

A STUDY ON PORT COMMUNITY SYSTEM DEVELOPMENT STRATEGIES IN TURKEY

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Abstract. The efficiency of communications among all the organizations which are somewhat connected to a seaport is crucial for effective port administration. The absence of such communication in Turkish maritime industry causes severe problems. Thus this paper aims to develop a guideline for successful development of a port community system in Turkey on the basis of SWOT analysis of the current situation and benchmarking successful cases around the world. For this purpose in-depth interviews were carried out with field experts of both public and industrial organizations. As a result, a three-stage development strategy was proposed.

1. INTRODUCTION

The appearance of international port logistics industry has been changing rapidly in the last few decades. In the old days, seaport were generally local institutions only serving their own hinterland. On the other hand increasing amount of international trade and container throughput, advent of ultra-large container vessels, changing customer demands, developments in information technology and new handling equipments, concerns about security and environmental issues have been putting great pressure on port administrations to increase their operational productivity and compete with other ports on a global scale. The advanced ports around the world are in a severe competition to ensure their strategic position as “hub” ports. In order to confront this competitive pressure, ports are investing heavily in their infrastructure and improving their operation systems.

Among these investments and improvement efforts, port community systems, which are “computer networks which link up the port with all the companies that use it, including hauliers, rail companies, shipping lines, feeder ports, shippers and customs officers” (Forward, 2003) are least studied. Such networks are being implemented in order to reduce paperwork and facilitate the information flow related for port operations and customs declarations, thus can significantly contribute to competitive power of a seaport.

Absence of such a system causes severe problems in Turkish maritime industry. Except for Customs Office and some terminal operators, most of the communications are carried out on paper. Even though customs and some terminal operators offer online declaration services, these services are not interconnected, thus the information stays where it is declared and cannot flow along the supply chain. For these reasons Turkish government, especially The Undersecretariat for Maritime Affairs, has been trying to establish a central information system to facilitate information flow along the whole seaport community.

On the other hand port community systems (PCS) require the participation of various organizations with different characteristics, often challenge them to integrate their systems or change their business processes. Previous studies state severe resistance of the port users which causes failure of the projects (Keceli et al., 2007) or delays and additional costs (Jeffrey, 1999). Considering the high failure rate of previous PCS development attempts, this paper aims to propose a model for successful PCS development in Turkey. For this purpose, the current situation of port operations and information flow among the port community was analyzed through in-depth interviews with public and industrial experts. Then a three-stage-transformation-strategy was proposed on the basis of SWOT analysis of the current situation and benchmarking successful cases around the world.

2. THEORETICAL BACKGROUND

2.1. Information Systems Used in Port Operations

The information systems used in port operations have three major functionalities (Fig. 1). Terminal operating systems (TOS) are “computer systems available for organizing the container terminal itself” (Jeffrey, [1]). These systems generally provide features related to the physical handling of cargo within the terminal area, such as planning, operation control, job instructions for equipments, etc. On the other hand Port Management Information Systems (PMIS) generally provide the upper management with features to monitor and control the overall port activities and other managerial functions, such as billing, automatic reporting, etc. Moreover, Port Community Systems are “computer networks which link up the port with all the companies that use it, including hauliers, rail companies, shipping lines, feeder ports, shippers and customs officers” (Forward, [2]). Such systems can be distinct systems or different modules in one integrated system, depending on the organizational structure of the port.

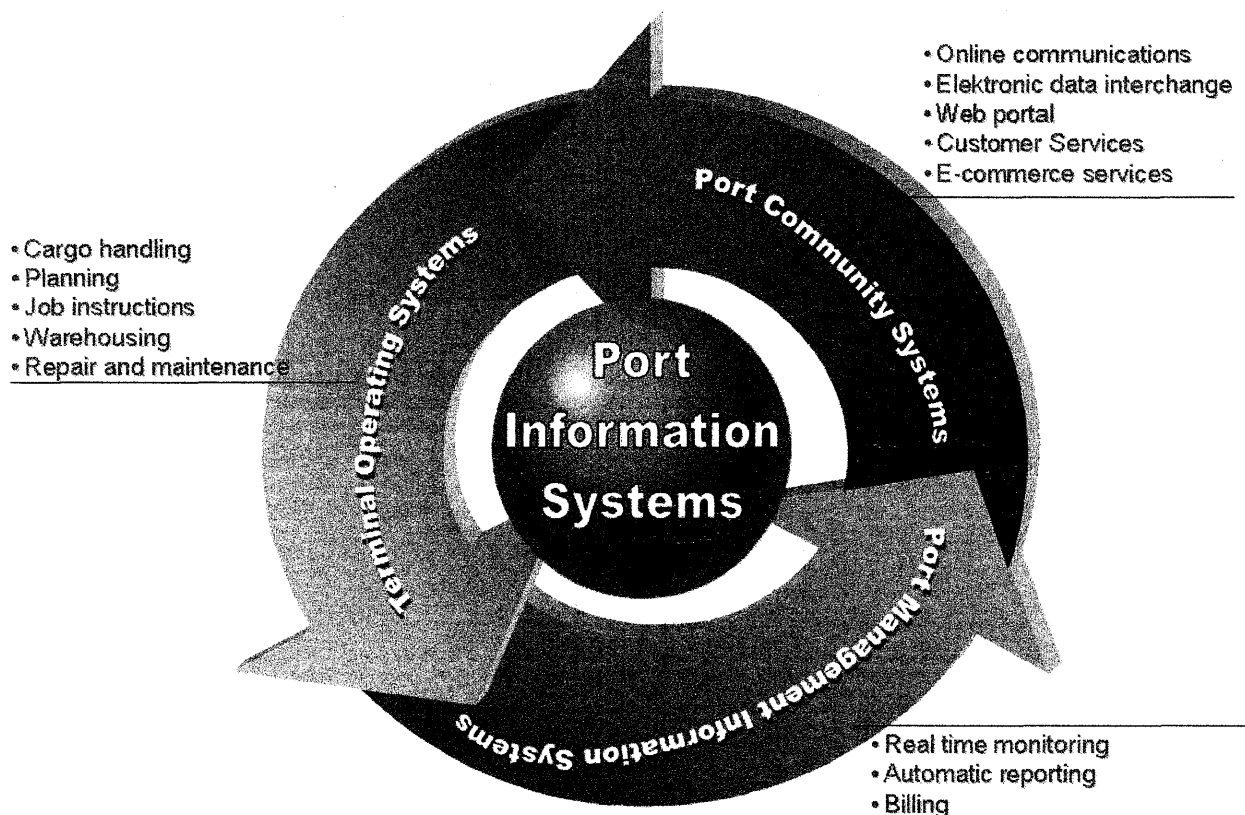


Fig. 1. Information Systems Used in Port Operations

2.2. Port Community Systems in World’s Advanced Ports

Port community systems have various forms and characteristics in each and every port. Among them, Portnet in Port of Singapore is the one that is most studied in previous research. Port of Singapore Authority’s (PSA) Portnet is the representative port community system since it is totally connected to PSA’s terminal operating system (CITOS) and custom declaration system (TradeXchange) of Singapore government (Applegate [3]). Besides Portnet, Data Communications System (Dakosy) [4] and COAST [5] (Container Authorization System) of Port of Hamburg, Customer Plus Programme and OnePort Ltd.[6] and Tradelink [7] of Port of Hong Kong, PortofRotterdam.com [8], Virtual Port and WebJonas [2] of Port of Rotterdam, PORT-MIS [9] and KTNET [10] in Busan Port can be considered as some of the well-known port community systems around the world. When the functionalities and services of these systems are examined, it can be easily concluded that not all of these systems offer full services required

by the port community, but some of them only offer a portion of the services, depending on the major stakeholders of each system. These functions can be classified under three major categories, namely port management related tasks, customs related tasks, and online platforms for electronic commerce among the port users, as shown in Table 1.

Table 1

Port Community Systems in World's Advanced Ports

| Port | System | Operator | Function | | |
|-----------|---------------------|---------------------------------------|----------------------------------|-------------------------------------|--------------------------------------|
| | | | Port Related Document Submission | Customs Related Document Submission | e-Business Function Among Port Users |
| Singapore | Portnet | Portnet.com | ✓ | ✓ | ✓ |
| | TradeXchange | CrimsonLogic Ltd. | x | ✓ | ✓ |
| Hamburg | Dakosy | Dakosy AG | ✓ | ✓ | ✓ |
| | COAST | HHLA | ✓ | x | x |
| Hong Kong | OnePort | OnePort Limited | ✓ | x | x |
| | Tradelink | Tradelink Electronic Commerce Limited | x | ✓ | ✓ |
| Rotterdam | Port Infolink | Port Infolink B.V. | ✓ | ✓ | x |
| | Portofrotterdam.com | The Port of Rotterdam Authority | ✓ | x | ✓ |
| | WebJonas | | x | x | ✓ |
| Busan | Port-MIS | KL-Net | ✓ | x | x |
| | KTNET | KTNET | x | ✓ | x |

2.3. Previous Studies on Port Community Systems

Traditionally, port users deliver cargo related documents and forms for port service requests through paper-based methods, such as sending a fax or handing in the documents directly. Sending the documents via e-mail also became a common practice due to the diffusion of the internet. The delivered information must be typed again in the port's information systems. Such typing works consume time and are vulnerable to typing errors. Port community systems allow the users to make service requests and input their information directly into the port's information system. Such a system drastically decreases paperwork, improves data quality, enables data integrity among different stakeholders, and supports the port management for operations ([11], [12]).

The study of Keceli et al. [13] is a case on Kumport's information systems. This paper is the first one to indicate resistance of port customers to information services offered by the port. It was stated the information services were not accepted by most of the customers, except for some big agencies that also work with foreign ports. Since the customers who appreciate the system are the ones who have already

tried similar procedures in other foreign ports, the main reason for this refusal is that these local agencies don't have experience about the information systems, thus cannot realize the convenience and benefits that the system will bring to their businesses. Thus, Keceli et al. [14] studied on the factors affecting adoption of PCS by sea and land carriers in Busan Port. The paper concludes that factors related to adopter company have the most powerful impact on system adoption, thus a successful implementation of a PCS definitely requires intimate relations with potential users

The study of Rodon and Ramis-Pujol [15] is a case study on Spanish Port Community Systems and it focuses on integrating with an existing system. It states that companies do not want changes to their activities and data models. Since it did not fit with adopters' processes, firms refused the programs. The study of Rodon et al. [16] is another case study on port community of Port of Barcelona, and it focuses on stakeholder relations in B2B environment. According to the paper, the potential users could not identify such practices in their daily operations, thus an increase in the interest for standard adoption among those who have participated in the standardization.

The article of Vincent [11] explains the PCS development efforts in India. The port community in India lacks a suitable EDI service provider, which was raised as one of the major obstacles in implementing EDI. The article states that one of the major obstacles to implementing a port community system in India is the cost of setting up and running such a system.

There are a few studies on port community systems; most of them are descriptive in nature (Rodon and Ramis-Pujol, [15]), mostly case studies. The deductions of these cases are utilized in the development of a suitable PCS implementation strategy for Turkish port industry.

3. CURRENT PORT ADMINISTRATION SYSTEM IN TURKEY

In order to analyze the current situation of port administration system in Turkey, several in-depth interviews were performed with field experts from Undersecretariat for Maritime Affairs, Harbour Master and some private ports.

Due to lack of a system for online data exchange, most of the operations are carried on paper-based methods. Some of the organizations have deployed or developed their own information systems, but transfer of data between such systems is not possible, since these systems are not developed without considering compatibility with each other, thus not integrated.

It is shipping agents duty to transfer each document from one organization to another, mostly as a printed document, as given in Fig. 2. Before the ship arrives at the port, the agent submits the required documents (1) to customs office to obtain permission to berth (2). The submits similar documents to the harbor master including the permission of the customs (3) in order to obtain permission to berth (4). The permissions are submitted altogether to the port administration (5) so that the ship can actually berth(6). After the berthing, customs officers board on the ship –generally with police officers– in order to inspect cargo and documentation. After inspections, customs officers issue a permission of loading(7), before which port operations cannot start. After the permission of the customs, port operations starts when the ship captain hands over the loading plan (8) to the port personelle. The port personnel generally record the berth and yard operations on a clipboard, and then input these information to the computers in the office (9). Some ports use sophisticated TOS software to control terminal operations, but such systems are not integrated to any external network for information exchange.

Both harbour master and customs office require the port management to submit status information via internet. Port officers are required to submit ship information, i.e. name, ship characteristics, positions and status, to the harbour master via internet on a daily basis (10). If the port handles liquid cargo, port officers are required to submit the cargo status in each tank to the customs office via internet on an hourly basis (11). No such requirement exists for other types of cargo.

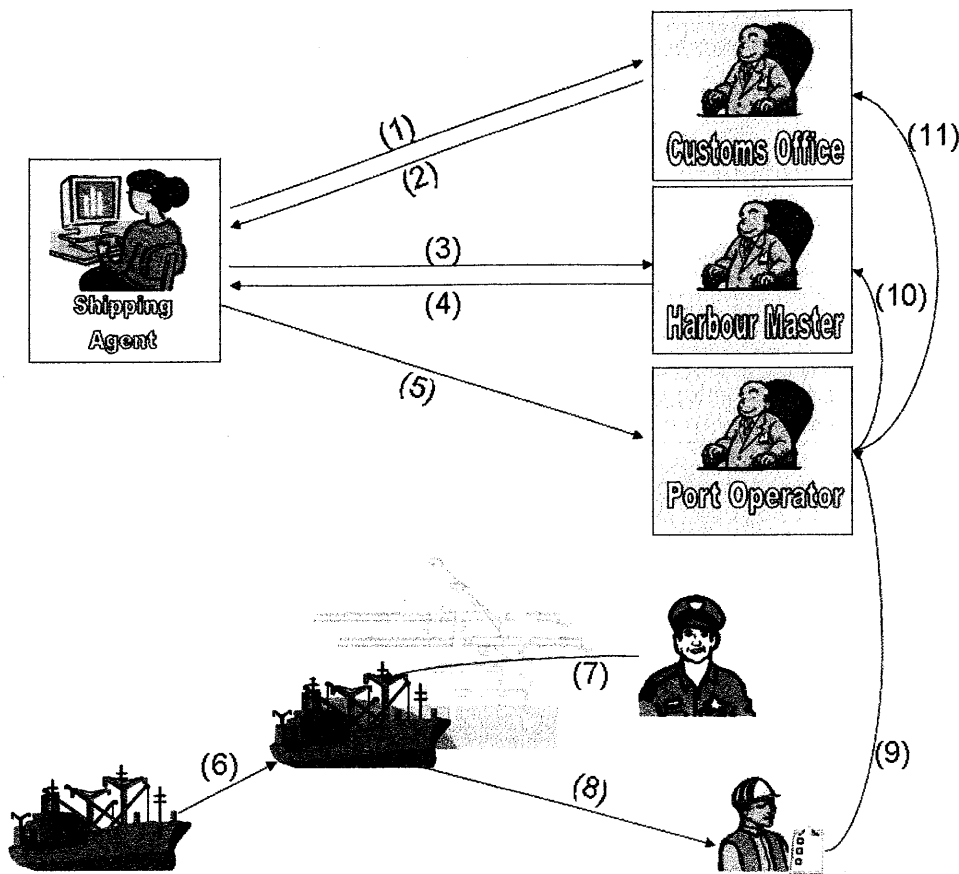


Fig. 2. Summary of Current Situation

4. PROBLEMS OF THE CURRENT SYSTEM

The general situation of the current system can be summarized as follows;

- **Too many repeated actions:** The shipping agents deliver the same documents to various institutions which decreases efficiency and increases process time. Since the same data on same documents are processed manually and differently in each institution, which is susceptible to every kind of human related errors (i.e. typing errors), eventually causing inconsistencies.
- **Intense paper traffic:** Since logistic activities are connected to each other just like the rings of a chain, the output data of one institution becomes the input for the another one. Eventhough each organization may have its own information processing capability, inter-organizational information transfer is based on paper. Data is printed out in one office, transported by the shipping agent, and then manually inputted in the other due to lack of connecting network among the organizations. Such paper dependance not only decreases overall efficiency, but also increases time of operations and rate of error.
- **Unreliable statistical data:** The data related to port activities are submitted by the port management to the harbour masters' office. But the port managements submit different figures to different organizations and there is no way to confirm which one really represents the actual situation of the ports. Ports may declare more than the actual their throughput to their customers in order to gain competitive advantage in the market, and they may declare less than the actual throughput to governmental offices in order to pay less tax. Any kind of additional statistical

data, such as performance indicators, speed of handling etc., can only be obtained by demand. Thus, there are serious problems about the quality and consistency of the statistical data for planning future projects and investments.

- **Weak control:** Paper-based operations have no back-up capability when processing officer makes a mistake. An officer may issue and permission to leave the port to a ship which is already detained by police, surveyor or another organization. This problem becomes more serious if the harbor master's office lack qualified human resources.
- **Difficulties in reaching information:** Storing information on paper makes it impossible to be accessed online. Thus any government, private or academic party has to make a request for any kind of information needed for any kind of research, project or investment. Eventhough if these requests are welcomed by the relevant authorities, it takes a long time to arrange and submit such information since hard-copy data is not convenient for analysis.

5. SWOT ANALYSIS OF THE CURRENT SYSTEM

In order to propose a direction of improvement, we have conducted a Strength-Weakness-Opportunity-Threat (SWOT) analysis.

Table 2

SWOT Analysis

| | |
|---|--|
| <p>Strength</p> <ul style="list-style-type: none"> - Proven technology - successful and unsuccessful cases are abundant for benchmarking; - Strong demand from the user side. | <p>Weakness</p> <ul style="list-style-type: none"> - Information stored as hard copies; - Some legal regulations require hard copy documents; - Inconsistent data for planning; - Weak control; - Insufficient infrastructure of the users; - Insufficient human resources. |
| <p>Opportunity</p> <ul style="list-style-type: none"> - Absence of port information systems makes it easier for integration; - Undersecretariat for Maritime Affairs had jurisdiction on port operators; - Support from industry, such as Chamber of Shipping, Port Operators Association, etc. | <p>Threat</p> <ul style="list-style-type: none"> - Privatization - implementation of various TOS types will make it more difficult for integration; - Conflict among different governmental institutions, such as Customs, Ministry of Finance etc. |

6. PROPOSED PORT COMMUNITY SYSTEM FOR TURKISH MARITIME INDUSTRY

There are a lot of examples in the world suggesting that a rapid implementation of any information system without proper adjustments in the underlying applications and processes is like to fail ([13], [14]). Thus port community system development efforts must be accompanied with transformation of underlying procedures and legislation.

Based on the analysis of the current procedures and the successful examples in the world, we have proposed a three-stage transformation strategy for Turkish maritime community, as shown in Fig. 3.

1. First Stage: Automation of Information Transfer Between the Port Operators and the Harbor Master's Office: Since the current legislation requires that each port operator must be certified by the Undersecretariat of Maritime Affairs, and the harbor masters have jurisdiction on the port operators, this stage is relatively easy to implement. The main objective of this stage is that every port operator must

implement a minimum level of terminal operating system (TOS) certified by the Undersecretariat of Maritime Affairs. This system should cover two main functions;

- (1) automatically report the activities within the port area to the harbor masters' office.
- (2) restrict the operations which are subject to the legal confirmation of the harbor master's office.

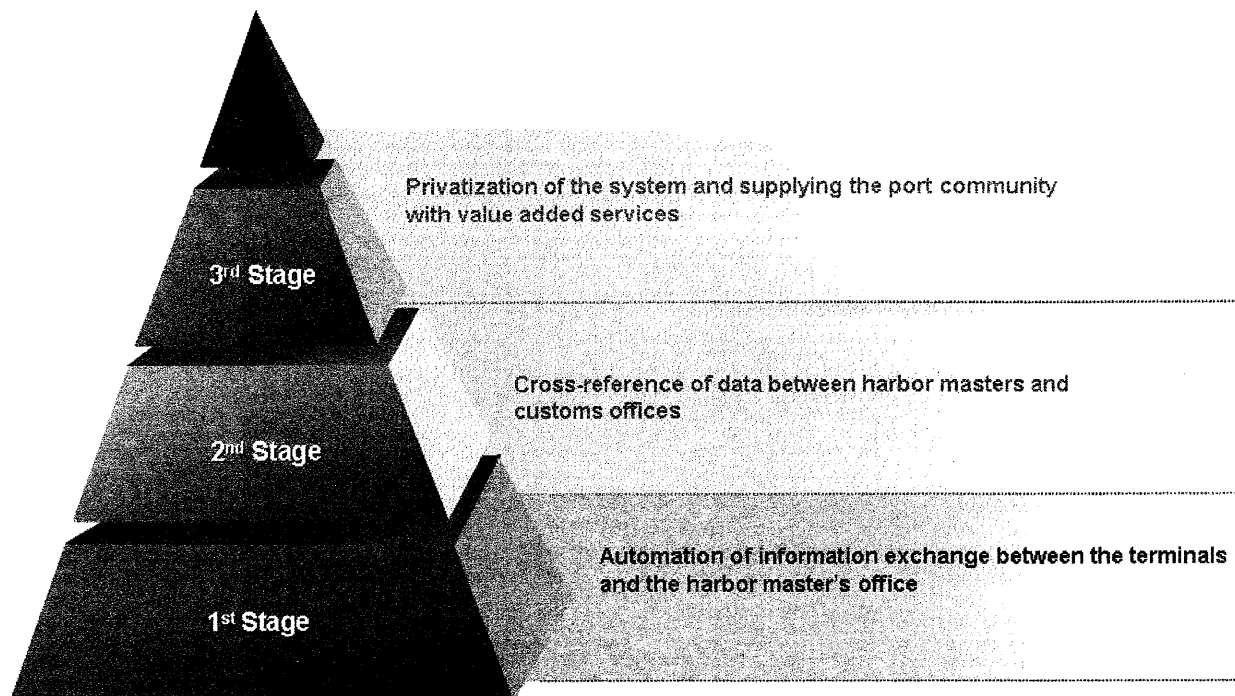


Fig. 3. Propose Strategy for Port Community Systems

The proposed port community system (PCS) is connected to ports' terminal operating systems (TOS) with and application program interface (API), where as government officers and customers can access the system through a graphical user interface (GUI), such as a web browser. The customers can log in their request through internet (1) and these requests can be transferred to the TOS of the corresponding terminal(2). On the basis of these requests, terminals can perform their operational planning and send job instructions to the equipment (3). In other words, terminal cannot perform any operation for any request without the confirmation of the harbor master's office. Upon completion of each task, equipment send reports to TOS (4) which are transfered to PCS (5). By this way, harbors office can maintain reliable statistical data which is obtained directly from the source where the data is created. The status of their cargo can be sent to the customers through a web portal or e-mail (6). Finally, the certifications and the legal requirements of the ships and the crew can be checked within the terminal area and logged into TOS via a hand terminal (7) and passed to the harbor master's office (5). The surveyors may go and check the ship when necessary.

In order to protect the privacy issues, the system does not necessarily cover any function related to the business relations (such as pricing) between the terminal operators and their customers. The information transfer is restricted to those which port operators are already supposed to report to the harbor master's office. Implementation of such a TOS would increase the efficiency of individual port and terminal operators, thus contribute to the international competitiveness of Turkish ports.

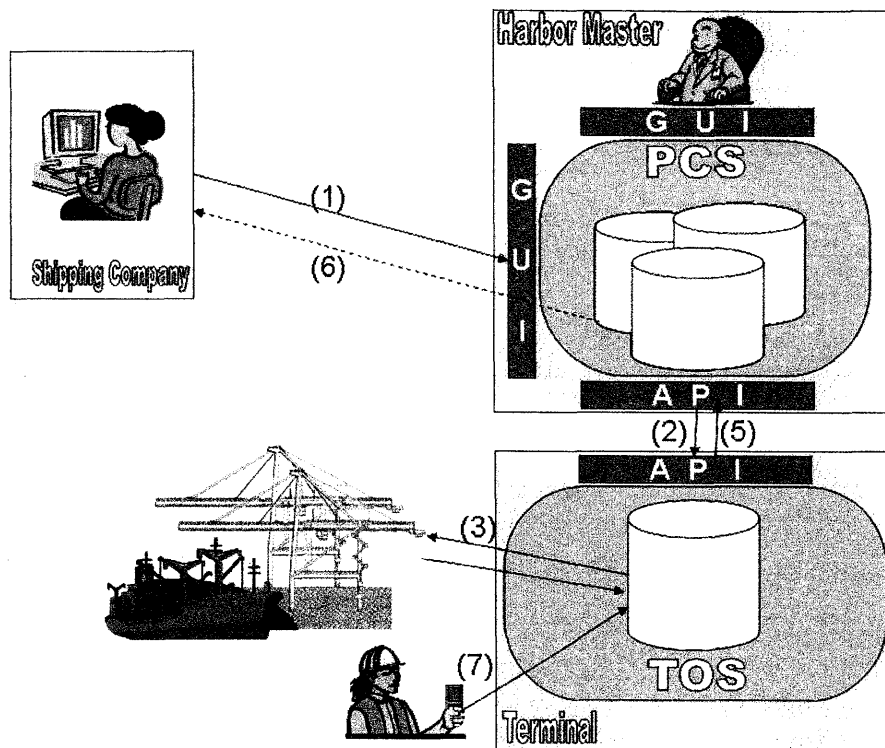


Fig. 4. First Stage of PCS

2. *Second Stage: Cross-reference of Data Between the Harbor Masters and Customs Office:* This stage is relatively more difficult to implement since neither the harbor masters nor the customs office have jurisdiction on the other. In this stage, an application program interface (API) would be provided between the databases of the harbor master's office and the customs office in order to check any inconsistencies in the data submitted by the shipping companies. These inconsistencies may be intentional or accidental. In any case, when there is any inconsistency, the customs enforcement officers or port state surveyors may directly visit the ship for verification. Thus limited number of personnel can be used more efficiently by focusing on the suspicious ships.

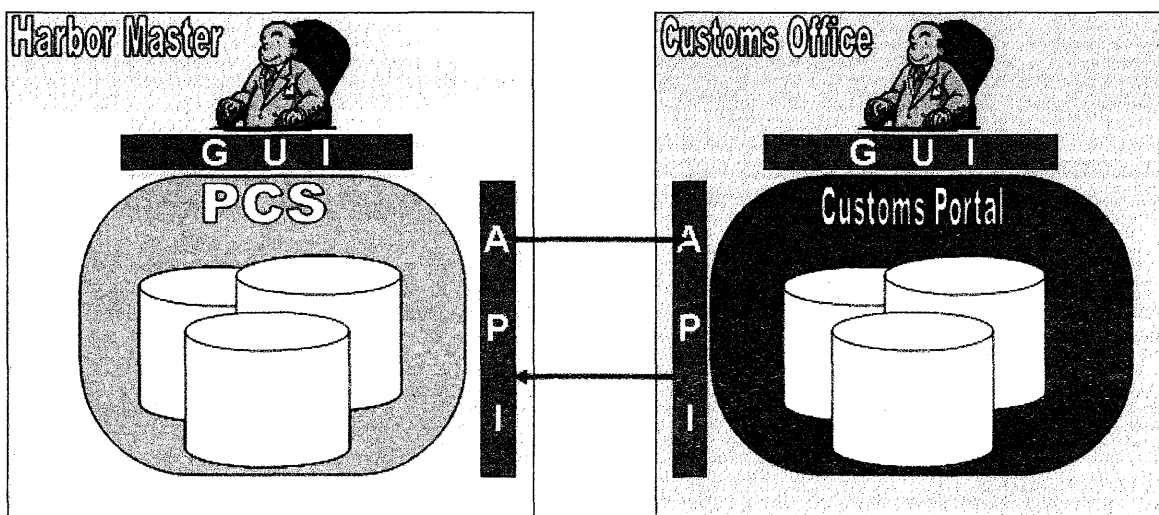


Fig. 5. Second Stage of PCS

3. Third Stage: Privatization of the System and Supplying the Port Community with Value Added Services: The involvement of the private companies (i.e. the port customers) in the system should be left to the final stage. There are several reasons for this. There are several published cases indicating that private companies may resist to change the type of business they are used to do, and refuse to use such a system until they perceive the benefits of the new system (Keceli et al., 2007; Keceli et al. 2008). Thus the involvement of the users before the maturity of the system may cause failure.

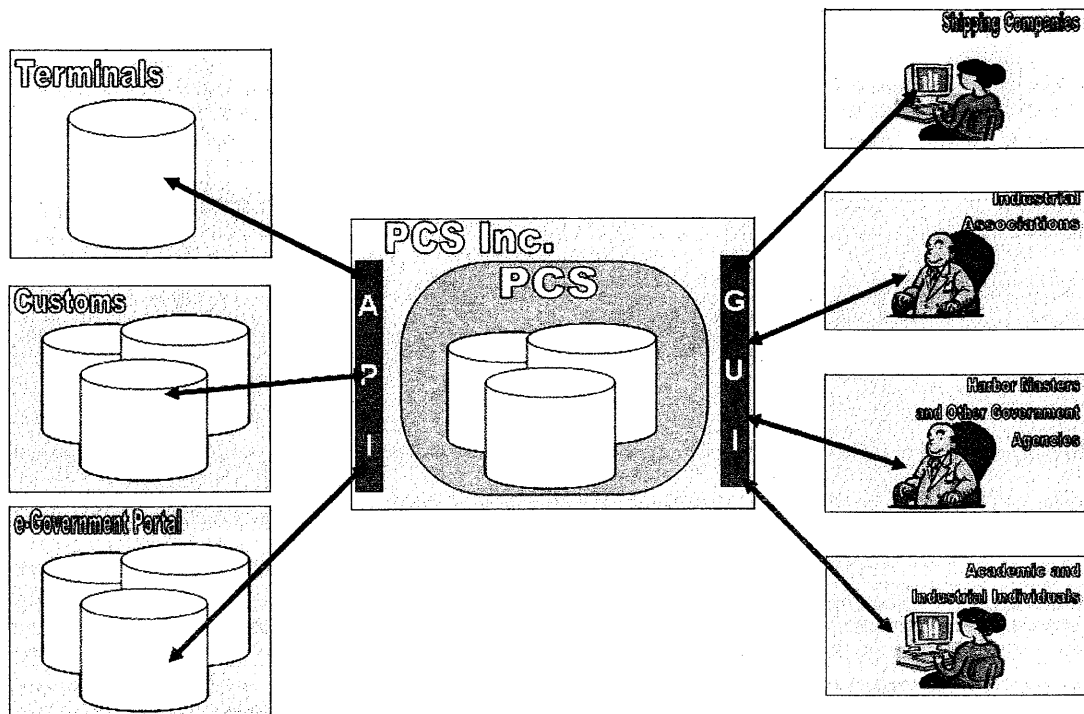


Fig. 6. Third Stage of PCS

Keceli (2008) suggests that user acceptance of port community systems directly depends on the support of the user company's top management and the technical reliability of the system. Thus, maturity of the system is not sufficient, the governmental agencies must provide good public relations with the industrial companies, such as providing training programs, seminars, incentives to ensure that the benefits of the new system is well perceived by the users.

Since it is not very practical for a governmental institute to provide commercial services, privatization of the system may contribute significantly to the efficiency of operations, quality of the services provided, and the acceptance of the system by the members of the port community. On the other hand, security and the control of the activities must be ensured by the government. Thus it is the best practice to operate a port community system by an independent corporation fully owned by the government. By this way not only commercial flexibility but also reliability and trust issues can be addressed.

7. EXPECTED BENEFITS OF THE PROPOSED SYSTEM

The expected benefits of the proposed system are summarized below:

- Performance:
 - Fast access to information.
 - Efficient use of limited human resources.
 - Strengthen control and enforcement mechanism.

- Information Quality:
 - Access to information directly from its source.
 - Decreased rates of human errors.
 - Decreased rates of inconsistency.
 - Analyzing raw data to obtain more quality information for decision support.
 - Recognizing unforeseen relations among data by using online data analysis techniques (such as data mining).
 - Provide reliable data for future investments, projects and research.
- Economic Benefits:
 - Decreased cost of information access.
 - Decreased communication costs for shipping companies.
 - Extra income for government.
 - Correct taxation and prevention of smuggling via cross-referencing data submitted by the shipping companies with actual cargo handled at the terminals.
 - Prevention of illegal income (i.e. bribery).
 - Decreasing the foreign dependency on port and logistics software.
- International Competitiveness:
 - International access to online information via internet.
 - Increased international competitiveness of Turkish ports.
 - Expected increase in the number of foreign ships calling at Turkish ports for transshipment.
 - Full conformity to international security standards.
- Efficiency of Terminal Operations:
 - Incentives and support for implementation of terminal operating systems in accordance with the prospective port community system.
 - Increased level of operational standards and efficiency within individual terminals.

8. CONCLUSION

In the modern world of port logistics, information systems play a crucial role in the competitiveness of ports. Among port related information systems, port community systems are the most difficult to implement due to enormous amount of investment required and inter-organizational relations that must be established. Industrial and academic literature is full of failure cases in which private companies find it difficult, or simply refuse to use the systems developed by the governments.

Under the light of past experiences, this paper proposes an transformation strategy for Turkish maritime industry for the implementation of the port community system. The main focus of this strategy is that all development efforts must be user-oriented, i.e. close relation with the users in the industry must be maintained and the design of the system features must be based on the needs and the value perceptions of the users.

A stepwise bottom-up development approach is proposed, such that small connections between ports and harbor masters must be established first, and then the system must be expanded with additional functions. Such an approach would increase the possibility of system's success since the system would reach a certain maturity level before external organizations participate willingly. On the other hand, since harbor masters have jurisdiction on the port operators, the system can be enforced to the port operators, minimizing the resistance to the system before it reaches a certain level of maturity.

The main limitation of this paper is that port community system development in Turkey is still an ongoing process. The outcomes of this paper is supposed to provide a guideline for the policy makers not only in

Turkey but also in other developing countries. When the Project comes to an end, the evaluation of the developed system on the basis of these guidelines still remains as an important topic for future research.

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