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Emerald Article: Logistics and transportation information systems in Turkey: e-government perspectives

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Logistics and transportation information systems in Turkey: e-government perspectives

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Abstract

Purpose – The purpose of this paper is to make an overall research on transport applications and discuss the critical success factors of e-transport applications in Turkey.

Design/methodology/approach – Based on literature review on e-government applications, this paper builds on theoretical understanding of critical success factors in e-transport applications.

Findings – Considering the critical success factors in transport related e-government services in Turkey, increasing logistics and transportation activities, national information system strategy towards the advanced information technology applications, adoption of European Union and international standards, awareness of transport industry about the importance of information technology, new regulations for information technology, priorities in providing financial incentives for information technology based innovation projects are determined as some of the opportunities for the development of information technology in Turkey. In terms of threats, insufficient use of e-transport services due to security and privacy problems, need for substantial financial resources, fragmented nature of organizational aspects, limited number of information technology providers in transport applications, insufficient amount of R&D and need for substantial financial resources are determined as threats for transport related government services.

Research limitations/implications – This paper is considered only for e-transport applications in Turkey.

Practical implications – The results can be used to develop policies to increase e-government adoption.

Originality/value – Critical success factors method addresses the requirements for developing e-government policies.

Keywords Transportation, Information systems, Turkey

Paper type Conceptual paper

Introduction

Information systems perform three vital roles in any type of organization: they support business operations, managerial decision making, and strategic competitive advantage. The application and development of IT have already had significant effects on the field of logistics and transportation. Owing to this development; business operation, up and downstream partnership in supply chains and customer relationship are changing. It is emphasized that passing information to all parties in the supply

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chains via IT will improve performances (Disney *et al.*, 2004). IT has been promoted as a means to enhance logistics competitiveness. It is seen as one of the few factors which has been proved to have the capability of increasing logistics competence and decreasing its costs simultaneously (Closs *et al.*, 1997; Stock and Lambert, 2001). Today both governments and intergovernmental organizations are all devoting their efforts to searching for chances of new development and application of IT. Globalization of logistics and transportation activities due to advances in technology, globalization of trade and supply chain management further required IT for smooth operation in global markets. As Sethi (2006) emphasized, transport provides a catalytic role in introducing development in all areas. As it is known, transport is also an important part of e-government applications. The aim of this research is to define the critical success factors in e-transport applications so that it will be possible to define the framework for removing a barrier in development in a developing country, Turkey.

The role and impact of information technology on logistics and transportation

The key enablers of interorganizational systems (IOS) is telecommunications and IT systems. According to Handfield and Ernest (1999), appropriate use of IOS provides decision makers with timely access to all required information, in an appropriate format, from any location within the supply chain. From the IOS perspective; IT is the main tool for integrating, coordinating and controlling the actors in the supply chain. Third party logistics service providers (LSP) and carriers as part of that chain provides product, service and information flow among the parties in that chain. Hence, in order to provide seamless service effectively and efficiently, logistics and transportation services should be integrated to the supply chain with effective and efficient IT. Logistics and transportation industry is one of the most international and complex industries involving many different parties including state authorities and procedures and requiring complex paper works (Figure 1).

Development of IT has made the integration of supply chains become possible, so that the links between parties in the chain, and the third parties are easier to establish. It is found that logistics managers and related state authorities increasingly seen to focus their efforts on the development of information systems and software tools. This is leading to new logistics practices and/or innovations (Hoek, 1998). Closs *et al.*, 1997 proved that IT capabilities can significantly influence overall logistics competence, specifically on quick response, standardization, and flexibility. Lai *et al.* (2005) investigated the impact of IT on the competitive advantage of logistics firm in China and found that IT could significantly influence a firm's compatitive advantage, and the effects are nonlinear.

Lancioni *et al.* (2000) has discussed how internet is used to manage the major components of supply chains and vendor relations. They pointed out that internet will continue to provide logistics managers with business information and enable them to improve the profitability of their supply chains. The development of IT has been predicted dramatically to affect the ways that business is conducted (Leek *et al.*, 2003). With the integration of IT; new products, services and marketing processes can be created to change the relationship between manufacturers and customers and to improve customer relationship ability (Hoek, 1998). Successful companies have developed customer focused e-business solutions for improving customer service levels

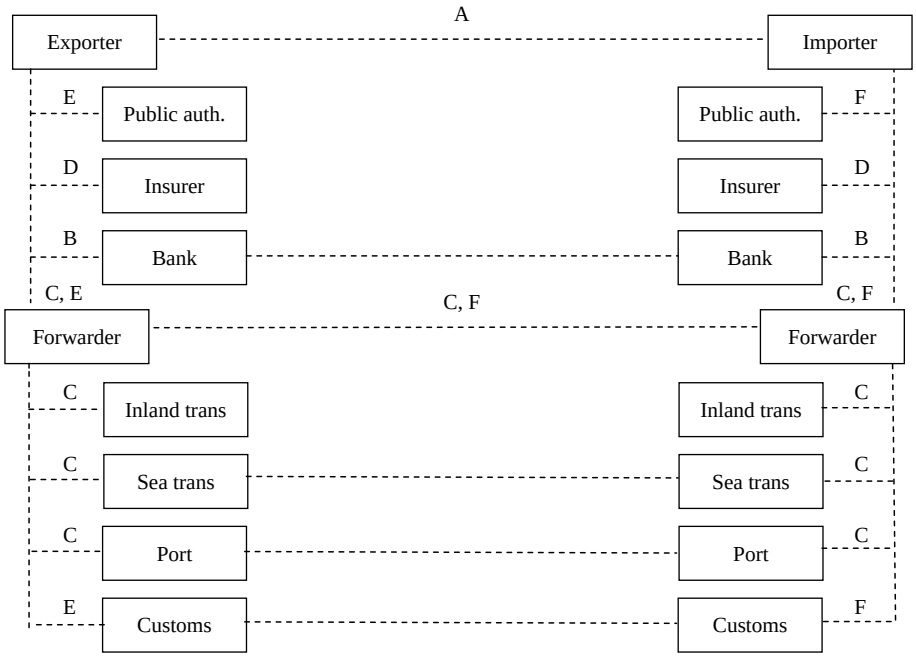

Figure 1.
Data flows in international trade and transport

that are most important in their business (Auramo *et al.*, 2005). In the study of Feng and Yuan (2006); the main impact of IT on logistics operations was found to be providing faster and reliable service to customers, increasing IT hardware and software costs and producing more business and thus increase revenues, reducing cost of staff, reducing load-waiting and delivery time, and reducing empty miles of travel and communication. The same research evaluated the impact of IT in terms of costs and revenue and 69.2 percent of the respondents suggested that IT application does help them reduce operation costs, with an overall average costs reduction of 9.9 percent and the rest of the respondents said that applying IT has increased their operation costs, with the average cost increase being 6.67 percent. Although LSP companies invest in IT heavily, state authorities must also facilitate the international logistics and transportation activities by using advanced IT tools since international logistics and transportation requires governmental services such as customs procedures, permissions.

Application and use of IT in logistics and transportation

Logistics management is seen as that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods and services

and related information from the point of origin to the point of consumption in order to meet customers' requirements. This definition not only includes and emphazies the flow of goods and services but also the flow of information among the parties involved including government authorities.

The types of IT used by LSP can be categorized into intrafirm and interfirm information systems. Intrafirm systems are used to facilitate collaboration among different functions within a firm. Examples of such systems include warehouses and fleet management systems, intranet, barcoding, radio frequency technology, and enterprise resources planning (ERP). Interfirm systems are employed to assist communication among different parties outside a firm including state authorities. Interfirm systems facilitate the flow of information enabling different parties in the supply chain to track and trace the security status, location and delivery times of the business items. In today's information era not only companies but also state authorities who are obliged to facilitate international trade and transport are required to apply IT in their public services.

Feng and Yuan (2006) found that most popular IT applied in logistics industry is internet and other popular IT are in order: electronic data interchange (EDI), e-commerce, barcoding, scanning, and datawarehouse. The same study reveals that the top five candidate application areas for logistics companies are transportation management, customer service/CRM, order processing, ERP, and warehouse management. As Feng and Yuan (2006) pointed out, transportation management is one of the five top candidate application for logistics companies. Furthermore, Pokharel (2005) classified IT applications in transport as: information exchange, route and mode planning, picking and delivery, electronic identification, mobile communication, physical automation, tracking and tracing, and managing claims.

Benefits and barriers of IT in logistics and transportation

Effective IT becomes necessary to support logistics and transportation processes. IT helps automate routine logistics activities, thus enabling managers to focus on strategic issues and core competencies. Some studies have reported that IT can improve logistical effectiveness, efficiency, productivity, flexibility, and cost and service quality (Daugherty *et al.*, 1995; Bhatnagar *et al.*, 1999). The reason for IT's potential in achieving logistics success is that it can help the logistics firms to improve their competitive advantages. The literature suggest that IT has the ability to enhance logistics competitiveness by increasing capability, decreasing costs, and improving service (Closs *et al.*, 1997; Bowersox and Daugherty, 1995; Daugherty *et al.*, 1995; Introna, 1991).

Pokharel (2005) surveyed the logistics and transportation services providers' perception on IT in Singapore and found that the use of IT in Singapore is perceived positively with increase in size of a logistics company but is indifferent with the type of industry covered and the type of the service offered by the companies. Logistics and transportation companies in Singapore consider efficiency, cost saving, reduced data entry error, increase customer service level as opportunities gained from IT.

Electronic commerce is possibly the most promising application of information technologies witnessed in recent years. Marri *et al.*, 2006) stated that new technologies, like product identification, mobile technologies and applications that utilize satellite location technologies (GPS) are seen as enabler for the new logistical systems that will

be necessary to fully benefit from e-business. They summarized the benefits of e-commerce in logistics as:

- shorten procurement cycles;
- increase the speed of communication;
- reduce purchasing and production cycles;
- reduce inventory and inventory related purchasing costs;
- promote closer relationship with customer;
- provide a quick and easy way of exchanging information internally and externally; and
- enhance customer services to shippers.

Perception on barriers to the implementation of IT in logistics and transportation was investigated by several researches in different countries. Top five difficulties facing logistics companies in implementing IT in Hong Kong are "lack of expertise in IT," "inadequate knowledge of employees," "insufficient financial support," "fear of changing the way they do things," and "difficulties in changing the organization culture" (Lai *et al.*, 2005). A survey among the transportation service providers in Singapore revealed that insufficient IT resources, justification of intangible benefits, integration with legacy systems, cost justification, and long time for implementation were determined as barriers to implementing IT.

According to the survey among the IT manufacturing and transport logistics companies in Taiwan; compatibility of IT systems between companies, information security, timeliness of information, shortage of professional staff, and accuracy of information exchange are top five difficulties of IT implementation although their ranking order changes among those firms (Feng and Yuan, 2006). The assistance mostly expected form the government by the Taiwanese firms is to help them obtain new information technology quickly, to provide a shareable platform, and to provide professional training program. It is claimed that IT and e-government have potentials to remove barriers in logistics and transport industry (Sethi, 2006).

E-government and transportation

Wu (2007) defined e-government transformation as one of the biggest challenges within the IT-related sector from the perspective of scale and complexity. E-government movement is being driven by reforms in public administration. In literature; it is possible to come up with many definitions of e-government. As Yıldız (2003) put, e-government is defined as "the relationship between governments, their customers (businesses, other governments and citizens) and their suppliers (businesses, other governments and citizens) by the use of electronic means". Similarly, e-government is "simply using information technology to deliver government services directly to customer 24/7. The customer can be a citizen, a business or even another government identity". Jones *et al.* (2007) defined the nature, culture and scope of e-government activities as: e-administration, e-citizen, e-services, and e-society. Costake (2006) categorized list of e-services for governments such as: basic public service (e.g. one portal access to information, public and coherent statistical information and basic statistical models relevant for microeconomic and macroeconomic analysis), general services

(decision support for public institutions based on data warehouses and business intelligence), and specific services which can be used for the legislative activities of the state, executive activities of the state and integrated information systems for maintaining public activities such as: agriculture, forestry, fishing, energy, transport, and financial. As it can be concluded, specific services is a priority for the development of basic public services and general services. Protogeros *et al.* (2006) classified the e-government cycle as:

- Electronic registrations to public records.
- Electronic completion and submission of applications by citizens or businesses in addition to their electronic processing by the public sector.
- Electronic transactions and financial dealings with the public sector and public authorities.
- Support of social security services.
- Electronic tenders.

Schware and Deane (2003) listed objectives of e-government as: bring government closer to citizens by providing them with easier access to information through personal computers, kiosks, and telephones and other resources; modernize public services in which "joined-up government" institutions communicate and work more effectively and efficiently; reduce opportunities for petty corruption at the point of service delivery; increase and capture revenue more efficiently (e.g. taxes, fines, and license fees) and increase mechanisms to create more accountability and transparency in the public sector. Schware and Deane (2003) listed priorities for e-government as: forms processing, public complaints, information, payments, procurement, customer response, and polling. As Ebrahim and Irani (2005) put, the role of e-government is not only to provide information and services to citizens, which could be provided by commercial firms. E-government can develop the strategic connections between public sector organizations and their departments, and make a communication between the government levels. This connection and communication improve the cooperation between them through facilitating the provision and implementation of the government strategies, transactions, and policies and also better use and running of government processes, information and resources. E-government has improved communication between different parts of governments so that people do not need to ask repeatedly for the same information from different services providers.

European Union (EU) aims to turn into a knowledge economy by 2010. This goal also imposes obligations for candidate countries such as Turkey. As Skulimowski (2006) emphasized, the national information system strategies in the New Member States and Candidate Countries such areas as: e-government, e-democracy, employment policy in the information society, e-science, e-health, e-learning, e-transport, and e-tourism. Millard (2003) categorized e-Europe common list of basic public services as citizen related and business related. Business-related services are listed as: social contribution for employees, corporate tax, VAT, registration of a new company, submission of data to the statistical office, custom declaration, environment-related permits, and public procurement.

The other classification for application areas of electronic government services (business related) are given in two dimensions (Millard, 2003):

(1) *Types of services.* This dimension has three alternatives. Services can be information services, communication services or transaction services.

(2) *Types of activities*. This dimension has also three alternatives such as administration, political or everyday life.

When we relate the e-transport activities with such dimensions; information services such as public service directory, guide to administrative procedures, public registers and databases are related with administration. Information services about consultation documents, background information in decision-making processes are related with political services. Information services on transport are helpful in everyday life. Besides, transactions services such as ticket reservation are helpful in everyday life. Discussions dedicated to questions of everyday life are communication services which are used in everyday life.

Logistics and IT adoption in Turkey

Logistics and transportation market in Turkey is growing rapidly due to both local dynamics such as increase in international trade and external dynamics such as foreign investments and EU integration process. Turkey has been considered as logistics center by the companies involved in trading and investing in. Developments such as: outsourcing logistics activities, supply chain practices, privatization, and deregulation in transportation market recently further increased need for IT investments in logistics and transportation infrastructure in Turkey. Although physical aspects of international logistics and transportation are solved to a certain extent, technological issues such as IT needs further improvements. Turkish government has initiated and invested in e-government services including transportation and logistics industry recently but these efforts seem to be in introductionary stage. In Turkey, information system usage in logistics industry is increasing rapidly. To take a note, the most important reason is the integration of global commerce and Turkey, and the speed in freight distribution. Diversity of products and increasing trade volume caused difficulties to identify the location of cargoes. There are three levels of road freight operations where information technology is used:

(1) Management and logistics functions where IT is used mainly for communication and long-term planning.

(2) Fleet management functions such as route planning and scheduling.

(3) Vehicle management including trip planning and cargo identification.

As in other countries, it is better to explain the information technology applications in Turkey in two related dimensions:

(1) *Information system in logistics companies*. The modules used can be described as: transport organization; route planning; vehicle, cargo, driver monitoring systems; warehouse information systems; customer relationship management.

(2) *Applications in public organizations*. Should have data about operations in modes: highway, airway, seaway, railway, pipeline, and customs.

As Rosacker and Olson (2008) stated that private and public sector organizations are clearly distinctive in many substantive ways including, for example, when they are assessed from an operational perspective or viewed through the varying lens of their complex and differing portfolios of stakeholders. As Ebrahim and Irani (2005) put, the continual development in information and communication technologies (ICTs) in the

last two decades has presented private sector organizations with many choices of applications and technologies to support infrastructure integration of e-business applications and systems which can benefit the public sector to implement effective e-government portal and support their business process.

Similar difficulties mentioned in the literature are faced by the logistics and transportation companies in Turkey. Besides, the industry also expects government support and facilitation in providing IT services. E-government services regarding transportation, logistics, and customs clearance in Turkey has recently been introduced but due to the fragmented efforts by the state authorities such as customs authorities, ports and other related bodies, and adoption of IT recently in e-government services, usage of e-transport and e-government services is limited. According to the results of e-government 2007, Turkey was ranked as the 27th country out of 100 (Getting 22.7 pts out of 100 for grading e-government studies). But in 2007, Turkey was the ninth country out of 100 (Getting 43.5 pts out of 100). The results show that Turkey made consierable effort to increase e-government usage.

Akman *et al.* (2005) defined:

- Government to government (G2G) services in Turkey as: Customs and State Statistical Institute, Customs and Central Bank, Treasury and Central Bank, Customs and Ministry of Finance, Ministry of Finance and Central Bank, Census Bureau, and Retirement Office.
- Government to Citizen services (G2C) in Turkey as: Retirement Office, Census Bureau, Ministry of Finance – Tax Office, Public and Private Banks, Turkish Airlines, General Directorate of Highways, General Directorate of Turkish Railways, and Ministry of Interior.
- Government to Business (G2B) services in Turkey as: Ministry of Finance – Tax Office, Public and Private Banks, Turkish Airlines, Ministry of Health, Customs Undersecretary, and Ministry of Tourism.

Methodology and analysis

Being a candidate country for EU, Turkey aims to turn into a knowledge economy by 2010. E-government is one of the main aspects in turning into a knowledge economy. As mentioned in the information strategies for candidate countries, e-transport, and e-government are two important dimensions, which have priority. In this research, first a literature review for e-transport services in Turkey is given with explanations. In the second step, an analysis for e-transport services is conducted with regard to the "critical success factors" method was applied in order to define the important issues to consider for e-transport services.

Throughout the analysis process; Turk Telekom, Turkish Informatics Association (TBD) Reports, Turkish National Informatics Master Plan (Tuena), The Scientific and Technical Research Council of Turkey (TUBITAK) Reports, and State Planning Organization (DPT) Reports were used to acquire the data. Data and information published on the internet and technical magazines were also used to further enrich the data.

As shown in Table I, Turkey has a number of information system projects for transport applications. Furthermore, Turkey is planning and should plan more projects for transport activities. The projects shown in Table I are base projects for upcoming ones. As the external environment changes rapidly, Turkey should consider

Table I.
Transport related e-government projects

Project owner	Project name	Objective	Parties of communication	Definition	Service
Customs	GIMOP (Customs office modernization project)	Aims at solving problems (facilitating e-trade and preventing illegal trade), encountered in customs processes, by means of automating all of the customs procedures, and modernizing the customs offices through this project. With the help of smart card, it is aimed to avoid using cash in customs area	G2B G2C G2G	Statistical information Efficient tax collection Statistical information Efficiency of staff Effective inspection Standardization of customs procedures Better administration	Transaction Information
	Computerized customs activities (BILGE)	A software enabling the customs activities to get actual timed computerized. Putting this software into effect has made it possible for 69 customs office to realize through on-line basis 99.5 of the foreign trade transactions in addition to the documents required by various other institutions. Besides, through the software, all the processes – from the point of arrival of the goods at the customs to the point where the import or export transactions are completed – are online and real-time basis	G2G G2B G2C	Transparency Effectiveness Efficiency Standardization of customs procedures Better administration	Transaction
	BILGE-EDI	Through this facility (internet and/or EDI), the related parties/companies are able to issue customs declarations in their own offices	G2G G2B G2C	Effectiveness Efficiency Productivity	Transaction

(*continued*)

Table I.

Project owner	Project name	Objective	Parties of communication	Definition	Service
	Project for the security systems at customs gates (GÜMSİS)	Aims at investigating the illegal flow of goods, vehicles and people. This system has been put into practice, having provided all the required equipment and software (e.g. Control center, Vehicle routing system, GPS). The project also aims at exchanging data through domestic and international intelligence associations; establishing strong intelligence and audit fleet well-equipped with ethical values so as to fight against smuggling and corruptions; putting into practice advanced technology (GPS, etc.) value input data so as to prevent low or high value good releases; proacting in providing data for goods and passengers by means of electronic data exchanging with the seaports and airports through which goods and passengers enter Turkey	G2G	Avoid corruption Transparency Effectiveness	Information
	Customs data warehouse system (GÜVAS)	Decision makers are provided with rapid and reliable information by means of accumulating/collecting all the information related with the imports, exports, transits and smuggles operated and recorded by all the customs offices throughout Turkey at a central data base established at the Undersecreteriat for foreign trade	G2G	Better administration	Information
Undersecreteriat for Maritime Affairs	Vessel traffic management and information system for turkish Straits	The project aims at providing navigation safety through entries and exists through the straits. This project makes it possible for all shipments/traffic through the straits to be monitored by the traffic control stations Those who will make use of the data/information to be produced by this system are the ships passing through the Straits with or without transits, the shore-based pilotage units, the units providing towage and tugging and escort services, harbour masters	G2G	Transparency Better administration Effectiveness Efficiency	Transaction Information
Ministry of transport and transport office	ULAŞNET	The project will provide online record the information about all the entering or existing vehicles and navigators and thus to easily provide the relevant statistics	G2G	Better administration	Information
	Land transport automation office	With this system, all transactions will be carried out rapidly due to computer support; as it will be possible for individuals (citizens) to apply through internet, visits to regional authorities (offices) will be minimized; rapid and healthy audits will be possible; and through integrations with the other related state offices, the processes will be effective	G2G G2B G2C	Effectiveness Efficiency Productivity Standardization of information and services	Transaction
	OGS (Automated toll-road project)	A new kind of automated toll payment for Turkish straits bridge and highway operated by General Directorate of Highways	G2C	Transparency Accountability	Information
	road information network project	Information about investment on road infrastructure			Information

(*continued*)

Table I.

Project owner	Project name	Objective	Parties of communication	Definition	Service
	Geographical information systems project	Transform highway inventory into digital format	G2G	Communication Coordination Collaboration Transparency Effectiveness	Information Transaction
General management of Turkish railways	Computerized ticket sales and reservation	This system has made it possible for the citizens/individuals to make use of the internet and intranet facilities in getting tolls/ tickets, returning or changing tickets, reserving seats, access to the information desk, etc.	G2C	Transparency Standardization of information and services Productivity	Transaction
	TCDD enterprise resource management	This is a project aiming to manage all the activities carried out in all the TCDD units, starting with the operational activities through an integrated information system	G2G	Communication Coordination Collaboration	Transaction
Airway	Traffic control system project	State Airport Authority displays arrival and departure times of the airplanes on its website for Atatürk Airport and Esenboğa Airport with delay times	G2C	Communication	Information
	Electronic ticket	Online ticket reservation	G2C	Transparency Standardization of information and services Productivity	Transction

Source: Yıldız (2003); http://bilgitoplumu.gov.tr/yayin/eDevletProjeveUygulamalari.pdf

the opportunities and threats in terms of the critical success factors for e-government projects.

Thus, critical success factors must be defined for e-transport and e-government services in Turkey.

World Bank (2006) indicated that e-strategy must focus on government priorities in IT development and evolve along with country's development needs and implementation capacities. Yoon and Chae (2009) aimed to prioritize the critical success factors of national e-strategy based on a country's economic status. The results of research showed strong indication that there were significant differences on strategic priorities of national e-strategy depending on the scale of economy. Political leadership and IT infrastructure were common in developed, developing, and underdeveloped countries. Legal framework was used in developed and developing countries. Institutional structure was appropriate for underdeveloped; funding and human capital were appropriate for developing; privacy and security, monitoring and evaluation were adequate for developed countries.

In Table II, critical success factors suggested by Yoon and Chae (2009) were explained for e-transport services.

IT infrastructure were explained in four dimensions as: availability, accessibility, awareness, and standardization and interoperability. Discussion of critical success factors are as follows.

Political leadership. Separate agencies within government have redundant planning committees for e-government. Committees within these agencies seldom have the mandate to influence ICT or telecommunications policy. Lack of coordination results in duplication of projects, redundant spending on similar projects and equipment, software licenses, and consulting services.

Accessibility. Another important implication regarding e-government development is the developing domestic and international digital divide. Clearly, individuals and countries with access to resources can take advantage of e-government, while individuals and countries with less access to resources cannot. Citizens and businesses do not access e-government applications due to prohibitive access costs for the internet and internet services. Access to adequate information infrastructure, and defining and putting in place proper legal and regulatory frameworks have been keys to making e-government both the instrument and the scenario for governance and public sector reform. But for developing countries, a "digital divide" affects most people's access to the information infrastructure. Çilan *et al.* (2009) have also found that there has been a digital divide between the EU 15 countries and the countries which are candidate of EU in 2004 (Romania, Bulgaria, and Turkey).

Awareness. Government leaders and officials seem to have lack of deep or conscious understanding of the dourness of the problem by means of its social and economic impacts. Therefore, continuous awareness programs and meetings to be organized for managers at all levels in the government organizations seem to be one of the effective solutions in this respect.

Availability. Akman *et al.* (2005) stated the lack of access to internet amongst certain sections of the population was seen as being the most important barrier to the development of e-government by all of the stakeholders. This was seen as being a particular problem for public sector organizations, as they cannot choose their customers. Indeed, many public services are provided specifically for vulnerable or

	Opportunities	Threats
Political leadership	*Political* Coordinating body has established National IS strategy and road map has been determined EU integration process *Technological* Established infrastructure	*Political* Too many institutions and authorities and bodies to be coordinated and conflicting objectives to be managed Delay in EU integration *Economic* Need for substantial financial resources Frequently failure in achieving stated project deadlines
Accessibility	*Demographics* High usage of IT among young population High share of young population	*Economic* High connection costs High access device cost Unable to access information anytime, anywhere (e.g. lack of kiosks) *Demographic* Low percentage of IT skilled citizens Digital divide in different regions of country *Technological* Slow internet speed Slow broadband access
Awareness	*Socio/cultural* Increasing usage rate of online services Attention on computer and information technology education *Economics* Increasing logistics and transportation activities Increasing foreign investment of international logistics and transport companies Increasing awareness of logistics and transportation firms about the importance of IT *Technological* Advanced IT applications in foreign logistics and transport companies	*Technological* Limited awareness and utilization of IT among small scale logistics and transport companies
Availability	*Technological* Different platforms for using e-transport services (e.g. mobile phones, portals) Increasing number of e-transport services (new projects such as emergency communication system, . . .) Contribution of private companies for new applications Increasing number of IT providers for transport from international market	*Technological* Insufficient number of e-transport services especially in ports and pipelines Limited number of ICT providers in transport applications
Standardization and interoperability	*Technological* Adoption EU and international standards Increasing interest of individual financial institutions	*Technological* Most of the web sites are informative not interactive Most of the information systems in related state authorities are fragmented in other words they are not integrated

Table II.
Critical success factors and e-transport services

(*continued*)

	Opportunities	Threats
	Legal Harmonization of border crossing and customs clearance Completed regulations for IT usage in commerce and transport	Insufficient number of implementations in ports Delay "integrated e-government" till 2009 Insufficient number of applications in pipeline *Socio/cultural* Resistance to change
Mature legal and regulatory framework	*Political* E-government and e-transport have priority in national IS strategies of candidate countries EU integration process forced establishment of legal and regulatory framework Completed regulations for IT usage in commerce and transport (such as e-signature, obligations for web presence of all companies)	*Socio/cultural* Problems during implementation *Legal* Incomplete legal framework and regulations
Security and privacy	*Technological* Advances in IT enabling solving security problems *Legal* New regulations aimed at solving security and privacy problems	*Political* Insufficiency of legal framework and authorities for security and privacy *Socio/cultural* Insufficient use of e-transport services due to security and privacy Lack of trust due to security and privacy problems
Shared knowledge and partnership	*Socio/cultural* Increasing number of transport and IT related projects which requires shared knowledge and partnership (universities, public authorities and private sector such as emergency communication system, traffic control management system) *Political* EU rules forcing and facilitating shared knowledge and partnership Establishment of a higher regulating and administrating body on knowledge-society plans	*Socio/cultural* Insufficient number of platforms to share information Inexperience in sharing information between different parties *Political* Fragmented nature of organizational aspects preventing shared knowledge and partnership
Funding and human capital	*Socio/cultural* Awareness about importance of projects *Economic* Different parties providing funds for projetcs (TUBITAK, EU, etc.)	*Economic* Allocation of limited financial resources for IT related innovations both by public and private organizations Insufficient number of patent applications Insufficient amount of R&D *Demographic* Lack of people who have IT skills

Table II.

low-income groups who are at least likely to have access to the technology. The main consequence of this is that public sector organizations will have to continue to provide services through multiple channels at least in the short-term to prevent excluding those who do not have access to the internet.

Standardization and interoperability. Especially, when complex application systems are developed and implemented without an e-government umbrella, they suffer from lack of common policies, standards and guidelines. There are numerous examples of well-conceived e-government efforts by individual ministries or departments that have faltered in the medium term because of inadequate budgeting for recurring expenses such as upgrades, maintenance tied to equipment life cycles, training, and staff. Gottschalk (2009) emphasized the integration of government information resources and processes, and thus the interoperation of independent information systems, are essential for e-government to be successful. Gottschalk (2009) also defined success of e-government as having agile, citizen-centric, accountable, transparent, effective and efficient government operations, and services. Interoperability refers to a property of diverse systems and organizations, which enables them to work together. When information and services are provided to and accepted between systems and organizations, they are said to inter-operate. In a narrow sense, social, political, and organizational factors influencing systems and system performance must also be taken into account. Interoperability of systems enables interoperability of organizations. Systems interoperability is concerned with the ability of two or more systems to exchange information or use the information that has been exchanged. Organizational interoperability is concerned with the ability of two or more units to provide services to and accept services from other units, and to use the services so exchanged to enable to operate effectively together. Inter-organizational systems concepts provide a targeted means to look at the cross-organizational features of a socio-technical system.

Mature legal and regulatory framework. The development of e-government also relies on appropriate legislation and regulations. A number of countries have yet to put in place a legal framework that addresses questions such as the legal status of electronic contracts and digital signatures, the privacy and security of data transmission, and the facilitation of electronic transactions.

Security and privacy. Another problem is with security and authentication that prevented the development of electronic transaction services. It is a specific problem with public sector organizations as the public generally saw them as being in a position of trust.

Shared knowledge and partnership. As with other IT projects, the implementation of e-Government needs to recognize the role of different stakeholders and integrate their perspectives to make target systems workable. These different perspectives take the form of competing technology frames consisting of different beliefs, interests, technology evaluation routines, and artifact characteristics (Azad and Faraj, 2008).

Funding and human capital. Particularly stakeholders from the local government sector witnessed the lack of finance for capital investment in new technologies as a major barrier. The reason is that IT was often not seen as a priority when competing for scare resources against other claims for capital investment for example new schools, roads and so on. Unlike the private enterprise, government agencies do not encounter the pressures of competitors that drive the organization to innovate in the short-term and thereby survive in the long-term. Without a competitive environment, the ICT sector lacks the means and motivation to generate innovations required to support new initiatives in e-government and e-commerce. The available pool of ICT skilled workers leave the workforce and migrate, intensifying the brain drain.

Conclusion

Logistics is key factor for competitive advantage. Transport, a sub-process of logistics, has an important role for trade and international trade. Transport activities are performed by different partners. Partners take different roles in different stages of transport. Partners in transport activities are categorized as: state companies, private companies and state authorities. As the number of partners and complexity of operations increase; the need for information system applications for transport management gets more and more important. As government institutions are important partners in transport applications, e-government and e-transportation applications also have vital roles in effective and efficient transportation management. Being a candidate country for EU, Turkey has also obligations for e-government and e-transportation applications. Turkey has begun to develop e-government applications since 1998. As Ebrahim and Irani (2005) emphasized, adoption of e-government is not straightforward and cannot be done in a limited period of time, rather it requires an integrative architecture framework approach to place government information and services online. This is one of the reasons why many government organizations are still in the infancy stage of e-government adoption. Turkey is also in the infancy stage of e-government adoption. Yıldız (2003) listed the objectives of e-governments in Turkey as:

- administrative control;
- improve the processes and increase the overall efficiency in the public sector;
- desire to improve the outcomes such as cost-efficiency and transparency;
- mimicking the global trends;
- fear of loosing the IMF and World Bank funds; and
- desire of private IT firms to earn some money from government projects.

Owing to limited e-government literature, Yıldız (2007) suggested to better examine and explain the process of – and participation patterns – in e-government projects within complex political environments. Hence, this research aimed to study the transportation related processes with its stakeholders in Turkey.

E-transportation projects in Turkey are related with Customs, Undersecreteriat for Maritime Affairs, Ministry of Transport and Transport Office, General Directorate of Turkish Railways and Airways. However, it is impossible to say that there are enough number of applications in ports and pipelines, which are also important partners in transport activities. The other point that most of the state authorities develop applications for their usage. The applications are not vertically or horizontally integrated yet. However, there are also some projects, which are being developed by different partners such as traffic system management project and emergency system communication system project. These projects will both have implications for intra government process engineering and inter government process engineering so that they will have important effects on vertical and horizontal integration. As interactivity and connectivity increase, relationship based on contracts will be transformed into services organizations and autonomous public administrations will transform into borderless public organizations. E-transportation application developers should always consider the critical success factors as well as other information system projects. Critical success factors for e-transportation applications can be categorized as:

political leadership, IT infrastructure (accessibility, awareness, and availability), standardization and interoperability, mature legal and regulatory framework, security and privacy, shared knowledge and partnership, funding and human capital. Unfortunately, it is not possible to say that Turkey has succeeded in either of these factors. Yoon and Chae (2009) underlined the fact that inadequate infrastructure, poor financing, low level of IT human resources, and lack of information awareness are common to many developing countries, and these work to reduce the effectiveness of support initiatives from international organizations and developed countries. Yoon and Chae's (2009) findings are also valid for Turkey. As a conclusion, Turkey should develop policies to increase e-government adoption. Hence, the other suggestion is to conduct researches how e-government applications are used by different parties; such as citizens, public companies, and private companies.

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