# Critical Success Factors of Information Systems in Kumport and Implications for Other Turkish Ports

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*Abstract:* - Due to increase in the amount of international trade and developments in shipbuilding and cargo handling technology, seaports are in a fierce competition to become the hub port of their region, and they are heavily investing in infrastructure and information technology in order to increase their operational efficiency. On the other hand, Turkish seaports fell behind on deploying information technology and the inefficiency is negatively affecting Turkish logistics industry.

The main purpose of this paper is to derive useful implications about information technology development for Turkish ports through the case study of Kumport, which is the best-in-class port in Turkey to deploy information technology. For this purposes, a series of interviews and observations were conducted on August 2006. According to the results, the success of Kumport lies in the foreseeing vision and determined attitude of the top management, and the consistency of the information systems with the local conditions and legal requirements in Turkey.

*Key-Words:* - Turkish ports, port information systems, Turkey, Kumport, critical success factors

## 1 Introduction

In the world of globalization, increase in total international trade, the impetus of containerization, and the advent of ultra-large container vessels enforced the seaports to a fierce competition to invest in port infrastructure in order to decrease service time, thus increase port's overall efficiency. For this reason, deployment of information system to regulate the operations within the port has been gaining importance. On the other hand, the level of utilization of information technology in major container ports in Turkey is relatively low. Due the insufficient infrastructure, the transport corridor between Europe and Asia is being shifted beyond the borders of Turkey [1].

Kumport, which is located in the Ambarli Port Complex [2], on the south-west coast of Istanbul, is by far the most high-tech container terminal in Turkey [3]. The information systems in Kumport made it the most efficient port in Turkey, and awarded a "Golden Anchor" by Deniz Haber [4] and Dunya Newspaper

[5] in 2006. In this paper, the information systems in Kumport were studied as the best-in-class case. The main purpose of this study is to identify the factors that led Kumport's success and to derive guidelines that can be used for information system development for other ports in Turkey.

## 2 Background of Kumport's Information Systems

System development process in Kumport, which can be divided into three phases, dates back to 1999. Those days Kumport was a small, general cargo based port whose annual container throughput couldn't exceed 10,000 TEU's. In those days port managers decided to sell the port and the main purpose of information system development was to increase the price. As a part of such a strategy, system development efforts were not based on a systematic research, planning or design, since the port managers did not intend to use the system at all.

In the second phase, failing to sell the port, the managers changed the strategy, and decided to run the port in a more efficient way. Due to the improvements in industrial and economic activity in Ambarli Port Complex, container throughput increased drastically, making it impossible to deal without computerized systems. Naturally, the system developed in the first phase couldn't fit the new requirements of the port, so several modules and functionalities were just added on the demand of the customers, without any distinct prior planning. But ironically, port's situation and environment were also changing simultaneously and the developments in the system always followed the improvements in the industry and the port itself. New yard management system development efforts started in 2002 and the system was implemented in the middle of 2003. Instead of deploying a package program for, like many other private ports in Turkey did, Kumport had its own system coded by a domestic company called Solon, in order to ensure that the system is in accordance with Turkey's local condition and legal requirements.

As the time passes, the strategy about information systems was also changed. Starting from 2006, Kumport is undergoing a system renewal project, which is supposed to continue for 2 years. Since all the source codes and documentation about the current system is possessed by the developer company, the port management is not able to configure the system when necessary. Especially when there is a failure in the system, the port depends on service of the developer company, which may not be feasible when needed. This time Kumport is developing its own system in order to possess the source codes. For this project, the port management has formed a project team of eight people, who are experienced about the subject. Unlike the previous projects, the new process is planned prior to development. In order to guarantee the success of the system, everything is carried out more scientifically and more professionally, including requirement analyses, design phases, required planning and process re-engineering. Besides, all efforts are documented systematically for future use. By doing so, Kumport will hold the advantage of having an information system that both fits exactly the requirements of the port and enables the port to revise and modify it whenever necessary.

## 3 Current Information Systems in Kumport

Although Kumport's system is the best case in Turkey, the system still depends on human intervention in its most basic functions. Kumport's port management system consists of several application programs which are connected to a central database. Theses programs are given in Table 1.

| Program | Description |
|---|---|
| *Solon Acenta* | Service requests from shipping firms are inputted to the system |
| *Solon Yard Plan* | Positions of containers in the yard area is determined by the Kumport staff and inputted to the system. |
| *Solon Bayplan* | Bayplans which are transferred from the ship captain are inputted to the system by Kumport staff. |
| *Solon Otomasyon* | Every operation within the port area can be monitored real-time. This program also enables general management functions, such as cargo tracking, billing, etc. |
| *Solon Job* | According to yard and bayplans inputted to the system, this program produces job instructions for operational staff (i.e. crane operators, stacker operators, forklift operators, etc.) |
| *Solon SP Terminal* | This program runs on hand terminals. |
| *Solon Kapi* | This program controls flow in and out of trucks through the gate. |

Table 1. The application programs used in Kumport

Although shipping companies can input their requests and cargo information directly through a dedicated line using *Solon Acenta* program, most of the firms prefer to send their information via e-mail or fax. These requests are taken by Kumport staff and manually inputted to the system. *Solon Yard Plan* program enables semi-automatic yard planning. It assists the staff to determine the positions of the containers in the yard. If the containers are to be exported, the bayplan which is obtained from the ship captain is also entered the system manually, using *Solon Bayplan* program.

The whole yard area is covered by wireless network that consists of 29 access points installed throughout the yard area, vehicle-mounted terminals and hand terminals. Vehicle mounted terminals have a touchpad screen and are mounted to the every quay crane, yard crane (RTG), stacker, forklift and other transport vehicles within the terminal. Hand terminals are used by pointers within the quay area and controllers in front of the gate.

When a truck brings a container to the port, it is stopped by a controller before entering the gate. The controller checks via his hand terminal whether the information of the container is inputted the system. If the information is not entered the system in advance, the truck is not allowed until the problem is solved. If the truck and the cargo information have been entered to the system, the controller lets the truck approach the gate. At the gate, gate clerk enters the vehicle number into the computer using *Solon Kapi* program. When the information about the truck and the cargo appears in the user interface, the driver is given a paper slip which indicates the entrance date and time, gate number, a serial number and vehicle plate number (in barcode form), container number, position in the yard, and the details about the shipping company and the container condition (container type, damage, etc.). If the truck is entering without container, the card contains only date, time, serial number, vehicle plate number and where to go in the yard. When the truck leaves the gate, the gate clerk takes back the slip and scans the barcode, and the gate-out process is automatically proceeded by the computer. On the other hand, various bureaucratic requirements related to customs and customs enforcement, which cannot be proceeded by the port management itself, must be fulfilled manually prior to leaving the gate.

Within the yard area, every equipment is supplied with a touch-pad terminal and directly connected to the central database. Based on the yard and bay plans which are entered to the system in advance, Solon Job program produces job instructions for every operator within the yard area. The user interface for crane and vehicle operators is designed extremely user-friendly, so that operators can report the completion of a task by clicking a single button on a touch-pad screen. The terminals mounted on the RTG's automatically report the task completion to the system, without any intervention of the human operator.

During loading and unloading operations in Kumport, there are six people in a post, four of whom are the members of the stevedoring company. Only two of them, i.e. a crane operator and a pointer, are Kumport's workers. The interface of the crane operator is very similar to that of the operators in the yard. The operations are assisted by a pointer who holds a hand terminal and reports every movement to system.

Every operation in the terminal can be traced real-time using *Solon Otomasyon* program. This program provides several management functions, such as container tracking in the yard, monitoring the current situation of all the tasks in the terminal area, completion rates of loading and unloading tasks, automatic service assessment and billing, and reporting. Not only the port managers but also the shipping firms are reported through this program. Every realized service throughout the day is reported to the firms next morning until 10 am via e-mail. The firms are allowed –in fact recommended- to deploy this program in order to track the current situation of their containers on a real-time basis, but only a few of them actually do so.

Starting from 2006, Kumport is holding a project that will continue for about two years to renew the existing information systems and strengthen some weak points of the current system, such as optimization, planning and internet-based customer relationship management (CRM). The port management targets at least two million TEU's by the year 2010, so the renewal of the information systems will be accompanied by a series of structural improvements. These structural improvements include replacement of quay cranes by SSG cranes, filling the sea for new stacking area, and construction of a viaduct to connect the two custom zones. The yard operations will be based on RTG's and RMG's, making the stackers out of concept.

## 4 Critical Success Factors for Information Systems in Kumport

According to the results of the questionnaire survey

that was carried out on August 2006, using Delphi method, critical success factors of Kumport's information system development project are listed below.

- Resoluteness and sanction power of the top management
- Formation of an experienced project team.
- Considering Turkey's local conditions and legal requirement during modeling and design of the system.
- Perfection of tests before going live.
- Internet-based CRM.

# 5 Discussion

Implications derived from the case of Kumport that can be useful for information system development projects for other ports are given below.

## 5.1 Factors within the port

### 5.1.1 Top management

There are several sources for system requests in an organization, such as departmental managers, top management, system analysts and outside groups. Among them, systems proposed by top management tend to be generally broader in scope, but also more difficult to manage, thus departmental projects are more likely to be successful, if the users are actively involve in the process [6]. On the other hand, the success of information systems development efforts in Kumport deeply depends on the enforcement of the top management, since at the beginning any other departmental officers had neither vision nor knowledge about the information systems. The top management took a series of cautions to have the employees and the customers to share this vision.

The port management was confident in this vision and every step was taken consciously. That's why Kumport didn't repeat the mistakes of other ports, which failed to align their systems to current conditions and legal restrictions in Turkey. The system was originally designed to respond those factors thus increasing the efficiency of the system and decreasing the development costs. These factors are discussed in Chapter 6.2.1 in more detail.

The success of information systems in Port of Singapore depended on the entrepreneurship of the state [7], so lack of such a state in Turkey was covered by Kumport's top management.

### 5.1.2 Labor and staff

When Kumport executed the information system project, there is said to be a "natural" resistance to the system. Both the office staff and the operational staff opposed the system severely. They even cut the wires vandalize the equipment. According to the port officials, there are several reasons for the staff to have such difficulties in adapting to the new system. Education level of most of the operational personnel is low, and they were totally not computer oriented. Hence they lacked the understanding of how the system works and what benefits it brings. The new system also caused the employees to fear for losing their jobs. On the other hand, some of the personnel were encountering illegitimate activities, such as bribing truck drivers, and these activities were prevented by the adoption of the system, causing more resistance to the system.

Kumport confronted this resistance by enforcement and training. Whoever resisted and failed to adapt the system was sent off. Then the staff understood that there was no other option for them, but to get used to the system. The training programs helped the staff not only with technical skills but also personal development and computer orientation. Special simulation rooms were constructed for this purpose. After getting to know the system, the fear for their jobs vanished and they realized the convenience of working with computer. For the time being, the staff got used to the system so much that they almost forgot to do the operations in conventional ways.

The information systems in Kumport also imply human ergonomics for system design. General profile for operations staff in the Turkish ports is said to be "low educational level" and "impatient", thus trying to use the equipment and touchpad terminal at the same time causes accidents. On average, two people die in Turkish ports in a year due to such operational accidents. Kumport is no exception, four people died in the last six years. Kumport approached to this problem by keeping the user interface of the equipment terminals very simple. Operations can be reported to the main system with only one click on the touchpad screen for stackers and forklifts. RTG's even don't require this, the operations are reported automatically. By doing so, the workload of the equipment and crane operators is kept at a minimum level to minimize error and accident rates.

## 5.2 Factors within Turkey

### 5.2.1 Law and regulations

As stated above, Turkish government is pretty far from being a "developmental state" referred by Lee-Partridge [7], and Turkish maritime industry is suffering from severe bureaucratic inefficiencies and multiple-governance [8][9]. The port management has legal responsibilities to Customs, Customs Enforcement, Ministry of Finance, Directorate of National Estates, Undersecretariat for Maritime Affairs, Istanbul Regional Directorate for Undersecretariat for Maritime Affairs. All these government organs require different conditions to be fulfilled and the multiplicity of regulatory organizations cause time delays and operational inefficiency. Thus there is a lot of literature about necessity of establishing a ministry maritime affairs and unification of all maritime regulation activities under the roof of this ministry [8][10]. Some of these regulatory bodies and the relations between the port management and them are peculiar to Turkey, so the information systems package programs that are provided by foreign companies –such as Navis, Cosmos, etc.– do not contain modules or functions for such local conditions and legal requirements that exist only in Turkey. For example, most of the container terminal operating systems treat containers as the unit item and define it with its number and properties (i.e. 20 ft, 40ft, reefer, dangerous cargo etc.). On the other hand, Turkish Customs Law requires that the port management must keep track of the list of the commodities in a container and their properties. Some other ports in Turkey spent some effort on such package programs but the results were not satisfactory. Kumport managers were glad that system was designed considering Turkey's conditions and thus preventing extra modifications on the program.

Another regulatory problem is that port management is not allowed to access EDI system of the Customs Office. The agencies submit their customs declarations to the port management and the Customs Office separately, thus duplication of data may cause inconsistencies. Kumport is planning to overcome this problem by cooperating with the agencies in order to retrieve custom declaration information from the agencies on an online basis.

### 5.2.2 Customers

Although the information systems yield benefits to both the port management and the customers, they did not cooperate for these technological efforts very much. Kumport proposed the agencies to install the software supplied, and input the service requests directly to the system database, instead of sending them via e-mail. But this offer was not accepted by most of the customers, except for some big agencies that also work with foreign ports. Kumport offered many incentives, such as hardware and software supply, and even offered to give an office space within the port area, but the result was not changed.

There are various reasons for the agents to refuse to use the system. Just like the port employees, the customers also don't want to change the way of business that they are used to. Some of them consider that the system implies workload transfer from the port to themselves. But 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.

Kumport is planning to overcome this with a web-based eased service request system, which will allow the customers to input their service requests directly through internet, without any need for separate software installation. On the other hand, the port has grown to such an extend that it has the power to be able to refuse the customers that still refuse to adapt the system. Kumport managers believe that when customers are forced to use the system for the beginning, they will realize the benefits and the convenience of the new system, and the resistance to the system will be minimized, just as in the case of the employees.

### 5.2.3 Software developers and academia

Kumport managers stated that Turkish port management industry has spent a lot time and money on information systems, but the results are still not so satisfactory. None of the Turkish ports managed to succeed with the system at the first trial; rather the current systems were developed by the end of a series of failures. The basic logic behind these failures is very simple but it took a lot of time for the port managements to realize this.

An information system for a Turkish port would either be developed within the port itself or it would be outsourced from somewhere else, but it seems that other Turkish ports couldn't succeed both of them. When they tried to deploy a package program, which is developed by a foreign company, it didn't match the legal requirements, because most of these are unique to Turkey. In order to fill the gaps between the system

and the requirements, other supplementary programs were developed, increasing the cost and decreasing the efficiency. On the other hand, none of these ports had sufficient human resources to develop the system by themselves. Another option was to outsource the system from a domestic IT company. But the port management couldn't trust "table and chair" IT firms, whether they could provide enough service, since the operations in the port may cease because of a possible failure in the system. Moreover, there is not enough academic research on this subject to guide the industrial organizations.

Since none of the related parties, i.e. government, port management, shipping and logistics industrial organizations, IT firms and academic units, do not have adequate expert knowledge and experience on this subject, development and standardization of information systems for Turkish ports must be put into practice as a collective effort of the whole port community.

## 6 Conclusion and Future Research

Kumport clearly represents a best example of successful deployment of information systems among Turkish seaports. The main contribution of this paper will depend on the applicability of the results to development of information systems in other public and private ports of Turkey. This issue has been gaining importance since the government decided to privatize the major national ports, i.e. Mersin, Izmir and Iskenderun, which were operated by Turkish State Railways (abb. TCDD).

The case of Kumport can be summarized around three points, the most important of which is the emphasis on the consistency of the information systems with the current legal and regulatory system in Turkey. The second one is that the success of the system totally depends on the foresight, vision, resoluteness and enforcement of the top management. Finally the third point is that neither the labor within the port nor other organizations outside the port lack consciousness about information systems and they are highly probable to resist participating the system. Operating in the same environment, these issues should strongly be considered prior to implementation projects for any other port in Turkey, in order to prevent the repetition of past failures.

Information system development for Turkish ports is a rich in content field for future research. For example the current situation of all public and private ports should be reviewed and classified, and the factors that caused previous failures should be detected. Thus the similarities between them can be discovered and a base for information systems "standards" can be established. On the other hand government's policy and the legal requirements imposed on the ports should be reviewed and an improvement plan should be proposed. Finally, a survey research targeting other port community members can be conducted in order to seize their doubts, perceptions and expectations about the information systems, thus these results can be reflected to system design.

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