

## Research Article

# Effects of e-commerce on supply chain of production companies in Isfahan

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## **ABSTRACT**

In competitive environments of international commerce, most companies consider supply chain management as a tool for achieving long term benefits. Information management has considerable importance among major processes of supply chain and plays key role in integrating members of chain. Therefore, industries should coordinate themselves with supply chain technologies and electronic commerce. Otherwise, it is impossible to penetrate into new markets and they cannot preserve their market share. One model of electronic commerce is business-to business electronic commerce markets in which the focus is on the relationship between relationships of these organizations. This new information ground has transformed the relationship between organizations and their communication including changing communication manner of supply chain members in market. Regarding importance of electronic markets in supply chain management of organizations and businesses, few studies are conducted about this. Based on this and regarding necessity of research in this field, this research tries to study the role and effects of electronic markets' functions in business-to-business field on supply chain management and particularly, supply chain functions like product unit cost and customer response time. This is descriptive survey and statistical population is experts of 20 production companies in Isfahan. Inclusion criteria for companies is the extent and application of electronic commerce concepts. Results are summarized by SPSS software. Regarding results o data analysis, an important point in this research is high effect of information service and logistic on both performance criteria which indicates considerable effect of sharing information related to the products, suppliers and customers and also practical concepts of electronic logistics which increase integrity and coordination of supply chain. Other part of research deals with ranking advantages caused by presence on electronic markets and results indicate that the importance of advantages caused by reduction in costs has higher position than other advantages of market and reduction of costs is an important reason of organizations for presence in electronic markets. In addition, introducing new product to market through electronic markets is an advantage that has highest importance in the given industries.

**Keywords:** electronic commerce, supply chain, business-to-business commerce.

## **INTRODUCTION**

In competitive environments of international commerce, most companies consider supply chain management as a tool for achieving long-term competitive advantages. Structure of supply chain consists of potential suppliers, producers, distributors, retailers and customers which seeks risk reduction in supply chain and follows goals like improving satisfaction of customers, optimization and management of inventories and higher profitability [1]. Among major processes

of supply chain, information management is very important and plays key role in integrating among members of chain. On the other hand, developments in electronic commerce has caused companies and industries to consider this field in order to develop their business and look for ways to reduce product and service cycle and enjoy new developments in management and technology (such as internet, world wide web and information technology).

Integrating supply chain management with technologies used for these activities is a competitive necessity of most industries. Therefore, industries should coordinate themselves by implementing supply chain technologies and electronic commerce. Otherwise, it is impossible to penetrate new markets and they cannot also preserve their market share. One model for electronic commerce is business-to-business electronic market in which the focus is on the organizations [2]. This new information ground has transformed the relationship between organizations and their communication and one effect of it is changing manner of communication between supply chain members of organizations in the market. Electronic markets, by providing information and transaction platform, accelerates information transfer among organizations and by gathering information of buyers and sellers in one point, reduces search costs and provides the communication with new buyers and sellers for organizations participating in market. But, regarding considerable importance of electronic markets on supply chain management of organizations and businesses, there are not yet enough study in this field. Based on this and regarding necessity of more research, this study tries to investigate the role and effects of electronic market functions in business-to-business, in supply chain management and particularly, functions of supply chain such as product unit cost and customer response time. This research studies the effects of electronic commerce on the supply chain of Isfahan production companies [3].

#### **Concept of supply chain and background**

Before emergence of supply chain, concepts like logistics were used which was a branch of martial sciences and then, it entered in economic and private activities. According to the definition of logistic management council in 1993 logistic is a part of supply chain process which conducts planning, implementation and effective control of

storing goods, services and related information from source to the consumption destination in order to meet the needs of customers. Regarding definitions, logistic mission includes sending given products and services to the given place in given time by optimal conditions with the highest efficiency and best result for an organization or company. Concept of supply chain is far from logistics and includes other activities. In fact, supply chain is present before and after logistic, during it and encompasses it. This concept like other concepts and philosophies is developed due to necessary conditions. In fact, supply chain management is not a term without historical background and if someone studied the progress of production and non-production industries and their changes, s/he can predict easily the emergence of such concept [4].

#### **Definition of supply chain**

By expansion of supply chain concept, various definitions has mentioned for it. Epix dictionary has defined supply chain as following:

1. Various steps of work from providing raw materials to delivery of final product which is defined as the relationship between suppliers to consumers is called supply chain [5].
2. All operation inside and outside of a company which enables supply chain to produce good and present service to customer is called supply chain.

Definition presented by supply chain council is:

Supply chain includes activities related to the production to final delivery of product from major suppliers to minor customers. These activities are divided into four groups:

- i. planning
- ii. Sourcing
- iii. Manufacturing and production
- iv. Delivery and distribution

Which includes management of supply and demand, sourcing raw materials and parts, manufacturing and assembly, storage, receiving orders, distribution through distribution canals and delivery to customer?

Supply chain includes all steps that act directly or indirectly to meet the demands of customers and does not include only manufacturer and supplier but encompasses transportation, stores, retailers and customers [6]. Supply chain for companies is such that it provides products or services for presenting in market [7].

Stedler and Kilger (2000) has defined supply chain as following: supply chain is a network of organizations with different activities and processes and upstream-downstream links which delivers added value in form of final product or service.

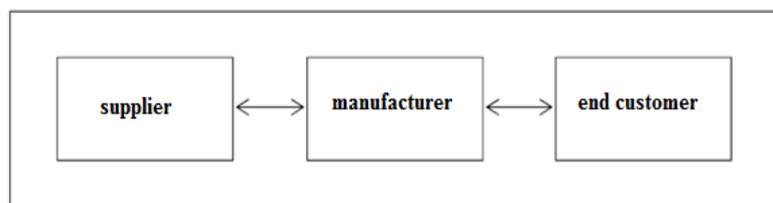
Supply chain is "process umbrella" by which products are produced and delivered to the customer. Regarding structure, supply chain is a complex relationship network that has its organizations or trade partners (supplier, producer, and distributor).

#### **Supply chain management**

Today, competition among companies has increased and their profit margins has decreased. Globalization, diversity in products and rising awareness of customers has made the markets more competitive and increase in competition has forced manufacturers to response to different needs of customers (Zhang et.al, 2009). In business world, supply chain management is a common term because it is one way for companies to achieve competitive advantage and its purpose is information, material and services' flow with systematic approach from supplies to company and delivering the products to end customer in an efficient way. In this systematic approach, emphasis is on end-to-end optimization

and only local or certain unit optimization is not considered. Therefore, companies should have better domestic and foreign technology (capacity of suppliers and requirements of customer) for competitiveness. Companies should change their attitude about supplier from enemy to partner and consider it as a source in order to promote performance of supply chain for rapid response in turbulent environment of business [8]. Undoubtedly, outsourcing is a developed paradigm of production and basic activity for each company in order to compete in international competitive market [9].

Great companies have found that optimal supply chain management increases success through obtaining direct and indirect profit in supply chain. Therefore, supply chain management has attracted managers and researchers. This approach has been shaped from early 1990s and now it is governing factor in taking strategies and effective way in order to create value for customers (Amin & Razmi, 2009). Managers traditionally focus on internal operation in order to increase revenue, while supply chain management emphasizes integration of internal activities and required decision makings for communication with foreign partners in order to promote competitiveness capacity [1]. Supply chain structure includes combination of potential suppliers, producers, distributors, retailers, customers and etc. that its emphasis is improving servicing customer, profitability and performance of business. Hughes (2003) in "requirements of supply chain" considers supply chain as one supplier, manufacturer and end customer (fig 1)



**Fig 1:** simple supply chain (Hughes, 2003).

In practice, supply chain includes different factors. Generally, extended supply chain can be displayed as figure (2) (Hughes, 2003).

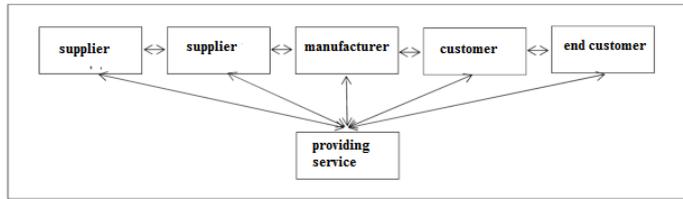


Fig 2: schematic of developed supply chain (Hughes, 2003)

More certain instance of supply chain can be found in figure (3) (Hughes, 2003)

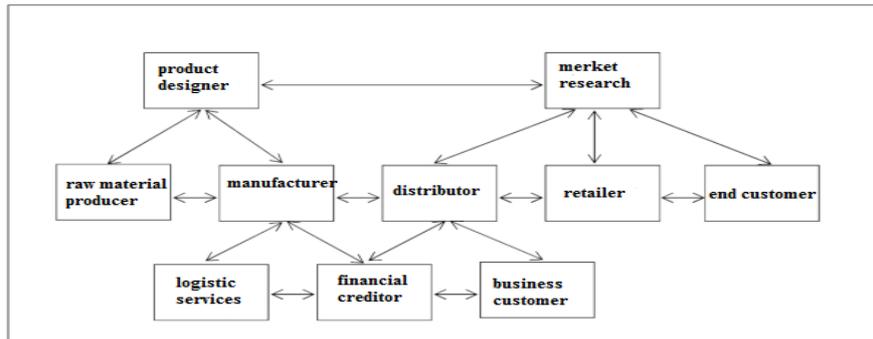


Fig 3: schematic of special supply chain (Hughes, 2003)

It should be mentioned that when we call a supply chain successful that products or services delivered in right size, optimal quality and in certain time and place (Sarkis & Telori). Supply chain management seeks to reduce risk in supply chain and by this way, it follows goals like improvement, customer satisfaction, optimization and inventory management and profitability (Simchi, 2004).

**Data analysis**

Purpose of this research is studying the effectiveness of electronic market functions on two criteria of supply chain performance. In order to study this subject and regarding shape and structure of questionnaire, index for measuring weight mean of response to each question is a number from 1 to 5. Weight mean of each question shows effect of each function on the criteria of supply chain which is compared with 1. Number 1 indicates non-effectiveness of each function of performance criteria. Unidirectional hypothesis testing is used to this test because rejecting null hypothesis is done when mean is larger than 1. Hypothesis testing is defined as following:

$$\begin{cases} H0 : \mu \leq 1 \\ H1 : \mu > 1 \end{cases}$$

$\mu$  indicates mean weight of society per effect of each electronic market functions on two performance criteria i.e. product unit cost and customer response time. This hypothesis repeats for 18 variables in product unit cost and customer response time. In order to test hypothesis, t-distribution with 95% confidence level was used. Tables 4-6 and 4-7 indicate results of test. In these tables, t value, degree of freedom, p-value, mean difference and confidence level for each variable has been calculated. This analysis was conducted with SPSS software and one sample t-test (P-value<0.01) (Keller & Warrick, 2000). Hypothesis testing is unidirectional but software conducts analysis in bidirectional mode; therefore, in order to reach correct p-value, significance level should be multiplied in 2. Significance is very near to zero and multiplying it in 2 gives same results which is lower than 0.01; therefore, all null

hypotheses were rejected and hypothesis 1 is accepted with high probability which indicates positive effect of all electronic market functions on reducing product unit cost and customer response time.

**Table 1:** t-distribution (effect of electronic market functions on reducing product unit cost)

One-sample test

	Test value=1					
	t-test	Degree of freedom (df)	Sig. (2-tailed)	Mean difference	%95 confidence level	
					Low limit	High limit
Information services	94.236	144	0	3.70345	3.6258	3.7811
Shared services	30.329	142	0	2.20280	2.0592	2.3464
Business intelligence services	9.015	125	0	0.69841	0.5451	0.8517
Trust increasing services	20.948	138	0	1.28777	1.1662	1.4093
Fixed pricing mechanism	23.246	144	0	1.47586	1.3504	1.6014
Dynamic pricing mechanism	54.988	144	0	3.24138	3.1249	3.3579
Logistic services	24.735	142	0	2.16783	1.9946	2.3411
Financial services	30.197	144	0	2.09655	1.9593	2.2338
Interactional services	15.747	137	0	1.69565	1.4827	1.9086

**Table 2:** t-distribution (effect of electronic market functions on reducing customer response time)

One-sample test

	Test value=1					
	t-test	Degree of freedom (df)	Sig. (2-tailed)	Mean difference	%95 confidence level	
					Low limit	High limit
Information services	46.524	144	0	3.03448	2.9056	3.1634
Shared services	72.370	144	0	3.47586	3.3809	3.5708
Business intelligence services	10.468	131	0	0.81818	0.6636	0.9728
Trust increasing services	16.717	142	0	1.48252	1.3072	1.6578
Fixed pricing mechanism	19.378	144	0	1.64828	1.4802	1.8164
Dynamic pricing mechanism	22.435	144	0	1.62759	1.4842	1.7710
Logistic services	31.102	143	0	2.59028	2.4257	2.7549
Financial services	21.333	143	0	1.60417	1.4555	1.7528
Interactional services	20.862	139	0	1.81429	1.6423	1.9862

This hypothesis can be analyzed with different analysis. If confidence level does not include zero, we can conclude that the difference is significant and null hypothesis is rejected (Gorge & Maleri, 2001). As seen, of 18 studied variable, no one is zero. Effectiveness of studied functions on improvement of supply chain criteria is predictable and what answers the research question, is effectiveness ratio of each variable to other variables. Therefore, table 3 measures mean weight of variables in two classes of reducing product unit cost. Figure 1 shows mean weight of variables.

**Effect of electronic market functions on reducing product unit cost**

Electronic market services are divided into three classes according to framework presented in chapter 2:

1. Information; 2-transactions; 3-added value; effect of each class of functions on reducing product unit price is shown in following:

Information:

Information services, shared services, business intelligence and services that increase trust among business parties are placed in this class. Services presented in this class form information services of process before transaction and in fact, they provide basis for decision-making process for transaction. Effect of these four variables on reducing product unit cost is different with each other (table 3). Among these four variables, information services with mean 4.70 has the highest effect on the reducing product unit cost. Second effective variable in this group is shared services with mean 3.20 and third and fourth variables in this class has the least effect on reducing product unit cost. Trust increasing services have

mean 2.28 and business intelligence services with mean 1.70 has the least effect on reducing product unit cost.

**Table 3:** effect of electronic market function on reducing product unit cost

One-sample statistics				
	Valid data	Mean	SD	Std. Error Mean
Information services	145	4.7034	0.47323	0.3930
Shared services	143	3.2028	0.86854	0.7263
Business intelligence services	126	1.6984	0.86967	0.6147
Trust increasing services	139	2.2878	0.72476	0.6349
Fixed pricing mechanism	145	2.4759	0.76451	0.5895
Dynamic pricing mechanism	145	4.2414	0.70981	0.8764
Logistic services	143	3.1678	1.04804	0.8674
Financial services	145	3.0966	0.83603	0.6943
Interactive services	138	2.6957	1.26496	0.10768

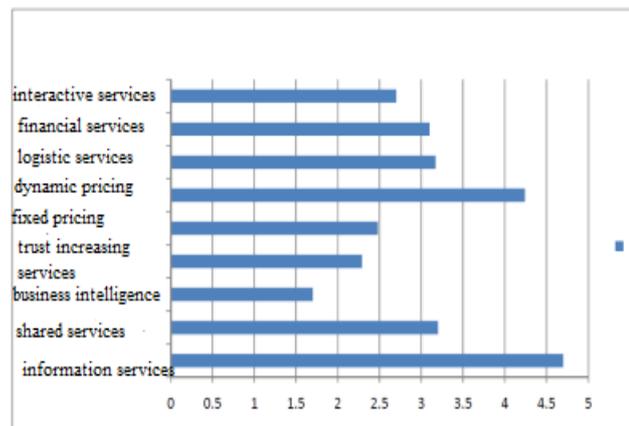
Among four variables of first group, information services have the least standard deviation which indicates least dispersion from mean and high accuracy of solution.

**Transactions**

Information services are followed by transaction services which facilitates main function of each market i.e. connecting supply and demand. Common systematic systems in electronic markets are placed into two fixed and dynamic pricing groups. According to results of questionnaires, dynamic pricing mechanism have higher position with mean 4.24 than fixed pricing mechanisms with mean 2.48. This shows that effect of dynamic pricing mechanism on reducing product unit price is higher than effect of fixed pricing mechanisms. Information obtained from table 3 has slight standard difference for two above variables which indicates low dispersion of experts' answers relative to mean.

**Added value**

Third class of market function are those functions which produce added value. Financial services, logistic services and transaction services are placed in this class. Financial services are those services that facilitate money transfer in the market. Mean of this variable is 3.10. Logistic services has mean 3.17. Transaction services has the least mean among variables with mean 2.70.



**Fig 1:** effect of electronic market functions on reducing product unit cost based on t-test

As seen, information services, dynamic pricing systems, shared services and logistic services in electronic markets have the highest effect on reducing product unit cost. Other market services have lowest position than above services and are placed in next places of table.

### Friedman test results

Friedman test was used to compare mean of these functions that its results are as following:

**Table 4:** descriptive statistics related to the effect of electronic commerce function on reducing product unit cost

Descriptive statistics

	Number	Mean	SD	Minimum	Maximum
Information services	121	4.7107	0.47107	3.00	5.00
Shared services	121	3.1818	0.90370	2.00	5.00
Business intelligence services	121	1.6777	0.86809	1.00	4.00
Trust increasing services	121	2.2810	0.72138	1.00	4.00
Fixed pricing mechanism	121	2.4876	0.76502	1.00	4.00
Dynamic pricing mechanism	121	4.2314	0.64240	2.00	5.00
Logistic services	121	3.2397	1.00021	1.00	5.00
Financial services	121	3.1240	0.79131	1.00	5.00
Interactional services	121	2.7273	1.23828	1.00	5.00

**Table 5:** mean ranking based on Friedman test- Friedman test Ranks

	Mean rate
Information services	8.30
Shared services	5.19
Business intelligence services	2.16
Trust increasing services	3.33
Fixed pricing mechanism	3.67
Dynamic pricing mechanism	7.36
Logistic services	5.31
Financial services	5.15
Interactional services	4.52

**Table 6:** Friedman test statistics Test statistics

N	121
Chi-square	527.363
Df	8
Asymp.sig	.000

a. Friedman test

Table 4 shows mean, standard deviation, minimum and maximum scores. Table 5 indicates mean ranks of each function. Table 6 is test result. As seen, Chi-square statistics with 8 degree of freedom and p-value with zero indicate rejecting null hypothesis. Regarding these outputs, effects of electronic business function on reducing product cost is different. Based on this, information services have the highest effect and business intelligence services has the least effect on reducing product unit cost.

Effect of electronic market functions on reducing customer response time

In this section, we study the effect of electronic market services in three classes 1) information, 2) transaction and 3) added value on customer response time. Information Among four variables in this group, shared services have mean 4.48. This mean indicates high effect of shared services on reducing customer response time. Information services with mean 4.03 shows lower effect on reducing customer response time. After these two variables, trust increasing services and business intelligence are placed with means 2.47 and 1.28, respectively. In this regard, deviation from first variable i.e. information services is lowest which shows less dispersion from mean.

### Transactions

Transaction services, as stated in reducing product unit cost section, are placed in dynamic and fixed pricing class. Effect of transaction services on reducing cost is high but these services cannot significantly influence on reducing customer response time. Obtained results confirm this problem such that fixed pricing mechanisms with mean 2.65 and dynamic pricing mechanisms with mean 2.63 indicate the

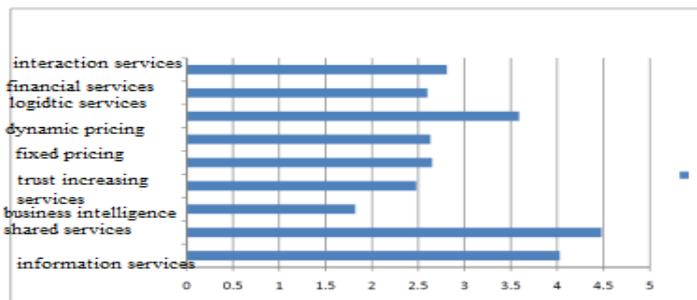
ineffectiveness of these services on customer response time. In this group, position of dynamic pricing mechanism is higher than fixed pricing mechanism but this difference is not so significant. Standard deviation of fixed pricing mechanism variable is higher than 1 and shows high dispersion of experts' answers to this question.

#### Added value

In this class, as reducing product unit cost, logistics services with mean 3.59 has the highest effect on reducing customer response time. After transaction services, transaction services are placed with mean 2.81 and financial services with mean 2.60 show the least effect on customer response time.

**Table 7:** effect of electronic market functions on reducing customer response time

	Valid data	Mean	SD	Std. error mean
Information services	145	4.0345	0.78540	0.6522
Shared services	145	4.4759	0.57834	0.4803
Business intelligence services	132	1.8182	0.89799	0.7816
Trust increasing services	143	2.4825	1.06052	0.8868
Fixed pricing mechanism	145	2.6483	1.02423	0.8506
Dynamic pricing mechanism	145	2.6276	0.87357	0.7255
Logistic services	144	3.5903	0.99939	0.8328
Financial services	144	2.6042	0.90236	0.7520
Interactional services	140	2.8143	1.02897	0.8696



**Fig 2:** effect of electronic market functions on reducing customer response time

As seen, effect of shared services, information services and logistic services is higher than market functions and shows more effects on reducing customer response time. From experts' point of view, financial services create trust and even transaction services in the market have direct effect on reducing customer response time and artificial intelligence services have the least effect on reducing customer response time which is expected due to not using these services in Iran.

#### Friedman test results

Friedman test gives similar results:

**Table 8:** descriptive test for effect of electronic business functions on reducing customer response time

	Number	Mean	SD	Minimum	Maximum
Information services	129	3.9845	0.74984	2.00	5.00
Shared services	129	4.4341	0.58423	2.00	5.00
Business intelligence services	129	1.7984	0.89600	1.00	4.00
Trust increasing services	129	2.4264	1.06635	1.00	5.00
Fixed pricing mechanism	129	2.6744	1.02441	1.00	5.00
Dynamic pricing mechanism	129	2.5736	1.02441	1.00	5.00
Logistic services	129	3.7364	0.86400	1.00	5.00
Financial services	129	2.5504	0.82462	1.00	5.00
Interactional services	129	2.8837	0.79019	1.00	5.00

**Table 9:** ranking means based on Friedman test

	Mean rate
Information services	6.96
Shared services	7.98
Business intelligence services	2.43
Trust increasing services	3.87
Fixed pricing mechanism	4.29
Dynamic pricing mechanism	4.16
Logistic services	6.59
Financial services	4.03
Interactional services	4.70

**Table 10:** Friedman test statistics-Test statistics

N	129
Chi-square	501.661
Df	8
Asymp.sig	.000

Table 8 shows mean, standard deviation, minimum and maximum scores. Table 9 shows mean rank of each function. Table 10 is result of test. As seen, Chi-square statistics with 8 degree of freedom and p-value with zero indicate rejecting null hypothesis. Regarding these outputs, effects of electronic business function on reducing product cost is different. Based on this, shared services have the highest effect and business intelligence services have the least effect on reducing product unit cost.

**Comparing results of electronic business functions** Table 11 compares effect of electronic market functions with reducing product unit price and reducing customer response time. Shared and logistics services have more intense effect on reducing customer response time, while information services, dynamic pricing mechanisms and financial services have higher effect on reducing product unit cost. Business intelligence services, trust increasing, fixed pricing mechanism and interactive services in both states have not direct effect on reducing costs and increasing customer response.

**Table 11:** comparing effects of electronic market functions relative to reducing product unit cost and customer response time

	Reducing product unit price	Reducing customer response time
Information services	8.30	6.96
Shared services	5.19	7.98
Business intelligence	2.16	2.43

services		
Trust increasing services	3.33	3.58
Fixed pricing mechanism	3.67	4.29
Dynamic pricing mechanism	7.37	4.16
Logistic services	5.31	6.59
Financial services	5.15	4.03
Interactional services	4.52	4.70

## CONCLUSION

Results of this research shows that information services, logistic services and dynamic transactions have the highest effect on reducing product unit cost and shared services, information services and logistic services have the highest effect on reducing customer response time. An important point in this research is high effect of information and logistic services on both criteria which indicates considerable effect of shared information related to the products, suppliers and customers and practical concepts like electronic logistics which increases integration and coordination of supply chain. In other part of research, benefits caused by presence in electronic markets were ranked and results showed that importance of benefits is caused by reducing costs and reduction of costs is an important reason for presence of organizations in electronic markets. In addition, introducing of new product in market through electronic

markets is a benefit that has highest importance in given industries.

### **Suggestions**

Since results of this research is about effect of electronic business function and high effect of information and shared services on supply chain; therefore, developing investment incentives is suggested for information and communication networks by private section.

Results indicate non-application of useful services like interactive services which shows lack of integrity in Iranian supply chain; therefore, it is suggested that Iranian managers obtain more positive attitude toward these services and try more to use these services which leads to integration of supply chain.

Results of this research indicate that in Iranian companies, concepts of electronic business are used in sale and purchase; therefore, the need for teaching electronic commerce concepts and using them is necessary among all elements.

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