

# Implementation and Performance Effect on Electronic Procurement and its Ship Management Companies

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**Abstract**—Transportation industry in general and maritime transportation industry in particular are not exception in this regard. Customers, partners, agents, collaborators, shippers, port operators, suppliers and service agencies are involved in the ship transport industry supply chain, and one of the major requirements in such a supply chain in which all concerned parties are scattered all over the world, is the high speed transferring of data between them. In maritime transportation procurement process plays an essential role. In this study based on the literature review, seven most frequently mentioned factors found. These performance factors were: Cost, visibility of supply chain, cycle time, procurement control, inventory management and purchasing errors which were influenced by implementing E-Procurement. An attempt has been made in this research to find the performance effect of e-procurement implementation in ship management companies.

**Index Terms**—E-Commerce, Internet, E-Procurement, E-Business.

## I. INTRODUCTION

The rapid growth of competition in the market and the consequent changes in economic conditions impose organizations and firms to implement new technologies to stay competitive. Those firms which have not implemented technology at the proper time are at the risk of losing customers or suppliers. (Jason R. Eaton 2003). Transportation industry in general and maritime transportation industry in particular are not exception in this regard. Operation in a very competitive market is the character of maritime transportation industry and the main driving factor toward implementing of technology in maritime transportation industry is continuous pressure for reducing overheads, costs and increasing efficiency and security.

Customers, partners, agents, collaborators, shippers, port operators, suppliers and service agencies are involved in the ship transport industry supply chain, and one of the major requirements in such a supply chain in which all concerned parties are scattered all over the world, is the high speed transferring of data between them. In order to achieve competitive advantage over the rivals, the e-commerce and e-business with their attributes are focal points for ship owners and other stakeholders.

Traditionally, the procurement process has consisted of excessive paperwork and a time-consuming process. The use of IT has changed the procurement process. E-procurement or electronic procurement means purchasing goods and services by using the internet as the communication media between different parties in the procurement process.

E-Procurement is purchasing of goods and services through internet or other information network. Organizations that automate their procurement system and control inventories could gain efficiency, reduce purchasing cost and improve delivery schedule.

Electronic business, or e-business, may be defined as the application of information and communication technologies (ICT) in support of all the activities of business. Commerce constitutes the exchange of products and services between businesses, groups and individuals and can be seen as one of the essential activities of any business. Electronic commerce focuses on the use of ICT to enable the external activities and relationships of the business with individuals, groups and other businesses.

Today, a major goal of a maritime's supply chain management is to apply information technology to their procurement systems efficiently and cost effectively. Moving away from traditional and paper based offline purchase processing to online procurement enables shipping lines to gain better procurement practices in terms of cost efficiency [1].

The remaining sections are organized as follows: Brief outline of E-Procurement process is presented in section 2. E-Procurement preprocessing methodology is mentioned in Section 3. The other phases of the system methodology are briefly explained in section 4. The implementation of the E-Procurement and data collection method is mentioned in Section 5 and 6. Experimental results are given in Section 7. Finally, Section 8 describes the concluding remarks.

## II. PROBLEM DISCUSSION

In the maritime competitive industry, cost reduction and increasing efficiency are important factors. As a result, ship management companies have implemented e-commerce to make more efficient business. Different parties in maritime supply chain such as customers, partners, agents, shippers, port operators spread geographically all over the world, ships are moving from a port to the other, they do need support in various places. Today one of the main necessities in ship management is facilitating the high speed data transferring between different parties in value chain activities to stay competitive [2].

Procurement technology plays a vital role in maritime industry, because ships usually purchase a large quantity of supplies for maintaining daily operations. The flow of goods, services, and information in maritime industry should be planned in a way that enables efficient transfer of these items into vessels. Today, a major goal of a maritime's supply chain management is to apply efficiently and cost effectively information technology to their procurement systems. Moving away from traditional offline purchase processing to online procurement presents significant savings, improved productivity and enhanced operational efficiencies.

Recently many ship management companies have used e-procurement solution in their procurement process. This e-procurement systems comparing to offline purchasing system heavily affected the companies buying center and total process of procurement.

### 2.1. Internet and E-Commerce

Kim and Ramkaran stated that like a desktop computer in the 1980s and the 1990s which had performed as a catalyst in re-engineering movement, the internet and WWW can be taken into account as a catalyst to radically change business process point of view. The inconceivable rise of Internet and information technology has changed the way of conducting business. Today most of organization and firms adopt Internet and information technology into their business processes. Internet and information technology provide new [3].

Backer defines e-business as the support of the several distinct phases of business transactions through

information technology. Nowadays, e-business and e-commerce plays a vital role in most of the firms and organizations, which operates in various parts of industries. The networks between shipping companies and their representatives allow both sides to monitor the bookings at online and offline marketing efforts in a single database. Bookings can be done directly into the systems, sent to centralized databases and then collected. It will provide shipping companies and their regional sales forces possibilities to operate efficiently [4].

### 2.2. Procurement and E-Procurement

Define procurement as "all of the activities involved in obtaining material and services and managing their inflow into an organization toward the end user. It includes obtaining manufacturing supplies for an assembly line as well as obtaining paper and pencils for a bank." Procurement always consists of paperwork and bureaucracy in both private and public sectors.

Procurement is the process of acquisition of appropriate material, goods or services and it contains a complete cycle of obtaining these items from ordering, processing, approval and receipt to payment approval [4]. Nowadays, Most of the companies spend a large portion of their income on procurement thus efficient transfer of goods, services and information is being focused by firms as an essential issue. Today companies tend to implement information technology to improve productivity and operational efficiency and decrease costs. The computer-enabled procurement system or e-procurement is a subset of e-business process of a firm.

E-Procurement is purchasing of goods and services through internet or other information network. Organizations that automate their procurement system and control inventories could gain efficiency, reduce purchasing cost and improve delivery schedule. He also mentioned that there are three major types of E-Procurement; ERP or enterprise resource planning which is used to create and approve purchasing using web technologies; e-sourcing which identifies suppliers by using information technology and web technology and finally e-tendering which sends information and pricing request to suppliers using internet technology.

### 2.3. Ship Management Company

Procurement is an important process which plays a vital role in maritime industry, because ships usually purchase a large quantity of supplies for maintaining daily operations. Today, a major goal of a maritime's supply chain management is to apply efficiently and cost effectively information technology to their procurement systems. The flow of goods, services, and information in maritime industry, should be planned in such a way that enables efficient transfer of these items into vessels. Moving away from traditional offline and paper-based purchase processing to online procurement presents significant savings, improved productivity and enhanced operational efficiencies.

### III. LITERATURE REVIEW

Theories about E-procurement will be presented in literature chapter based on the research problem which has been presented in chapter one, It will begin by with presenting of procurement and E-procurement and the followed by E-procurement in maritime industry.

#### 3.1. Procurement

Most of organizations and firms spend about one third of their income for purchase services and goods [5]. Even some researchers as kalakota and Robinson 1999 cited at David Caffey 2009 stated that 50 to 60 percent of total revenue is being spent on purchasing goods and services. Three steps of purchasing materials and services are information, negotiation, and settlement:

- Information: it consists of demand recognition, source evaluation and collecting data about vendors, products and market situation.
- Negotiation: it means communicating with suppliers and asking for quotation and availability for required materials, services and final contract
- Settlement: settlement means completion of contract; it is achieved when services and capital have been exchanged.

Due to the fact that most of organizations spend more than 30% of their revenue for purchasing materials and services, procurement has great business value; nevertheless this process is mostly very inefficient because of bureaucracy and complicated workflow which is time consuming and expensive.

#### 3.2. E-Procurement

The action of conducting procurement operation electronically and paper-free is called e-procurement which consists of whole operation of procurement such as requisition, approval, shipping, etc. and not just buying process. E-procurement encompasses "requisitioning, purchasing, transportation and in-bound receiving process". It starts with requisition for an item and ends with invoice payment

There are three types of e-procurements [5]:

- ERP which includes requesting and approval of purchasing process by utilizing internet technology
- E-tendering which is the request of information and price from suppliers and receiving feedback electronically
- E-sourcing which is the discovering and accessing new suppliers through internet and web technology.

### IV. SYSTEM METHODOLOGY

The system proposed uses background for undertaking a research, it contains research's theoretical

and philosophical assumption and guidance of these items for the methods adopted. In this chapter the researcher illustrates the system method used besides how the thesis is created.

#### 4.1 Research Purpose

Classifying business research on the basis of purpose allows us to understand how the nature of the problem influences the choice of research strategies. Referring to Zikmund there are three research purposes; exploratory, descriptive and explanatory or casual. The nature of the problem is determining the research purpose.

The exploratory research as a useful means in exploring what is happening; seeking new insight; asking questions and assessing phenomena in a new light. This type of research purpose is especially functional if the investigators wish to clear their understanding of the problem such as exploring the nature of the problem.

There are three ways for conducting exploratory research:

1. Literature research
2. Expert interviewing
3. Focus group interviewing

This study, according to research question moreover based on the fact that the researcher is trying to investigate the differences and similarities of the research findings with frame of reference, called descriptive study [6].

#### 4.2 Research Approach

There are two categories of research approach; quantitative and qualitative. Selecting any of these research approaches depends on the research problems and research questions.

We believes that in quantitative research approach, a theory is tested by using methods, which measures, and analyses research variables. In this approach, findings are spread and extendable. The limitations of quantitative approach are:

- Manipulation
- Reliance on measurement
- Variable control
- Reductionism

### V. DATA COLLECTION METHOD

We believe that data collecting process is the key strength of the case study method, which uses multiple sources and techniques. The researcher decides ahead about evidence to gather and analysis techniques to use with the collected data to find answers of research questions. Data gathering method is normally qualitative, yet in some cases can be quantitative. Surveys, interviews, documentation review, observation, and even the collection of physical artifacts are different methods for collecting data in a qualitative research.

One of the basic considerations in data collection is

type of data. There are two types of data in qualitative research, naturally occurring data and generated data. The main data gathering method in naturally occurring data are observation, documents analysis and interview analysis while the main methods in generated data are group interview and in-depth interview. There are six common sources of evidence in case studies see figure 1:

1. Documents (e.g., reports, newspaper articles)
2. Archival records
3. Interviews
4. Direct Observations
5. Participant-Observation
6. Physical Artifacts

Interview is one of the important sources of evidence; it plays an important role in case study research data collection [6]. Based on the research questions in this study, which are generated data, the data collection method discussion will be limited to the documents and in-depth interview in this study.

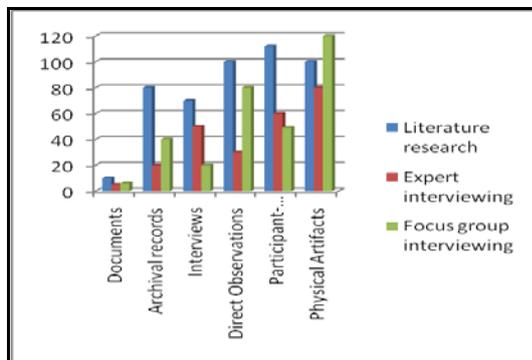


Figure. 1: Data collection method using Six Common Sources of Evidence in Case Studies.

**Security:** E-Business systems naturally have greater security risks than traditional business systems, therefore it is important for e-business systems to be fully protected against these risks. A far greater number of people have access to e-businesses through the internet than would have access to a traditional business. Customers, suppliers, employees, and numerous other people use any particular e-business system daily and expect their confidential information to stay secure. Hackers are one of the great threats to the security of e-businesses. Some common security concerns for e-Businesses include keeping business and customer information private and confidential, authenticity of data, and data integrity. Some of the methods of protecting e-business security and keeping information secure include physical security measures as well as data storage, data transmission, anti-virus software, firewalls, and encryption to list a few.

**Privacy and confidentiality:** Confidentiality is the extent to which businesses makes personal information available to other businesses and individuals. With any business, confidential information must remain secure and only be accessible to the intended recipient. However, this becomes even more difficult when

dealing with e-businesses specifically. To keep such information secure means protecting any electronic records and files from unauthorized access, as well as ensuring safe transmission and data storage of such information. Tools such as encryption and firewalls manage this specific concern within e-business.

**Authenticity:** E-business transactions pose greater challenges for establishing authenticity due to the ease with which electronic information may be altered and copied. Both parties in an e-business transaction want to have the assurance that the other party is who they claim to be, especially when a customer places an order and then submits a payment electronically. One common way to ensure this is to limit access to a network or trusted parties by using a virtual private network (VPN) technology. The establishment of authenticity is even greater when a combination of techniques are used, and such techniques involve checking "something you know" (i.e. password or PIN),

"something you need" (i.e. credit card), or "something you are" (i.e. digital signatures or voice recognition methods). Many times in e-business, however, "something you are" is pretty strongly verified by checking the purchaser's "something you have" (i.e. credit card) and "something you know" (i.e. card number).

**Data integrity:** Data integrity answers the question "Can the information be changed or corrupted in any way?" This leads to the assurance that the message received is identical to the message sent. A business needs to be confident that data is not changed in transit, whether deliberately or by accident. To help with data integrity, firewalls protect stored data against unauthorized access; while simply backing up data allows recovery should the data or equipment be damaged.

**Non-repudiation:** This concern deals with the existence of proof in a transaction. A business must have assurance that the receiving party or purchaser cannot deny that a transaction has occurred, and this means having sufficient evidence to prove the transaction. One way to address non-repudiation is using digital signatures. A digital signature not only ensures that a message or document has been electronically signed by the person, but since a digital signature can only be created by one person, it also ensures that this person cannot later deny that they provided their signature.

**Access control:** When certain electronic resources and information is limited to only a few authorized individuals, a business and its customers must have the assurance that no one else can access the systems or information. Fortunately, there are a variety of techniques to address this concern including firewalls, access privileges, user identification and authentication techniques (such as passwords and digital certificates), Virtual Private Networks (VPN), and much more.

**Availability:** This concern is specifically pertinent to a business' customers as certain information must be

available when customers need it. Messages must be delivered in a reliable and timely fashion, and information must be stored and retrieved as required. Because availability of service is important for all e-business websites, steps must be taken to prevent disruption of service by events such as power outages and damage to physical infrastructure. Examples to address this include data backup, fire-suppression systems, Uninterrupted Power Supply (UPS) systems, virus protection, as well as making sure that there is sufficient capacity to handle the demands posed by heavy network traffic.

## VI. SAMPLE SELECTION

We divided sampling techniques into two main categories:

1. Probability or representative sampling
2. Non-probability or judgment sampling

In probability sampling the probability of each sample selection is equal for all population, while in non-probability sampling, the probability of each case which is selected from total population is unknown. The generalization from non-probability samples about population is possible but not on statistical ground. There are three common methods for sampling in qualitative research: purposive sampling, quota sampling, and snowball sampling see figure 2.

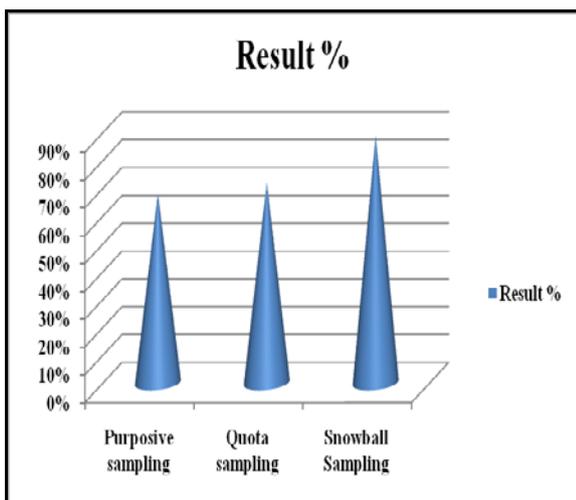


Figure. 2: Three common methods for sampling in qualitative research.

1. Purposive sampling: One of the most typical sampling strategies is the purposive sampling; based on the criteria relevant to a particular research questions the participants are selected. Sample sizes are not fixed before data collection. Purposive sample size uses the theoretical saturation; theoretical saturation is the point where there is no new insight to the research question or when the answers are theoretically saturated [7].

2. Quota sampling: It is sometimes considered as a type of purposive sampling. In this sampling method the researcher decides the size and characteristics of samples during designing the study.
3. Snowball Sampling: the snowball or chain referral sampling in the same way sometimes considered as a type of purposive sampling. This method is used when it is difficult to identify samples in the population; in this method, participants guide the researcher to other people who could potentially participate in or participate to the study. This method is in addition used to find hidden people which are not accessible through other sampling strategies [8].

## VII. EXPERIMENTAL RESULTS

According to the data analysis that conducted in the previous chapter, in this chapter the conclusions will be drawn. Consequently the managerial implication of this research will be presented. Furthermore, the recommendation for future research will be suggested.

Data collected from the organization under study confirms the effectiveness of e-procurement on cost reduction. According to the data collected through interviews, using electronic procurement systems reduce costs in the process of procurement directly and indirectly. E-procurement direct cost reduction has been achieved into two areas, first of all reducing costs of communications such as mail; telex etc. in comparison with the traditional procurement and secondly reducing the cost of papers and printing. If we accept time is valuable in shipping industry due to high cost of vessel's delay, the e-procurement application indirectly reduces costs by accelerating the procurement process in ship management companies. Another indirect cost reduction is also concerned with time reduction, with employing e-procurement, vessel's procurement orders are being received faster which creates more opportunities to choose the most cost-effective goods, services and supplies in the best place [9].

Three reasons have been found according to the collected data as the barriers for increasing efficiency and reducing number of employees see figure 3:

1. Implementing of e-procurement has increased the number of orders firstly by classifying items (different items cannot be collected in one order form) and secondly by providing convenience in ordering (on previous system ship's stuffs were trying to collect their orders in less forms due to difficulty of numbering and typing in paper-based forms). Therefore, in spite of reducing time for processing each order in e-procurement system, multiple requests have increased the volume of the work in the system.
2. Complexity of procurement process and bureaucracy also prevents from increasing

efficiency. The procurement processes have not been changed and the same paper-based system and rules have been applied to new e-procurement system.

3. Consideration about employees: IRISL is a government company which has some considerations about its employee's.

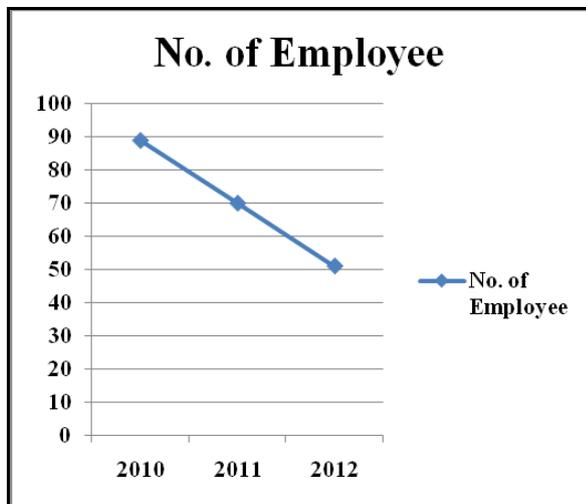


Figure. 3: Reducing number of employees

Concerning the efficiency improvement, it is recommended to control the number of procurement requests issuing by vessels, this will minimize the workload on the system. It can be done either by software limitation or applying special organization rules on order issuing.

Reengineering of procurement process in IRISL should be carried out to minimize the complexity and bureaucracy and increase the system efficiency. On the subject of inventory management, one of the main problems is vessel's updating; it should find the solution for the mentioned problem. Encouraging ship stuff by financial allowances and providing proper tools for inventory management can be considered as the solutions for this problem.

Concerning inventory management, IRISL should solve the problem of connectivity between maintenance and procurement software, in this way ship stuffs will only fill the information in one of these two software not both and this will reduce the workload on board of vessels. According to the data gathered from the samples, the effectiveness of e-procurement on error reduction in organization under study is approved. Based on the collected data utilizing electronic procurement has reduced the amount of supply errors.

## VIII. CONCLUSION

The research purpose and problem of the paper will be addressed and an overview of findings will be outlined. The purpose of the research was to provide better understanding of the impact of e-procurement in performance of ship management companies. The

research result indicates that in overall implementation of electronic procurement has enhanced performance in the Shipping management Company. In five of the seven research questions, interviewees have confirmed that the performance has increased dramatically. In the other two research questions, lack of performance improvement was not related to the electronic procurement system and it was mostly due to the managerial and systematic problems. Generally, e-procurement is found effective in increasing performance and it can be utilized as a beneficial tool, especially during economic crises in shipping companies.

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