

Examining Effects of Electronic Market Functions on Decrease in Product Unit Cost and Response Time to Customer

Maziyar Nouraei

Abstract—Electronic markets in recent decades contribute remarkably in business transactions. Many organizations consider traditional ways of trade non-economical and therefore they do trade only through electronic markets. There are different categorizations of electronic markets functions. In one classification, functions of electronic markets are categorized into classes as information, transactions, and value added. In the present paper, effects of the three classes on the two major elements of the supply chain management are measured. The two elements are decrease in the product unit cost and reduction in response time to the customer. The results of the current research show that among nine minor elements related to the three classes of electronic markets functions, six factors and three factors influence on reduction of the product unit cost and reduction of response time to the customer, respectively.

Keywords—Electronic Commerce, Electronic Market, B2B Trade, Supply Chain Management.

I. INTRODUCTION

IN the recent decade, internet and electronic commerce (E-commerce) have changed the business trade in organizations and organizations structure, relation with customer and shareholders and stakeholder dramatically [7]. One of electronic commerce models is the business-to-business (B2B) electronic markets transaction in which the more focus is on the relationship between organizations. In fact, B2B is an inter-organizational internet-based information system which facilitates electronic transactions between sellers and purchasers [12]. Such new informational infrastructure has changed the relation between organizations and their form of relations. One of changes caused by this infrastructure is the change in how members of a supply chain of an organization in the market connect with each other [20]. Despite of high importance of electronic markets in the supply chain management of different organizations and business, not much research has been conducted in this field. Thus, the current paper examines roles and effects of electronic markets functions on inter-business, supply chain management and especially on product unit cost and response time to the customer.

II. ELECTRONIC MARKET AND ELECTRONIC COMMERCE

An electronic market is a kind of market in which purchasers and suppliers, through gathering together and sharing their information, buy and sell services and products. The information technology would facilitate transactions in such market. The participants in the electronic market are purchasers, suppliers of technology, sellers, and investors [6]. The electronic commerce is the electronic exchange of data. Briefly, the electronic data interchange is defined as production, processing, application, and exchange of data and documents through automatic and electronic methods among computer systems and based on certain standards and common language and with the least human factors interference. Albeit, the electronic commerce is a field wider than the electronic data interchange. The electronic commerce is revolution in communications. In the simplest definition, the electronic commerce is finding resources, evaluation, negotiation, ordering, delivery, payment and presenting support services which are done electronically. Hence, the E-commerce is a method in which information. Products and services are traded through computer communication networks [5]. The E-commerce is applied in different forms. Business-to-business is one of E-commerce types in which E-commerce functions as a medium between two sellers [6].

III. B2B BUSINESS TRANSACTION

The B2B transaction is applied whenever the seller and customer both are in one business unit (legal personality) or parts of one business unit which they use computer networks and electronic equipment to communicate with each other. For instance, two business units install an electronic network to deliver the order, issue contract, receive bills, and pay for costs [3].

The communication between business units needs much time to complete all trade processes in the traditional method. However, if all transactions are done using internet, the cost and time would get spent the least [16]. This technology is the developed model of electronic data interchange (EDI). In fact, B2B backs to EDI concept which has grown and developed increasingly due to internet expansion. An open and special network of internet which is increasingly becoming a communication and trade tool and EDI usage is getting ended anymore [8]. Business units' relying on equipment, facilities, and services of other business units is another factor for growth and development of B2B [15].

Maziyar Nouraei is with UPC Universitat Politècnica de Catalunya Barcelona Tech Spain (phone 0034632918898, e-mail: maziyarnouraei@yahoo.com).

IV. ELECTRONIC MARKET FUNCTIONS

Reference [11] has come up with a relatively complete division of electronic commerce functions. They identified nine services and the classified those into three classes of informational services, transaction services, and services producing value added.

Informational services and information flow in virtual world and electronic markets are done so faster than what is done in physical and traditional markets. In electronic markets, purchasers and sellers can access to each other's information very comfortably and faster [2]. Electronic markets have provided effective services in improving transactions quality. The most primary effect of electronic market in transaction part is related to price and pricing. The price as the most critical element in marketing plays important role in how transactions are done. The electronic market creates clear prices and more suitable transaction environment [1]. The last function of the electronic market is related to creation of value added. The value added means an extra wealth which is produced through production or service processes and is calculated by deduction of medium inputs (e.g. purchase cost) from outputs. The value added created by electronic markets have more efficiency than value added produced in traditional markets [14].

V. SUPPLY CHAIN MANAGEMENT

The supply chain includes all activities related to flow and conversion of product from the raw material stage (extraction) to delivery to the final consumer and also the related information flows. Generally, the supply chain is a chain of all activities related to product flow and material conversion, from the stage providing raw material to the stage of final product deliverance to the consumer [18]. In 1990s, along with improvement of production processes and application of re-engineering patterns, managers of many industries found out that to survive in the market, only improving the internal processes and flexibility of the company's abilities is not sufficient. They concluded that part and material supplies should also provide material with the highest quality and least cost and products distributors should have closeness to market development policies of the producer. Due to this approach, supply chain approaches and management were born [13]. Today, the SCM is recognized as one of fundamentals of electronic business implementation in the world [9].

In the present research, the electronic market functions are examined in three categories information, transactions, and value added. Finally, effects of each of the three factors on reduction of response time to customer and product unit cost are analyzed.

VI. PROBLEM STATEMENT

Electronic market as a type of interchange electronic commerce provides a new infrastructure for transactions and inter-organizational communications. These new trade models, using internet and related technologies, provide possibility to connect organizations and execute electronic transactions.

Electronic markets help suppliers and purchasers to coordinate inter-organizational activities through using the internet. On the other hand, along with increasingly complication of SCM in the organizations, conducting research about how electronic markets influence on SCM and its elements is needed more than any other time. Not correctly recognizing functions of electronic market and its certain effects on SCM has led to not efficiently use of potentials of electronic market.

VII. RESEARCH NECESSITY AND IMPORTANCE

Since the traditional business transaction environment cannot respond to high volume of transactions and increase of purchasers and sellers, using electronic trade methods and electronic markets is an important issue. Also, knowing functions of electronic markets and special notice to effects of such functions on SCM are so on demand. Thus, the current paper aims to examine impacts of electronic market functions on SCM.

VIII. RESEARCH OBJECTIVES

The main objective of the present research is to measure effects of electronic market functions on performance of supply chain of organizations in the market. The minor objectives are as follows:

- 1- Examining functional effects of information in electronic market on product unit cost and response time to customers
- 2- Examining functional effects of transactions in electronic market on product unit cost and response time to customers
- 3- Examining functional effects of value added in electronic market on product unit cost and response time to customers

IX. RESEARCH QUESTIONS

The main question of the present research is as follows:

How much do electronic market functions influence on performance of SCM in organizations involved with the market?

The minor questions of the current study are as follows:

- 1- How much is functional impact of information in electronic market on decrease in the product unit cost and response time to customer?
- 2- How much is functional impact of transaction in electronic market on decrease in the product unit cost and response time to customer?
- 3- How much is functional impact of value added in electronic market on decrease in the product unit cost and response time to customer?

X. RESEARCH METHODOLOGY

The current research is a field and descriptive study. The statistical population of the study includes 45 top level managers of 20 factories in the food industry in province of Shiraz, Iran. Since the statistical population is small and all people are accessible, sampling is not done. To collect the

research's information, the questionnaire is used. In the questionnaire, effects of electronic market functions on two performance criteria of SCM are measured.

In order to measure reliability of the questionnaire, six specialists in SCM and electronic markets are used. The Cronbach's alpha 0.82 shows high reliability of the questionnaire. For data processing, software SPSS is applied.

XI. RESULTS

Regarding the impacts of electronic market functions, the effect of this market on the product unit cost and the response time to customer is analyzed. To do so, H^0 and H^1 are defined as follows:

$$\begin{cases} H_0 \leq 1 \\ H^1 > 1 \end{cases}$$

The weighted average of answers is a number between one and five. The weighted average of each question (intense of effect of each function on SCM's criterion) is compared with one (one shows no effect of function on the SCM criterion). μ represents weighted average of population for each function of electronic market on two performance criteria product unit cost and response time to customer.

TABLE I
T-DISTRIBUTION, EFFECT OF ELECTRONIC MARKET FUNCTIONS ON DECREASE IN PRODUCT UNIT COST

variables	Test value = 1					
	T test	DF	Sig.(2-tailed)	Mean differences	Confidence interval 95% for average of each variable	
					lower limit	upper limit
informational services	32.626	44	0.00	2.89	2.72	3.07
Shared services	9.843	44	0.00	1.42	1.13	1.71
Business intelligence services	12.395	42	0.00	2.20	1.84	2.56
Trust-enhancing services	11.683	43	0.00	1.44	1.19	1.69
Fixed pricing	15.225	44	0.00	1.68	1.46	1.91
Dynamic pricing	31.061	44	0.00	2.74	2.56	2.91
Financial services	13.267	44	0.00	2.18	1.85	2.51
Logistics services	16.922	44	0.00	2.67	2.35	2.99
Transactions services	21.620	44	0.00	2.91	2.64	3.18

TABLE II
DISTRIBUTION, EFFECT OF ELECTRONIC MARKET FUNCTIONS ON DECREASE IN RESPONSE TIME TO CUSTOMER

variables	Test value = 1					
	T test	DF	Sig.(2-tailed)	Mean differences	Confidence interval 95% for average of each variable	
					lower limit	upper limit
informational services	32.626	44	0.00	3.18	2.94	3.41
Shared services	9.843	44	0.00	1.43	1.06	1.80
Business intelligence services	12.395	42	0.00	1.94	1.63	2.25
Trust-enhancing services	11.683	43	0.00	1.11	0.83	1.39
Fixed pricing	15.225	44	0.00	1.68	1.03	1.64
Dynamic pricing	31.061	44	0.00	2.74	1.18	1.87
Financial services	13.267	44	0.00	2.18	1.29	2.05
Logistics services	16.922	44	0.00	2.67	2.96	3.48
Transactions services	21.620	44	0.00	2.91	3.19	3.55

To measure the mentioned test, t-distribution with 95% confidence coefficient is applied. The hypothesis test is one-way while the software SPSS analyzes it in two-way case. Therefore, to reach a correct p-value, a significant value (sig) should be multiplied into two. The values of sig observed are so close to zero, therefore two times of them leads to similar results which are less than 0.01. Thus, all null hypotheses are rejected and H^1 is accepted with very high probability. All of these cases show positive effect of all electronic market functions on decrease in product unit cost and response time to customer.

A. Effects of Electronic Market Functions on Decrease in Product Unit Cost

Services of electronic market are classified into three classes: information, transactions, and value added. Impacts of each class on decrease in the product unit cost are examined.

TABLE III
EFFECT OF ELECTRONIC MARKET FUNCTIONS ON DECREASE IN THE PRODUCT UNIT COST

Variables	Range of changes	Average	Standard deviation
informational services	2	3.89	0.595
Shared services	3	2.42	0.968
Business intelligence services	4	3.20	1.163
Trust-enhancing services	3	2.44	0.820
Fixed pricing	3	2.68	0.742
Dynamic pricing	2	3.74	0.591
Financial services	3	3.18	1.100
Logistics services	3	3.67	1.059
Transactions services	3	3.91	0.904

In the class of information, three elements of information services, shared services, and business intelligence services, and trust-enhancing services. Informational services with average 3.89 and shared services with average 2.42 are of the maximum and minimum effect on decrease in the product unit cost, respectively. In the class transactions, there are two elements: dynamic and fixed pricing. The dynamic pricing (average 3.74) has the higher place on fixed pricing (average 2.68). Transaction services with average 3.91 and financial services with average 3.18 are of the maximum and minimum effect, respectively. In a concurrently examining the three classes, transaction services with average 3.91 and shared services with average 2.42 have the maximum and minimum impact, respectively.

B. Effects of Electronic Market Functions on Decrease in Response Time to Customer

In this section, the impact of electronic market services in three groups of information, transaction, and value added on the response time to customer is analyzed.

TABLE IV
EFFECT OF ELECTRONIC MARKET FUNCTIONS ON DECREASE IN THE RESPONSE TIME TO CUSTOMER

Variables	Decrease in product unit cost	Decrease in response time to customer
informational services	3.89	4.18
Shared services	2.42	2.43
Business intelligence services	3.2	2.94
Trust-enhancing services	2.44	2.11
Fixed pricing	2.68	2.33
Dynamic pricing	3.74	2.53
Financial services	3.18	2.67
Logistics services	3.67	4.22
Transactions services	3.91	4.37

Regarding the information, information services with the average 4.18 and trust-enhancing services with average 2.11 are of the maximum and minimum impact, respectively. Regarding the transaction, effect of dynamic pricing with average 2.53 is more than fixed pricing with average 2.33. Related to value added, transaction services have the maximum impact on decrease in the product unit cost with average 4.37. Financial services with average 2.67 have the least effect on response time to customer. In a general view,

transaction services with average 4.37 and trust-enhancing services with average 2.11 have the maximum and minimum effect on decrease in response time to customer, respectively.

TABLE V
COMPARING EFFECTS OF ELECTRONIC MARKET FUNCTIONS ON PRODUCT UNIT COST AND EFFECTS ON RESPONSE TIME TO CUSTOMER

Variables	Range of changes	Average	Standard deviation
informational services	3	4.18	0.765
Shared services	4	2.43	1.260
Business intelligence services	4	2.94	0.937
Trust-enhancing services	3	2.11	0.920
Fixed pricing	4	2.33	1.012
Dynamic pricing	4	2.53	1.126
Financial services	4	2.67	1.234
Logistics services	3	4.22	0.849
Transactions services	2	4.37	0.599

Table V compares impact of electronic market functions on decrease of product unit cost with effects on decrease in response time to customer. Information services, logistics, and transaction services have more intense effects on reduction of response time to customer. Transaction and financial mechanisms of the market have more intense impacts on reduction of product unit cost. Shared services of the market which includes exchange of messages, events, and news among agents participating in the market, have similar and weak effects in both cases with averages 2.42 and 2.43. Table V shows that trust-enhancing services also do not have direct effects on decrease in cost and increase in response time to customer in both cases.

XII. CONCLUSIONS

Regarding the results shown in Tables I and II, all functions of electronic market would influence positively on the two factors reduction of product unit cost and response time to customer. In a research by [4], applications of logistics in electronic commerce are categorized into two classes: development of electronic market and deletion of elements of SCM [4]. Development of electronic market itself leads to decrease in response time to customer and deletion of SCM's elements leads to reduction of product unit cost. Thus, results of the above-mentioned research match with results of the paper in the food industry. Reference [17] in their study about specifications of the electronic market concluded that there is a significant difference between traditional and electronic markets for both sellers and purchasers. Reference [21] presented frequency and non-contractibility of transactions as two important factors in selection of electronic market functions. There is compatibility between results of the current study in the food industry and the results of [21]. In the present research, informational services, business intelligence services, dynamic pricing, financial services, logistics services, and transaction services influence on decrease in the product unit cost more than the average level. Reference [19] concluded that information plays an important role in decrease in costs. Reference [10] state that dynamic nature of B2B E-

commerce leads to transformation from the fixed pricing to the dynamic pricing; therefore, results of [10] match with the current study's results.

Three elements of informational services, logistics services, and transaction services effect on decrease in response time to customer more than the average level. Specifically, transaction services would influence on reduction of product unit cost very much however they would not impact on reduction of response time to customer much due to transaction structure. The obtained results confirm this issue.

XIII. MANAGERIAL IMPLICATION

Regarding the results, followings are recommended to improve E-commerce. These recommendations come from the research on Shiraz food industries in 1392. Hence, extending these results and recommendations to other industries should be done cautiously.

- Specific paying attention to criticality of internal and external information of organizations
- Building trust in organizations to implement B2B
- Using appropriate pricing method regarding conditions followed by E-commerce
- Specific paying attention to changes coming from E-commerce and its effects on financial services of organizations
- Paying attention to new transaction conditions and change in business methods

REFERENCES

- [1] Ba S, Pavlou P (2002). Evidence of the Effect of Trust Building Technology in Electronic Markets: Price Premiums and Buyer Behavior. *J. MIS Quarterly*, 26(3):243-268.
- [2] Bakos J (1991). Information Links and Electronic Marketplaces: The Role of Interorganizational Information Systems in Vertical Markets. *J. Management Information Systems*, 8(2):31-52.
- [3] Bendoly E, Kaefer F (2004). Business technology complementarities: impacts of the presence and strategic timing of ERP on B2B e-commerce technology efficiencies. *J. Omega*, 32(5):395-405.
- [4] Delfmann W., Albers S, Gehring M (2002). The impact of electronic commerce on logistics service providers. *Int. J. Physical Distribution & Logistics Management*, 32(3):203-222.
- [5] DeLoneW, McLean E (2004). Measuring e-Commerce Success: Applying the DeLone & McLean Information Systems Success Model. *Int. j. Electronic Commerce*, 9(1):31-47.
- [6] GuoJ (2007). Business-to-business electronic market place selection. *J. Enterprise Information Systems*, 1(4):383-419.
- [7] Hong W, Zhu K (2006). Migrating to internet-based e-commerce: Factors affecting e-commerce adoption and migration at the firm level. *J. Information & Management*, 43(2):204-221.
- [8] Hsieh C, Lin B, (2004). Impact of standardization on EDI in B2B development. *J. Industrial Management & Data Systems*, 104(1):68 – 77.
- [9] Johnson M, Whang S (2009). E-Business and Supply Chain Management: an Overview and Framework. *J. Production and Operations Management*, 11(4):413-423.
- [10] Kalagnanam J, Katircioglu K, King A J, Lawrence R D, Lee H S, Lin G Y, Lu Y (2002). Applications of flexible pricing in business-to-business electronic commerce. *J. IBM Systems*, 41(2):287-302.
- [11] Lenz M, Zimmermann H.D, Heitmann M (2002). strategic partnership and competitiveness of B2B E-marketplaces Preliminary Evidence from Europe. *J. electronic markets*, 12(2):100-111.
- [12] Iyer, Germain R, Claycomb C (2009). B2B e-commerce supply chain integration and performance: A contingency fit perspective on the role of environment. *J. Information & Management*, 46(6):313-322.
- [13] Lummus R, Vokurka R (1999). Defining supply chain management: a historical perspective and practical guidelines. *J. Industrial Management & Data Systems*, 99(1):11 – 17.
- [14] Piotrowicz W, Irani Z, (2010). Analysing B2B electronic procurement benefits: information systems perspective. *J. Enterprise Information Management*, 23(4):559 – 579.
- [15] Soliman K, Janz B (2003). An exploratory study to identify the critical factors affecting the decision to establish Internet-based interorganizational information systems. *J. Information & Management*, 41(6):697-706.
- [16] Son J, Benbasat L (2007). Organizational Buyers' Adoption and Use of B2B Electronic Marketplaces: Efficiency- and Legitimacy-Oriented Perspectives. *J. Management Information Systems*, 24(1):55-99.
- [17] Strader T, Shaw M (1997). Characteristics of electronic markets. *J. Decision Support Systems*, 21(3):185-198.
- [18] Tan K (2001). A framework of supply chain management literature. *J. Purchasing & Supply Management*, 7(1):39-48.
- [19] Voigt G., Inderfurth K (2012). Supply chain coordination and setup cost reduction in case of asymmetric information. *J. or spectrum*, 33(1):99-122.
- [20] Wang S, Zheng S (2011). The impact of business-to-business electronic marketplaces: a field study. *Int.J. Networking and Virtual Organisations*, 8(3):224-240.
- [21] Wang S, Archer N (2004). Strategic Choice of Electronic Marketplace Functionalities: A Buyer-Supplier Relationship Perspective. *J. Computer-Mediated Communication*, 10(1):11.