

Influence and Acceptance of Information and Communication Technology in Road Transportation Case Study (Mazandaran Province)

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Abstract

Target: Transportation firms can use from functional tools base on ICT for improving their process. Also these tools have used widely in recent years but there are less research about this matter. This study wants to fill the gap and provides experimental analyses by using ICT in transportation industry.

Designing/hypothesis/found: The analyses use from multi-study that it based on semi-structure interview at management of leading transportation companies in Italy that we do that in some leading transportation company in Mazandaran that has caused to have comparison results.

Measuring productivity is effective tool for analysing road transportation freight and can logical solution for judging about its distance to desired mode. Improving productivity by evaluating and analysing indexes and then planning can do for denying their obstacles; for more information the last mode of road transportation has investigated and then assessment and analysis of productivity index has done for comparing with current mode. Calculating of research is based on descriptive statistic.

Keywords: ICT; Transportation; Semi-structure; Measuring; Index; Productivity

Introduction

Displacement and transportation have excellence opportunity for financial and social developing in the country and may know as one of the most important industry in Iran. Transportation has grown meaningfully in Europe since last decade and traffic volume is twice between 1990 till 2005 and statistical resources show this growing up will continue [1]. Italy is one of European country with high volume traffic and has more than 50 kilometer per 240 billion ton-kilometer transportation in a year (ministry of infrastructure and transportation of Italy 2008). So transportation has shown as one of the most main logistic (transition goods from producer to consumer) costs. According to sources, transportation cost has include 25 percent to more than 50-60 percent of overall logistic cost.

Main target of research is based on 3 structure parts of logistic services provider, messengers, small transportation firms, rail and sea carriers, distributors and recipients and fundamental structure of terminals that show in picture one. For various reasons, transportation industry is more competitiveness than the past [2]. Firstly, globalization and being international process has effect on all aspects of small economy in the world that have international players role. Secondly, customer transportation service look for efficiency that compression costs and service grade and finally aims have relation with external environment like decreasing traffic jam and increasing confidence level which have more importance.

According to recent statistic that transportation organization publishes, 501 thousand drivers more than 4 thousand firms and active institute, 306 thousand trucks and 184 thousand kilometers road are constitute main parts of transportation. Road transportation in Iran is moving 540 million ton goods that have the most transportation share between other ways of transportation (about 90%).

According to investigations the market of transportation in Iran in 2000 was about 61,938 billion Rial that shows 21 percent growing to last year [3].

Also, investigation of goods demand (ton-km) from 2000 to 2009 shows the growing 8% per year and measure of goods movement has 8% growth, so these statistics show permanent growth in transportation of Iran; while, 70 percent of total transported goods and 73 percent of cargo trucks traveling were in the province and 50 percent of all cargo travelling has used from infant carriage or cabinet trucks. Existence statistics show more than 55 million tons cements and 45 million ton metal goods are the most measure share of road transportation [3].

Studies show the proportion of accidents to dead and average age of trucks decrease 5% each year from 2000 to 2009; while the number of firms and active transportation institute in road transportation in the country has increase 4% and the length of highways in this period improved. Also about 36% of road cargo transportation of country has more than 25 years old and 82% of road cargo transportation is owned by personal drivers [3].

Literature Review and Theoretical Framework

Information and communication technology has vital importance in developing logistic services for making supply demand order, where transportation and wholesaler are as the main cost and criterion [4]. Hence, one of the importance of ICT is decreasing logistic costs and being better than vitals in cost-based functions [5]. In addition, ICT can have key role in addressing to other opportunities related to transportation performance. For example the value of ICT can support

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some criticalities, where may appear during the goods transportation to final destination. In fact, some unpredictable happens may occur when it is real time of delivery; for instance, twice navigation or twice timing for truck to adapt itself with the new condition and achieve to initial goal as close as possible. About standard delivery, some happens may occur in heavy traffic like truck breakdown vice versa unforeseen requests such as good returns and etcetera [6,7].

Based on these conditions, producers of technology are representing wider tools to the past, especially those who work with internet tools like web technology or new services in internet or measuring by new cell phones and wireless technology such as mobile connection and automatic identification [8]. These kind of tools are able to increase number of functions where were the aim of traditional services; For instance, transportation and warehousing based on information transition, source and type of planning, tracking and tracing, calculating transportation rate and reports [8].

In recent years a lot of transportation models have done for increasing productivity in United State of America. According to data overall productivity in transportation of America 1990 to 2000 had increased about 2.1% per year that road transportation across rail transportation had increased 5.2%. The main effective factor on productivity is using important modern instruments and developing technology that is the cause of producing process and expanding information technology process in transportation. Also increasing productivity in road transportation industry by using information technology (hardware and software), do by optimized routing and adaptive lading. Hence, there are fewer studies on increasing productivity in Iran and there are less information about it and in this study has tried to compare information of developed country like USA and Italy with Iran to present some ways to increase productivity in road transportation (Figure 1).

Problems in Measuring Transportation Productivity

Sample companies tested and evaluated by experts in this study rather to companies that wants to present information had one-sided behaviour and divided results. Anyway, findings provide interesting results about how to and where ICT invested in that these information are useful for companies wants to invest in transportation and logistics.

In fact for measuring the change of productivity needs to enter four quantities masterly and comparison them together. The quantities are:

1. Output growth rate Y'
2. Input growth rate L'
3. Important factors growth rate K'
4. Used average goods growth rate I' .

Using these 4 standard formula quantities shows measuring of changing about what should be name for productivity factor :

$$A' = Y' - [a (L')] - [p (K')] - [(1-a-a) (I')],$$

A' : overall factor change to productivity

α : achieved weight in distribution output load

β : obtained weight in distributing important output.

Obviously, the main problem for measuring productivity is developing acceptance of these 4 basic rates and showing their weight (i.e., α, β and $I - \alpha - \beta$) for finding different input factors. Because of different reason this measuring and weight problem almost happened for number of hypothesis and judgment; anyway, extra problems can enter to the transportation, because this section is in public interesting that exists in governmental matters. With descriptive method, above theory by government used for public aims in the case of transportation for keeping low the rates.

Information Collection

Semi-interviews have done with managers in 75 companies. Two different types of questionnaires provided, before starting interview responders say some short answers while there were wide details; interior type of questionnaire supported the interview. Questionnaire divided to 5 parts according to literacy and organizing: interview and detail of companies, describing the process of transportation, detail of ICT tools, performance process and effect and advantage of tools on transportation process.

This theory includes repetitious data and multi-level collected data is guided by designing. That way the interview has reformed according to before interviews. As interview developed, more attention was focused on essential background. Each formal interview did 60-120 minutes and recorded the voice. Writing of each interview was provided for future analysis. After completing all interviews, members checked [9].

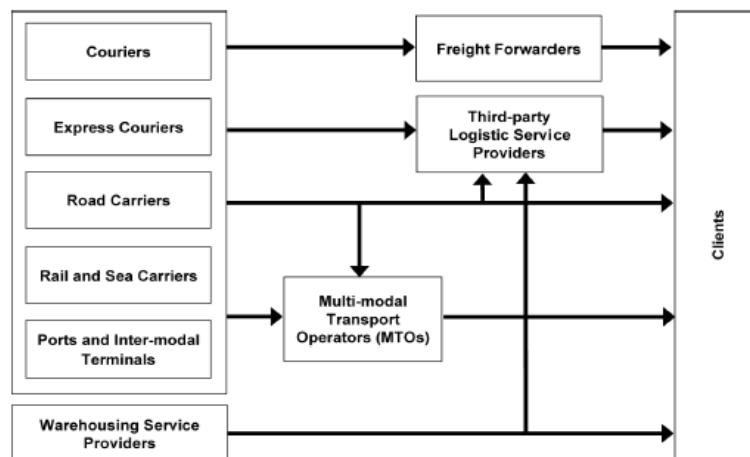


Figure 1: Transportation and logistics service chain.

Analysis Data

Collected data has analyzed in two types: first inside case analysis and mutual analysis. These explanations have described according to used structure. They were on the centre for each case, as they helped for addressing a large amount of problems [10]. Wrote descriptions in this case are essential for safety of research. Each case analysis include: company identity, detail of that, describe of process steps of transportation and showing performance of ICT tools. This process allows to unique samples to show off [11].

Question of research include these items:

1. How much do you familiar with information and communication systems?
2. How much did you use from internet for making transportation easier?
3. Are you familiar with navigation? and how much do you use that for finding the fastest way to destination?
4. Do you get any help from the government for knowing GPS? How much?
5. Do you like to use information and communication technology in transportation if it exists?
6. How much do you use road information system for controlling traffic in city?
7. How much tools like cell phone has effect on your company service quality?
8. How much do you know about the cost of ICT and does this amount make you satisfy or not?
9. Do you believe on interior radio for controlling your company vehicles? Why?
10. Which of these information and communication tools are more appropriate for you? And why

- i. Computer
- ii. GPS
- iii. Navigation
- iv. Cell Phone
- v. Traffic information of each city.

According to these questions (of course all answers are keeping in archive for using in research works); responses are totally different and noteworthy [12-18]. These questions individually and out of job environment have asked that responders have appropriate time to answer. The answers have analysed with SPSS statistic software.

Results

In main observation of research literacy these items have investigated:

- Transportation management (TM)
- Supply chain execution (SCE)
- Field force automation (FFA)
- Fleet freight management (FFM).

As we explain in Table 1 total view on ICT shows 158 tools in 75 companies that major use is by supply chain execution (about 60 tools), also the rate of acceptance is low and field force automation and transportation management have dynamic nature and in comparison with other solutions have used more than others.

Results of analysis have summarized in 5 conditions that come in Table 2 as:

- P1: tools of transportation management frequently accepted for routine supporting, while didn't common for strategic activities.
- P2: Function of supply chain execution active one by one by EDI tool and distributed, while multi-tools to multi-tools were rare.

Position	Current acceptance	Technology	Function of produce chain	Operation title	Subject and company
P2,P5	On place	EDI	Order process	Logistic service provider	Gharb Steel
P2	On place	Internet	Order process	Fast transportation	Mazhin sanat
P2	On place	EDI	Order process	Fast transportation	Mazhin sanat
P2,P5	On place	Internet	Order, approve, receive, process	Fast transportation	Atm
P2,P5	On place	EDI	Order, approve, receive, process	Logistic service provider	Asal steel
P2,P5	On place	Internet	Following order, approve, receive	Logistic service provider	Asal steel
P2,P5	On place	EDI	Order, approve, receive, process	Private company(freight insurance)	Mazhin sanat
P2,P5	On place	EDI	Order and following process	Logistic service provider	Baradaran
P2,P5	On place	Internet	Order and following process	Logistic service provider	Baradaran
P2,P5	On place	EDI	Following order, approve, receive	MTO	Digi kala
P2,P5	On place	Internet	Following order, approve, receive	MTO	Digi kala
P2,P5	On place	Internet	Following order, approve, receive	Private company(freight insurance)	Shab
P2,P5	On place	Internet	Order, approve, receive, process	Private company(freight insurance)	Behno
P2	On place	EDI	Order, approve, receive, process	Private company(freight insurance)	Iran yak
P2,P5	On place	EDI	Order process	Logistic service provider	Mazandar
P2,P5	On place	internet	Following order, approve, receive	Fast transportation	Post
P2,P5	On place	EDI	Following order, approve, receive	Fast transportation	post
P2,P5	On place	EDI	Order and following process	Logistic service provider	Saika
P2,P5	On place	EDI	Order and following process	Logistic service provider	Iran kade
P2,P5	On place	Internet	Following order, approve, receive	Logistic service provider	Iran kade
P2,P5	On place	Internet	Following order, approve, receive	Fast transportation	Felen
P2	On place	EDI	Following order, approve, receive	Logistic service provider	Bedjo

Table 1: Transportation management.

Position	Current acceptance	Technology	Function of produce chain	Operation title	Company and subject
P2	On place	Internet	Following order, approve, receive	Logistic service provider	Faran
P2,P5	On place	Internet	Approve receipt	Private company(freight insurance)	Hala
P2,P5	On place	EDI	Following order, approve, receive	MTO	Shad
P2,P5	On place	Internet	Following order, approve, receive	MTO	Yakhmak
P2,P5	On place	EDI	Approve receipt	Private company(freight insurance)	Sisa
P2	On place	EDI	Order, approve, receive process	Private company(freight insurance)	Lambe
P2,P5	On place	EDI	Order process	Interior model terminal	Amol si
P2,P5	On place	EDI	Following and order process	Interior model terminal	Amol si
P2,P5	On place	EDI	Following and order process	Interior model terminal	Amol si
P2,P5	On place	Internet	Following and order process	Interior model terminal	Amol si
P2	On place	EDI	Order, approve, receive process	Logistic service provider	Sine
P2	Project/under assessment	Internet	Order, approve, receive process	Logistic service provider	Sarbazi
P2,P5	On place	EDI	Automation freight document process	Logistic service provider	Lorel
P2	On place	EDI	Order process	Logistic service provider	Jam sar
P2	On place	EDI	Order process	Logistic service provider	Bdh
P2	On place	EDI	Order process	Logistic service provider	Hassn golpour
P2	On place	Internet	Following and order process	Logistic service provider	Nama saz
P2,P5	On place	EDI	Following and order process	Logistic service provider	Nob plan
P2	On place	Internet	Order process	Private company(freight insurance)	Jigar
P2	On place	EDI	Order, approve, receive process	Private company(freight insurance)	Lobo
P2,P5	On place	EDI	Order process	Interior model terminal	Sazokar
P2	On place	EDI	Order process	Marine terminal	Farz
P2,P5	On place	Internet	Order process	Private company(freight insurance)	Chaman
P2,P5	On place	Internet	Order process	Fast transportation	Seda
P2,P5	On place	EDI	Order process	Logistic service provider	Sabok
P2,P5	On place	Internet	Order process	Logistic service provider	Golestan
P2	On place	EDI	Order, following, approve, receipt process	Logistic service provider	Golestan
P2	On place	Internet	Order, approve, receive process	Logistic service provider	Golestan
P2	On place	EDI	Order process	MTO	Bandar
P2,P5	On place	EDI	Order process	Marine terminal	Labkhand
P2,P5	On place	Internet	Order process	Fast transition	Sorat
P2,P5	On place	Internet	Order, following, approve, receipt process	Logistic service provider	Amade
P2,P5	On place	EDI	Following order, approve receipt automation freight document	Logistic service provider	Soran
P2	On place	Internet	Order process	Rail transition	Te kale
P2,P5	On place	Internet	Order, following, approve, receipt process	Fast transition	Amme jan
P2,P5	On place	EDI	Order, following, approve, receipt process	Fast transition	Daii jan
P2,P5	On place	EDI	Order, following, approve, receipt process	Marine terminal	Che konam
P2,P5	On place	Internet	Order, following, approve, receipt process	Marine terminal	Khahar

Table 2: Supply chain execution.

- P3: Field force automation often used for activity report, while it should execute at the minimum operational time.
- P4: Fleet freight management often used for addressing or satellite warning for investigating functional parameter has almost low range of acceptance.
- P5: Merge level of different tools are generally low in achieving to strategic benefits, should follow in higher level (Tables 1-4).

Results and Topics

In current experimental study about road transportation in Iran and especially in Mazandaran province we have investigated the effect of ICT and its acceptance in companies.

Totally, results show that current effect of ICT on transportation industry is immature and from different aspects of subject has importance. Firstly, only routine operational activities are commonplace and widely they are automated, while other top activities

like planning, accounting and designing supported rarely. Secondly, the most innovative tools (i.e., mobile and wireless system) have less acceptance level [19]. Thirdly, the level of tool merging is also restricted and just there is one alternative to use as major alternative. According to our idea, there is a need for high level of merging instead of achieving all tool advantages.

If transportation management tools(TM) often accepted by supported routine activity (i.e., routine activity or planning); their usual using for strategic activities will be less (i.e., accounting and dynamic routine activity). Tolls of SCE are expanded and related to main function of road (i.e., as investigation of middle step in transportation process) and approve of receipt [20-23]. Most of them used by EDI tools, while standardization rarely happened by multi-tools. FFA tools frequently perform for unreal time and suggest functions like warning of plan delivery (i.e., PDAs that support changing data). A few operational supporters provide real time. Finally FFM tools use satellite warning GPS/GPRS for navigation and monitoring. Tracing functional parameter in both goods (i.e., temperature degree and pressure) a vehicles (i.e., tire wind pressure) rarely used.

Position	Current acceptance	Technology	Function of produce chain	Operation title	Company
P3,P5	On place	Mobile	Operational support, receipt plan	Logistic service provider	Edman
P3	Project/under assessment	Network	Warning, report	Fast transportation	Loftan
P3	Project/under assessment	Mobile	Plan report, attention to receipt	Fast transportation	Ghorban
P3,P5	On place	Network	Operational support, receipt plan	Logistic service provider	Dahanet ko
P3,P5	On place	Mobile	Report	MTO	Nossh
P3	Project/under assessment	Network	Report	Private company	
P3	On place	Wifi	Plan report, attention to receipt	Logistic service provider	Post
P3,P5	On place	Network	Report, operational support	Fast transportation	Post
P3,P5	On place	Mobile	Plan, attention to receipt	Fast transportation	Post
P3	Project/under assessment	Network	Plan, attention to receipt	Private company	Shefte
P3,P5	On place	Mobile	Plan, attention to receipt	Fast transportation	Moos
P3	On place	Network	Plan, attention to receipt, report, operational support	Fast transportation	Lala
P3	On place	Wifi	Report	Private company	Tejarat iran
P3,P5	On place	Network	Report, operational support	Private company	Ghamze
P3,P5	On place	Wifi	Operational report	Interior terminal	Naz
P3,P5	On place		Operational report	Interior terminal	Pedarete
P3,P5	On place		Operational report	Interior terminal	Hayhay

Table 3: Field force automation.

Fleet freight management	Field force automation	Function of produce chain	Transportation management	Tools
18	24	59	31	On place
14	8	1	3	Under assessment
32	32	60	34	Overall
30	29	46	34	Number of companies

Table 4: Fleet freight management.

It is possible a lot of reasons exist back of this immaturity. Based on research finds, two reasons have the most importance. First, less common knowledge and companies problem to identify potential benefits (about accuracy, safety, traceable and et.) where due to special tolls or technology. Second, destroying logistics and transportation industry in Mazandaran province (with different type's level) undoubted is massive and powerful obstacle for investigation new technologies and expanding mixed alternatives.

In this case, maybe interesting that some of project examples haven't occurred in other sides of the world and especially in Europe yet, so for approving of how ICT tools can be successful needs to test it in wider area. One of interesting example of this matter [11,12]. Target of system is providing architecting system based on web for structure planning and merging data information changes in this case by different players (i.e., waterway, roadway and railway in the border transportation) in port and around it and designing related rout for transportation.

Finally, the important points are so interesting [24]. There is relation between current and future using of ICT, strategic management and acceptance of organizational behaviour. In main current article, we suggest that increasing of ICT tools may change transportation charges attitude. In the other words, managers of transportation companies should have more knowledge about alternatives and their effects on succeed factors in logistics and transportation industry. In fact, technology producers should have better reaction against the companies that take their alternatives for their business process and more insist on organization changing than technological changing [25].

This study had some limitations that should consider. Firstly, designing case study of pioneer firms needs to negotiate and exact results division that hope to do interviews more understandable and answers more knowledgeable. And at least assess according to the data has found in interviews.

Anyway finds show acceptance of ICT mechanism in involved companies with transportation activities. In this case, most of study emphasis was on evaluating the acceptance of ICT in transportation companies; specially, decision making process was more interesting for having more detail to introduce understanding needs and the most critical operation opportunity [26]. In addition investigation of ICT tools effect on process may provide both of descriptive and quantity models for measuring advantage that achieved from acceptance of ICT to overcome problems and help managers to decide invest in ICT. At last this matter investigated and expanded experimental work about making decision in supportive group decision system for evaluating information and communication technology in the field of logistic.

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