an interchange agreement that all parties can subscribe to and that will give legal sanction to a document interchange with no documents and no signatures. For documents relating to public authorities such as Customs it is sometimes necessary to alter certain aspects of the current legislation to bring it into line with the new method of document interchange.

Administration of codes and message versions is another problem that needs to be addressed. One organization or company should be put in charge of administering the codes and implementing message amendments, so that changes can be coordinated among all users. If this is not done, messages may be rejected because of differences between databases. By the same token, it is also important to use the same message versions and codes for as long as possible, as every change presents problems for all users of the system.

Lastly, it is essential to be aware that, for implementation of an EDI system, trained staff needs to be hired, or else existing staff need to be trained properly.

Technical problems: EDIFACT messages that are an exact match with the message content defined by the parties are not easy to find. Strict adherence to EDIFACT standards means that content has sometimes to be subordinated to syntax.

One of the major problems as long as all value added networks are not interconnected is that all parties must agree on one such network to use; in addition, most networks still leave something to be desired in terms of reliability or customer service.

Other problems encountered during implementation of an EDI system are ones relating to the application of the old technology: suppliers are hard to find and poorly trained; technical staff in the other companies involved in the document interchange may also be untrained; and the software products, which are often first versions, have design faults. For example, it has been extremely hard to find a sufficiently fast EDIFACT translator for.

The main technical difficulties with designing in-house applications are, on the one hand, achieving automatic operation that is 100% reliable and, on the other, obtaining a fast system- response time, which depends on the speed of the translator, of the communications systems, and of the computer's central processor.

When the use of EDI is optional, the fact that some parties send documents by EDI while others use paper creates great technical and administrative complications.

Chapter Four

"A case Study of Alexandria International Container Terminal"

4.1. Introduction

This chapter will explain the Egyptian Ports and terminals and their locations and analyzing the application of EDI in Alexandria International Container Terminal and its benefits to such terminal.

4.2. Historical background of Egyptian Ports:

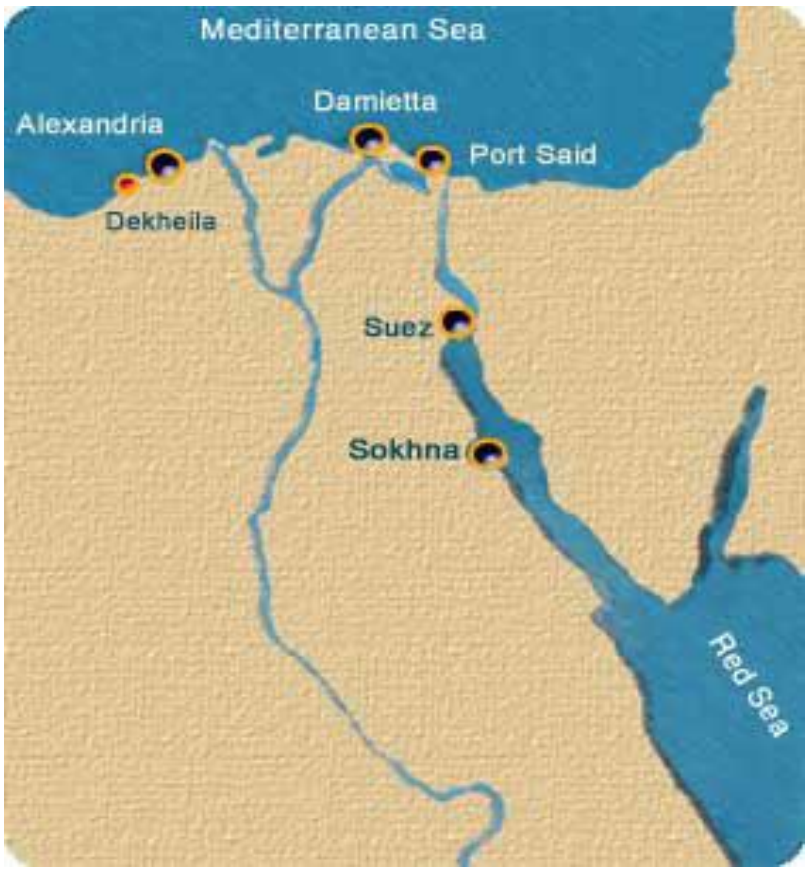

Figure No. (4.-1) Egyptian Ports

- Egypt's geographical location lends an important aspect to the maritime transport sector. Overlooking both the Mediterranean and Red seas linked by the Suez Canal; Egypt realized its role at an international level. The government overplayed the infrastructure of a great maritime industry by building ports and supplying them with high tech. equipments to handle cargoes and passengers.

- Among the most important ports is Alexandria which is the biggest port in Egypt, Dekheila Port which is a natural extend to Alexandria Port. Damietta Port which has the largest container terminal and most sophisticated equipments in the Middle East, and Ports Said and Suez at both ends of the Suez Canal.

- It is historically recorded in 1874; Egypt was the first country to dig a man-made canal across its lands to link the Mediterranean Sea to the Red Sea via the Nile River and its branches. That Canal was abandoned and reopened several times then later named "The Suez canal". It was opened for international navigation on 17 November 1869.

4.2.1. Alexandria Port

The Port of Alexandria is the main port in Egypt, dating back to 1900 when the Pharaohs established a port west of Pharoon and Pharous Islands. This port was called “Rakouda” and was located north of Pharous Island, known as “Ras El Teen” region now, with two ports and more than ¾ of Egypt’s foreign trade passing through it.

The area of the port measures 2300 meters long and 300 meters wide with docks of varying depths and more than one entrance. The 2 ports are located eastwards of Alexandria and are called the Eastern Port and the other is westward of Alexandria and is called the Western Port with a t-shaped

peninsula separating them. Unlike the Eastern port, the western port is used for actual navigation and thus it is called “Alexandria Port”.

- Approach area: The harbor is protected by marine rocks and 2 break waters while the width of the entrance is about 400 meters and there are two fairways in between as follows:

The port is divided into two sections separated by coke (used for making steel) quays and breakwater. The first part is called the port or inner dock while the second is known by the dock or outer part with an area of 600 hectare. The first section is devoted to general cargo trade and the second for petroleum or bulk cargoes. Pilotage is obligatory for vessels entering or exiting the port.

4.2.2. Dekheila port:

Dekheila port is a natural extension to Alexandria port due to the increasing volume of container movement in Alexandria as well as increased growth of population, increased industrial development, and free zones in Alexandria's West Delta.

The site of Dekheila port was chosen for many economical and geographical reasons, mainly:

- Its gulf shape and depth will decrease purification costs.
- The area is semi-sandy saving money for buildings and rubble.
- The extended area is enough for future projects.
- Ability to link the site with national roads and railways.
- Site is near to important amenities such as El Dekheila Iron & Steele, free zones and electrical generating project, thus saving transportation costs for materials.

- Approach area: Navigational channels: they are 1.5 miles long, 25 meters wide, 24 meters deep. Rotation Circle: can be found in front of berths and for maneuvers. Its diameter is 750 meters with a depth of 20 meters.

4.2.3. Port of Damietta

The port of Damietta is about 8.5 km to the west of Damietta branch of River Nile in the Mediterranean Sea to the west of Ras El Bar, It is at the distance of 70 km to the west of port Said Port. The construction covers an area of 25 km.

- Approach area**:** Canal entrance: The canal is 11.3 km long and 300 m wide, this gradually decreases until it reaches 250 m at water break and 15 m depth. The canal is surrounded by 18 buoys which are lit at night, odd numbers on the right and even numbers on the left, There is an external waiting area.

4.2.4. Port Said

The Port Said port lies to the northern entrance of the Suez Canal. It is considered one of the most important Egyptian ports due to its distinctive location on the entrance of the most significant waterway in the world (The Suez Canal) and in the middle of the biggest merchant shipping line between Europe and the east. It is moreover the biggest transit port in the world.

- Latitude: 31 16' N Longitude : 32 19' E VHF : 73, 12, 13, 16
- The Approach Area : Waterways : 459 feet wide and 12.5 to 13 meters deep, Water breaks: The Suez Canal entrance leading to the port is protected by two water breaks. The eastern water break is approximately 3.5 miles long while the Western is approximately 1.5 miles long.

4.2.5. Suez port

Suez port is situated on the southern end of Suez Canal, approximately170 km south of Port Said.

- Latitude: 57° 29' N Longitude: 33° 32' E
- Approach area: Ships usually berth in the waiting area. The channel has been shoveled at port El Sakhra El Gadida and coastal pier at relevant depth

11.28 m. Ships, whose draft exceeds 11.28m, can enter the port during the tide only on condition that the draft does not exceed 12.19m

4.2.6. Sokhna Port

It is the port of 21st century. It is considered one of the recent ports that were established by B.O.T system. It is managed via logistic centers. It is regarded as one of the huge national projects. It is also the result of planning, regular executing for an important phase concerning the position of Egypt on the map. It is considered the first comprehensive and multipurpose hub port. It comes under what is called "Third Generation ports" to serve export and import operations of general cargo, bulk and container handling. It is also equipped with ultimate technology.

Location of the port**:** It is located on the western coast of Suez gulf, on a distance 22.3 km2 and away from Suez city 43 km.

4.3. Alexandria International Container Terminal (AICT):

4.3.1. About AICT:

Hutchison Port Holdings (HPH) was pleased to announce that it has entered into agreements in12 March 2005with a consortium led by the Alexandria Port Authority for the construction, operation, and management of two terminals at Alexandria Port and El Dekheila Port. As part of the agreements, AICT, a new joint venture company is being established between HPH and the consortium will develop these general cargo terminals into modern container handling facilities.

Alexandria International Container Terminals (AICT) operates the Ports of Alexandria and El Dekheila that is a member to Hutchison Port Holdings (HPH), where both ports are located on the Mediterranean Sea in Egypt.

Serving as the country's main commercial ports, Alexandria Port and El Dekheila Port are well-positioned to capture cargoes from the hinterland.

Incorporating the global experience, best practices and proprietary leading-edge technologies of the HPH Group, AICT will be able to manage its operations to the highest levels of efficiency, security and service. Phase I of AICT's development completed in June 2007.

4.3.2. AICT Terminal

- A free zone company within the port
- Two (2) separate container terminals
- Adding 650,000 TEU new capacity
- New equipment of latest specifications
- Post- Panamax Quay Cranes with twin lifts
- One-window operations –customs on site

4.3.3. AICT Facilities (El-Dekheila):

- Total area (hectares)= 19
- Container berth= 2
- Total berth length = 510 m
- Depth alongside = 12 m
- Container Quay Crane = 2
- Rubber tyred gantry cranes = 6
- Reach-strackers and empty container handlers = 4

4.3.4. Terminal Control Systems:

- CTMS -HPH Terminal Operation System with design capacity up to 3M TEU annual throughput
- It encapsulates the expertise of HPH in real-time terminal operations and management

- Currently deployed in Panama (910K TEU), Ningbo (2M TEU), Xiamen (1.2M TEU), Pearl River Delta Ports in Southern China (800K TEU), etc.
- Comprehensive suite covering yard planning, ship planning, gatehouse, equipment control, intelligent grounding, auto IT dispatching, RDT, pager, EDI, billing, web access
- It has advanced features tailored for terminals with limited equipment (e.g. inbound PA, smart dual cycle)
- Streamlined to run with minimal hardware requirements
- Centrally supported by HPH.

4.3.5. Staff and Training:

- Current Staff –all trained both locally and internationally.
- Training undertaken in the following areas:
  - > Security Training –ISPS
  - > Berth operators –lashing of vessels
  - > Supervisors –lifting procedures/break bulk handling
  - > Ships bosses –operations
  - > Superintendents –leadership skills
  - > CTMS –terminal management systems
  - > Training undertaken in the UK, Hong Kong, Panama and China
  - > Training also given at the Port Training Institute, Alexandria Port

4.3.6. El Dekheila terminal attributes:

- 24/7 operation
- Preferred terminal for ships with over 200M LOA
- Night navigation available
- 35 minutes from pilot station to berth
- Large yard stacking area
- Fast dispatch and full cycle of services

- New equipment and terminal control systems
- EDI exchange and vessel planning facility

4.4. Electronic Data Interchange application in AICT:

This is the outcomes of the case study of this research about AICT that gathered from several interviews with key persons from AICT on how the company is applying the system of Electronic Data Interchange and what are these documents that be used in different processes.

4.4.1. INBOUND BAPLIE:

It is an electronic document for discharge plan that the port administration receives from shipping lines prior vessel arrival.

It's Functions: Bayplan/Stowage Plan Occupied and Empty Locations Message (BAPLIE) to be used in Electronic Data Interchange (EDI) between partners involved in Administration, Commerce and Transport. It is message to transmit information about equipment and goods on a means of transport, including their location on the means of transport. The message can be exchanged between (liner's) agents.

4.4.2. OUTBOUND BAPLIE:

It is the final figure for cargo onboard vessel after operation completion that is issued by AICT and sent to shipping lines.

4.4.3. MOVINS (Stowage instruction message):

It is the Loading instructions in EDI format that they receive from shipping line prior loading onboard vessels.

Its functions: A Stowage instruction message contains details of one means of transport vehicle, giving instructions regarding the loading, discharging and re-stowage of equipment and/or cargoes and the location on the means of transport where the operation must take place. In the shipping industry the

Stowage instruction message can be used between partners involved in the loading and discharging of vessels and other means of transport, like stevedores, shipping lines, tonnage centers, etc.

4.4.4. COARRI (Container discharge/loading report message):

It is the Vessel movement operation including date/time of loading and discharge generated from AITC system and sent to shipping lines offices.

Its functions: A message by which the container terminal reports that the containers specified have been discharged from a seagoing vessel (discharged as ordered, over landed or short landed), or have been loaded into a seagoing vessel.

4.4.5. CODECO (Container gate-in/gate-out report message):

It I the Gate in and out report generated from terminal application and sent to shipping lines.

Its functions: A message by which a terminal confirms that the containers specified have been delivered or picked up by the inland carrier (road, rail or barge). This message can also be used to report internal terminal container movements (excluding loading and discharging the vessel).

4.4.6. CUSCAR (Customs cargo report message):

It is the CARGO MANIFEST in EDI format including the description of goods in the containers loaded and discharge**.**

Its functions: This message permits the transfer of data from a carrier to a Customs administration for the purpose of meeting Customs cargo reporting requirements. It is envisaged that the Customs Cargo Inventory Report

Message may be initiated by the carrier to report single or multiple consignments to a Customs administration. The message is transmitted upon arrival of the goods, or where national legislation permits, prior to arrival. The data provides Customs with a means of "writing off" or acquitting the cargo report against Goods declarations. It also allows Customs to undertake selectivity processing in order to select high risk shipments requiring examination.

4.4.7. TPFREP (Terminal performance message):

It is the Terminal performance report in EDI format sent from terminal to shipping lines after vessel departure.

Its function: The Terminal performance message is a message to transmit information relating to the operations carried out by terminal operators such as the loading, discharging and re-handling of containers and/or roll on/roll off items, hatch covers etc**.** The Terminal performance message will be transmitted by a terminal operator to the ship operator, tonnage centre or shipping line. The message is used to give information on the operational handling of a ship in a container terminal after the completion of the operations.

4.5. Benefits of applying EDI in AICT:

EDI had directly treated several problems long associated with paper-based transaction systems:

- **Time delays**: Paper documents may take days to transport from one location to another, while manual processing methodologies require steps like keying and filing that are rendered unnecessary through EDI.
- **Labor costs**: in non-EDI systems, manual processing is required for data keying, document storage and retrieval, sorting, matching, envelope

stuffing, stamping, signing, etc. While automated equipment can help with some of these processes, it seems that labor costs for document processing represent a significant proportion of their overhead. In general, labor-based processes are much more expensive in the long term EDI alternatives.

- **Accuracy**: EDI systems are more accurate than their manual processing counterparts because there are fewer points at which errors can be introduced into the system.
- **Information Access**: EDI systems permit numerous users access to a vast amount of detailed transaction data in a timely fashion. In a non-EDI environment, in which information is held in offices and file cabinets, such dissemination of information is possible only with great effort, and it cannot hope to match an EDI system's timeliness. Because EDI data is already in computer-retrievable form, it is subject to automated processing and analysis. It also requires far less storage space.

Chapter Five

Conclusion and Recommendation

1.1. Introduction

This concluding chapter presents the conclusions of the analysis of the case study about the benefits of EDI in AICT, such as facilitating the operation of container terminal, reducing cost, time and effort in each stage in the terminal operation. This research proposed recommendations about using the XML to gain more advantages than EDI in facilitating the container terminal operation.

1.2. Conclusion

The conclusions of the study could be summed up in the following points:

1- Electronic Data Interchange consider as a backbone of any container terminal operation as it facilitates its flow as well as facilitating the international trade.

2- Electronic Data Interchange could reduce paper work because the movement of the transactions could be computerized.

3- Using EDI will provide specific and measurable increases in the speed of document transfer

4- Electronic transfer improves accuracy of data as it eliminates the need for copying data from one paper document to another.

5- Using Electronic Data Interchange help the port to achieve its desired standard.

6- Electronic Data Interchange enables all the partners to access any information they need.

7- Customs procedures require long time to handle, but Electronic Data Interchange eliminates these procedures.

8- Handling documents and storage it require labor cost and consuming time, and this issues could be avoided while using Electronic Data Interchange.

9- Time and date of the Loading, discharging and handling the containers must be determined and documented to specify the responsibility of each partner, but this stage might take long time and a lot of paper works, so the Electronic Data Interchange would solve this problem as they would be done electronically.

1.3. Recommendation

After a thorough analysis of data, the following recommendations are hereby made:

Ports are one link in the transport chain, closely connected with shipping agents, shipping companies and land transport operators. The information circuits between port operators when goods passed through a port are complex. They involve the exchange of many documents and pieces of information between many partners. These exchanges may be grouped by kind to form sizeable flows. Thus, it is very important to apply the information technology concepts such as **Electronic Data Interchange** in the AICT operation to increase the port productivity and competitiveness but EDI is not

the only tool for document interchange that exists and a decision needs to be made as to the most appropriate procedure and technical medium for each purpose. The Port of Barcelona, for example, on re-examining the whole process of document-interchange relating to ship entry and exit, designed a new system that greatly simplified the old one and that was based on fax transmission, since there was no added value to justify introducing EDI in this case. In reengineering other procedures, alternative technological media have been used, such as Internet for information (i.e. XML) on cargo manifests' contents, or audio-text for information on their status.

This research recommend applying the new technological tool which is the XML (**eXtensible Markup Language**), It is about computers exchanging information - but the exchanges are taking place via the Internet. XML file can get to be five times bigger than an EDI file. And file size is very important especially when sending and receiving through the Internet.

This figure shows the reasons behind this recommendation about using the XML over the EDI by brief comparison between them:

#	**Point of Comparison**	**Electronic Data Interchange (EDI)**	**eXensible Markup Language (XML)**
1	***Function***	EDI is a well-established technology for automating order processing and document interchange between computer applications.	XML is an emerging standard designed to simplify Web-based e-commerce transactions between computer applications.
2	***Understand***	EDI documents are typically in a compressed, machine-only readable form.	XML is an open human-readable, text format.

3	***Transferring Documents***	EDI documents are typically sent via private and relatively expensive value-added networks (VANs).	XML documents are typically sent via the Internet - i.e. a relatively low-cost public network.
4	***Mapping***	EDI traditionally requires customized mapping of each new trading partner's document format.	XML is designed to require one customized mapping per industry grouping, so most companies will be able to work to one format and use XML.
5	***Operational Tool***	EDI typically requires dedicated servers that cost from US$10,000 and up.	XML requires a reliable PC with an Internet connection.
6	***Operational Network***	EDI can involve high on-going transaction based costs keeping up the connection to the EDI network and keeping the servers up and running.	EDI in Internet-based has low ongoing flat-rate costs using existing Internet connections and relatively low-cost Web Servers.
7	Capacity	EDI is estimated to be limited to 300,000 companies worldwide and about 20% of their suppliers because of operational costs and complexity.	XML appears to have no upper limit in terms of numbers of users.
8	Adjustments	EDI was traditionally built from the ground up in semi- isolation without being able to share resources with other programs.	XML is being developed in a world of shared software development populated by many low-cost tools and open source projects

After stating the difference between the XML and the EDI it seems that the XML has more advantages than EDI, such as: it easy to be understanding by human, lower cost, one customized mapping and more capacity.

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CHAPTER ONE

Theoretical framework of the research

CHAPTER TWO

Container Shipping Industry

CHAPTER FOUR

A case study of Alexandria International Container Terminal

CHAPTER FIVE

Conclusion and Recommendation

CHAPTER THREE

Information Technology Aids

THE ROLE OF ELECTRONIC DATA INTERCHANGE IN CONTAINER TERMINAL OPERATIONS:

"A CASE STUDY OF ALXANDRIA INTERNATIONAL CONTAINER TERMINAL"

By

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