

Full Length Research Paper

The essential infrastructures' preparation assessment for establishing the electronic stock exchange in Iran

S. M. Allameh and N. Jafari*

University of Isfahan, Islam Republic of Iran.

Accepted 18 February, 2010

Establishing an electronic stock exchange market can be a perfect example of new technologies and IT utilization in the stock market in Iran and thus it can pave the way and provide the opportunity for all walks of life to invest in the stock exchange market. The essential infrastructures' preparation assessment for opening the electronic stock exchange in Iran helps us identify the essential infrastructures' present status, specify the probable problems and challenges and prepare the grounds for its establishment. In this study at first, some information about electronic stock exchange marketing is presented, and then the preparation for the most important infrastructures is evaluated and finally the preparation ranking of each of these infrastructures' components is discussed. The questionnaire of the research is of self administered questionnaire type with a reliability of 0.89 and a formal validity which was validated by professors and experts. In order to evaluate each of the hypothesis, the one-sample t-test and for ranking the components, the Friedman test was used and it was revealed that the financial and banking (electronic banking), technical and security infrastructures were potential for setting up an electronic stock exchange market. In contrast, the telecommunication and connectivity, cultural, legal and civil infrastructures did not have such a potential. After all, the conclusion was drawn that the essential infrastructures are not present for setting up an electronic stock exchange market in Iran.

Key words: Electronic stock exchange, stock exchange, infrastructure, information technology.

INTRODUCTION

Numerous advantages of electronic marketing have not only made developed countries but also developing countries to make use of it as a competitive tool in national and international fields (Heeks, 2001). The Lack of electronic commerce methods leads to nothing but having no universal economy position.(Commerce.Net, 2000) The daily extension of electronic commerce deployment in the world by economic foundations and corporations and gradual acceptance on the side of customers manifest the potential advantages of electronic commerce in commercial and economical fields (Oxley and Yeung, 2006). Rapid developments in the realm of information technology have made significant changes in financial quarters of most countries in the world. Information tech-

nology introduced a new way of investment and transaction, affecting the money and capital market in the middle of 1980s (Show, 2000). Intangible investment is one of the most significant features of the markets undergoing information technology. Since the exchange market has a logical relation with electronic environments, it can provide the brokers and the people who want to buy shares with an easier access (Sucllion and Nicholas, 2001). Communicative innovations have not only made the wide spread of prices, transaction information and electronic order registration possible, but also created new forms of trading systems. These innovations have made shareholders needless of attending trading floors, having face to face interactions and using telephone networks (Hendershot, 2003). New technology has decreased the costs of new trading systems' installations and removed the obstacles from the way of new competitors. Electronic trading systems are being installed internationally and nearly all stock exchange systems are fully electronic (Itoh, 2002). Thus

*Corresponding author. E-mail: N_Jafari62@yahoo.com.

opening an electronic stock exchange in Iran is inevitable but before doing anything, the basic infrastructures must be evaluated to see whether the necessary grounds and preparations are there in Iran or not? Also, the obstacles which should be removed and the shortcomings are identified so that we can prepare the conditions for establishing an electronic stock exchange market in the country. Any negligence in this stage will decrease the efficacy of stock exchange market in the future.

RESEARCH LITERATURE

In this part, some information about electronic stock exchange is presented, and then the most important infrastructures and the major components of each of these infrastructures are discussed.

Stock exchange and the changes

A stock exchange is a corporation or mutual organization which provides "trading" facilities for stock brokers and traders, to trade stocks and other securities. Stock exchanges also provide facilities for the issue and redemption of securities as well as other financial instruments and capital events including the payment of income and dividends. (Beck and Levine, 2004).

One of the major stock exchange features is legal support of depositors and capitals that are not working and specifying legal requirements for capital applicants (Krishnamurti et al., 2003). No significant changes were seen in stock trading in two hundred years. Stock trading took place in a so called stock market and at specific hours. The market was open only during stock trading hours and at other times trading was not possible. Today, there are no time or place limitations for investors, though communicative and computer innovations have made the wide spread of prices, transaction information and electronic order registration possible and also created new forms of trading systems (Giudici and Roosenboom, 2004). These innovations have made shareholders needless of attending trading halls, having face to face interactions and using telephone networks. New technology has decreased the costs of new trading systems' installations, accelerated order registration processes and made larger groups of people able to have access to the market information. (Hendershot, 2003) Different types of stock exchange market can be classified into three groups as the following:

Traditional stock exchange

In this type of stock, buyer or seller must go to the broker's office and fill out the purchase order or sale shares' forms in person. These daily orders are incorporated by the broker into the stock trading network from 8:30 to 12:30 so that if there are no sales or pur-

chase queues, yet the trading can be done if the deal is possible. In this type of stock marketing, the market is defined as a physical place. The major problem with this type of stock marketing is that time order is not taken into account when the orders are inserted into the system by the broker. In fact, the orders are prioritized by the system operator and the time order does not depend on the orders' priority of placement. The second problem is the low precision of this stock marketing method. Since the orders are manually registered in the system, there always is the probability of making mistakes. On the other hand and as mentioned before, since the market is defined as a physical place, buyers and sellers must personally go to the market and do the job themselves, spending a lot of time and money (DiTullio, 2005).

Stock exchange in transition

There are other types of stock exchange which are in transition phase from traditional to electronic in which the brokers are present in the halls but the customers must not necessarily attend and can simply have access to the available shares, prices and rates on the internet. After getting the prices they can personally go or buy the particular share by making a telephone call. A feature of this type is that it enables the customers to make use of momentary opportunities (DiTullio, 2005).

Electronic stock exchange

In this type of stock, there are no more stock halls and brokers buy and sell in their own offices. The offices are bigger and the number of personnel is much more than the previous types. The customers should not necessarily go to trade floor and can do the job electronically, 24/7. Consequently electronic stock is providing the investors with necessary electronic facilities to gain direct access to the market. In general, there are two types of Direct Market Access (DMA) in electronic stock exchange:

- (1) Traditional direct market access
- (2) Pure direct market access

Traditional direct market access (DMA) in electronic stock exchange

In this type of access, all orders are electronically submitted to the broker and of course according to FIX protocol. Then the broker automatically submits the orders to the target market. In fact in this method, traders do not have direct access to the market but the whole broker order placement submission procedure is done electronically and according to FIX protocol. Traders do not need to make any telephone calls or use broker stations for placing an order. In this system the broker works between market and customers too. The orders are not manually and daily submitted to the market by the

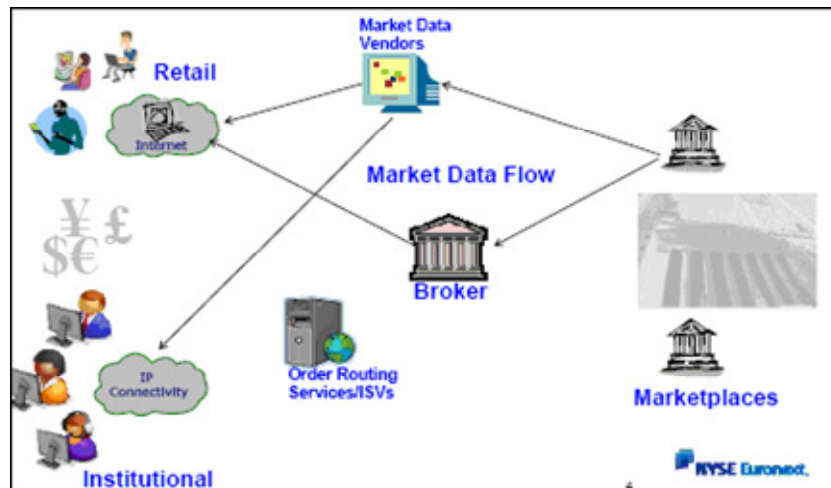


Figure 1. The trading procedures and the broker role in traditional DMA.

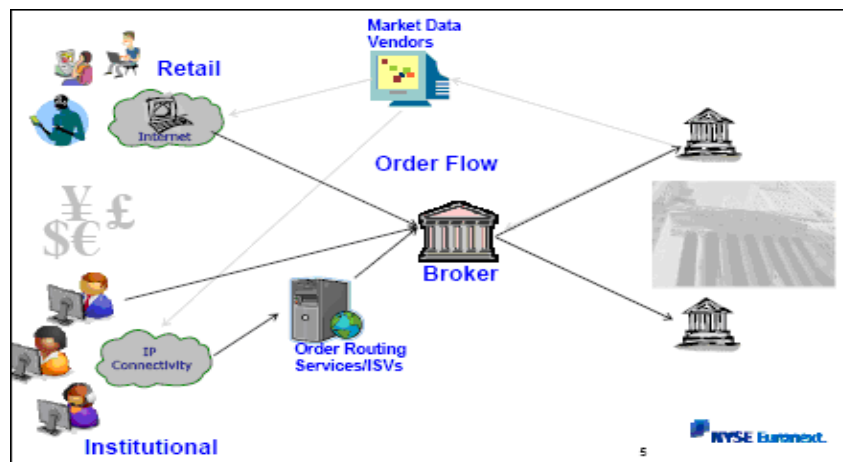


Figure 2. The customers' market accessibility in the pure DMA.

broker, but they are automatically registered as soon as the customer sends his sales or purchase order to the system. The orders are standardized by the broker order system for the target market and are finally presented to the market. All these steps are done automatically and do not have anything to do with hand (Tierney, 2008). Figure 1 shows the trading procedures and the broker role in the process.

Pure direct market access (DMA) in electronic stock exchange

In this model, brokers are totally eliminated from the system and the traders can directly send their orders to the target markets. Due to new technology achievements, this model has attracted a lot of attention in recent years. This system not only supports the present trading

models, but also tries to increase the efficiency of the market, to speed up the order placement in the market and to enhance the accessibility of the market information for the traders. (Tierney, 2008)

Figure 2 shows the customers' market accessibility in the full direct access model of the electronic stock market. In this model, the broker has other roles like risk management, consultation, etc.

What is FIX?

The Financial information exchange (FIX) Protocol is a series of messaging specifications for the electronic communication of trade-related messages. It has been developed through the collaboration of banks, broker-dealers, exchanges, industry utilities and associations, institutional investors and information technology provi-

ders from around the world. These market participants share a vision of a common, global language for the automated trading of financial instruments.

FIX is the industry-driven messaging standard that is changing the face of the global financial services sector, as firms use the protocol to transact in an electronic, transparent, cost efficient and timely manner. FIX is open and free, but it is not software. Rather, FIX is a specification around which software developers can create commercial or open-source software, as they see fit. As the market's leading trade-communications protocol, FIX is integral to many order management and trading systems. Yet, its power is unobtrusive, as users of these systems can benefit from FIX without knowing the language itself (Kim, 2007).

Essential infrastructures for electronic stock exchange establishment

The establishment of an electronic stock exchange needs a lot of appropriate preparations. After studying the research literature (EIU, 2008; Oxley and Yeung, 2006; MIT, 2003; PERM, 2003; Heeks, 2001; MOSAIC, 2001; CIDCM, 2001; APEC, 2000; Commerce.NET, 2000; McConnell, 2000; CSPP, 1998) and having discussions with stock exchange experts, the financial and banking (electronic banking) infrastructures, telecommunication and connectivity infrastructures, cultural infrastructures, technical and security infrastructures, legal and civil infrastructures turned out to be the most important and essential infrastructures for electronic stock establishment in Iran capital market.

Financial and banking infrastructures (electronic banking)

Having a fast and precise banking network is a must for electronic stock exchange establishment. This network should work needless of the customers' physical presence and be accessible on the internet. Using credit cards and Electronic funds transmission systems is also necessary.

Telecommunication and connectivity infrastructure

Electronic stock establishment needs an appropriate and accurate telecommunication and connectivity infrastructure. Therefore having optical fiber networks, high speed internet, low internet costs, easy internet access, fixed and mobile phone networks is absolutely necessary for this purpose.

Cultural infrastructures

It is quite obvious that individuals and networks show

resistance and opposition against new changes. One way to reduce this resistance is through education and training. Building an internet using culture and doing everything electronically is two of the greatest steps towards having electronic stock market. Many stock exchange users are people who are accustomed to traditional trading networks. So for having an efficient electronic stock exchange implementation, a lot of cultural and educational activities must be done.

Technical and security infrastructures

Electronic stock exchange implementation requires a lot of investment in technical and security areas. Technical infrastructures of identification and trading and supervisory software are also necessary. It is noteworthy that the concept of security is the most important concern of the electronic stock customers. Since the security plays an important role in electronic trading, data security is of great importance.

Legal and civil infrastructures

In order for an electronic stock exchange implementation to be successful, new laws must be legislated and legal support of the judiciary for electronic documents' acceptance with an equal credit of paper documents is quite necessary. Also, the laws which are related to digital signature and buyer or seller identification are other important aspects of the legal infrastructures of the discussion.

The most important and essential infrastructures of the electronic stock exchange implementation and its indices are shown in Table 1.

RESEARCH QUESTION

Are the essential infrastructures for establishing an electronic stock exchange provided and ready in Iran?

RESEARCH HYPOTHESES

Hypothesis 1

The electronic banking infrastructures are provided and ready for establishing electronic stock exchange market in Iran.

Hypothesis 2

Telecommunication and connectivity infrastructures are provided and ready for establishing electronic stock exchange market in Iran.

Hypothesis 3

Cultural infrastructures are provided and ready for establishing electronic stock exchange market in Iran.

Hypothesis 4

Technical and security infrastructures are provided and ready for establishing electronic stock exchange market in Iran.

Hypothesis 5

Legal and civil infrastructures are provided and ready for establishing electronic stock exchange market in Iran.

Major hypothesis

The essential infrastructures for establishing electronic stock exchange are provided and ready in Iran.

RESEARCH DESIGN AND METHODOLOGY

The research objective is applied and it is descriptive survey method from the methodology point of view. In this research, books, magazines, articles, proposals, websites and other relevant stock and electronic marketing documents and evidences are used for data collection. The questionnaire of the research is of research-made questionnaire type with a reliability of 0.89 and a content validity which was validated by professors and stock exchange consultant.

The statistical population of this research was 415 people of the Tehran stock exchange market staff and broker offices personnel. Their personal information was provided from stock organization and central broker office. The research sampling method was randomization. After the first sampling with 30 working experts of the Tehran stock exchange market staff and broker offices, a standard deviation of 0.45 was obtained. It was put in the formula and the final sample population came to 177 with an accuracy of 0.95. Since usually a number of distributed questionnaires are not back, 185 questionnaires were distributed and 172 of them were completely filled out and were put to be the base of the research. In the present study In order to evaluate each of the hypothesis, the One - Sample T Test and for ranking the components, the Friedman ranking test was used. The used software was SPSS and Microsoft Office Excel 2003.

Testing of hypotheses

The acceptance/rejection of hypothesis was tested through the use of One- Sample t test.

Hypothesis 1

For testing hypothesis 1, we used One - Sample t test.
(H0): The electronic banking infrastructures are not provided and ready for establishing electronic stock exchange in Iran.
(H1): The electronic banking infrastructures are provided and ready

for establishing electronic stock exchange in Iran.

Table 2 presents the results of this analysis. It is observed that the probability value is smaller than the ($\alpha = 0.05$) level of significance and $t = 8.213$. In this situation, H0 is rejected and H1 is accepted.

Hypothesis 2

For testing hypothesis 2, we used One - Sample t test.

(H0): Telecommunication and connectivity infrastructures are not provided and ready for establishing electronic stock exchange in Iran.

(H1): Telecommunication and connectivity infrastructures are provided and ready for establishing electronic stock exchange in Iran.

Table 3 presents the results of this analysis. It is observed that the probability value is smaller than the ($\alpha = 0.05$) level of significance and $t = -11.903$. In this situation, H1 is rejected and H0 is accepted.

Hypothesis 3

For testing hypothesis 3, we used One - Sample t test.

(H0): Cultural infrastructures are not provided and ready for establishing electronic stock exchange in Iran.

(H1): Cultural infrastructures are provided and ready for establishing electronic stock exchange in Iran.

Table 4 presents the results of this analysis. It is observed that the probability value is smaller than the ($\alpha = 0.05$) level of significance and $t = -18.559$. In this situation, H1 is rejected and H0 is accepted.

Hypothesis 4

For testing hypothesis 4, we used One-Sample t test.

(H0): Technical and security infrastructures are not provided and ready for establishing electronic stock exchange in Iran.

(H1): Technical and security infrastructures are provided and ready for establishing electronic stock exchange in Iran.

Table 5 presents the results of this analysis. It is observed that the probability value is smaller than the ($\alpha = 0.05$) level of significance and $t = 9.119$. In this situation, H0 is rejected and H1 is accepted.

Hypothesis 5

For testing hypothesis 5, we used One - Sample t test.

(H0): Legal and civil infrastructures are not provided and ready for establishing electronic stock exchange in Iran.

(H1): Legal and civil infrastructures are provided and ready for establishing electronic stock exchange in Iran.

Table 6 presents the results of this analysis. It is observed that the probability value is smaller than the ($\alpha = 0.05$) level of significance and $t = -17.099$. In this situation, H1 is rejected and H0 is accepted.

Major hypothesis

For testing major hypothesis, we used One - Sample t test.

(H0): The essential infrastructures for establishing electronic stock exchange are not provided and ready in Iran.

(H1): The essential infrastructures for establishing electronic stock exchange are provided and ready in Iran.

Table 1. The most important and essential infrastructures of the electronic stock exchange implementation and its indices.

Infrastructures	Index
Financial and Banking (Electronic Banking)	The costs of electronic money exchange in the banking network Electronic money and cards frequency of use The possibility of exchanging funds and deeds in the banking network
Telecommunication and Connectivity	Having high speed internet Internet accessibility costs The cell phone and city fixed line network span The frequency of unsuccessful connections and interruptions
Cultural	The previous courses held to train experts in the field The previous measures taken to teach people The people level of knowledge about using new technologies The people level of awareness about how economical using new technologies is The people level of trust and reliance on electronic trading The extend of people getting used to electronic trading and password memorization The people resistance against the trading methods from traditional to electronic
Technical and Security	Having essential software technologies Having facilities to protect the customers' financial resources The ability to identify the customers using digital signature Having facilities to protect the customers' secret information Having professional and specialized personnel The possibility of making secure and credible communications Having insurance facilities to attract customers' trust Having offices that can issue digital signature certificate
Legal and Civil	Having digital signature laws Having appropriate legal grounds for patching up problems and claims in electronic trading Having necessary laws for communication operators on service failures and low quality of services Judiciary electronic deeds' acceptance of deeds which have a credit equal to paper deeds The clear tax status in electronic stock trading

Table 2. Result of one-sample t test for hypothesis 1.

t	df	p value	Mean difference	95% confidence interval of the difference	
				Lower	Upper
8.213	171	.000	.34787	.2643	.4315

Table 3. Result of one-sample t test for hypothesis 2.

t	df	p value	Mean difference	95% confidence interval of the difference	
				Lower	Upper
-11.903	171	.000	-.55087	-.6422	-.4595

Table 4. Result of one-sample t test for hypothesis 3.

t	df	p value	Mean Difference	95% confidence interval of the difference	
				Lower	Upper
-18.559	171	.000	-.65878	-.7288	-.5887

Table 5. Result of one-sample t test for hypothesis 4.

t	df	p value	Mean difference	95% confidence interval of the difference	
				Lower	Upper
9.119	171	.000	.32340	.2534	.3934

Table 6. Result of one-sample t test for hypothesis 5.

t	df	p value	Mean difference	95% confidence interval of the difference	
				Lower	Upper
-17.099	171	.000	-.63285	-.7059	-.5598

Table 7. Result of one- sample t test for major hypothesis.

t	df	p value	Mean difference	95% Confidence interval of the difference	
				Lower	Upper
-10.766	171	.000	-.23425	-.2772	-.1913

Table 7 presents the results of this analysis. It is observed that the probability value is smaller than the ($\alpha = 0.05$) level of significance and $t = -10.766$. In this situation, H_1 is rejected and H_0 is accepted.

THE HYPOTHESIS TESTING RESULTS

In this research, the one-sample t-test were used to evaluate each of the hypothesis (Table 7) and it was revealed that security infrastructures were potential for setting up an electronic stock exchange market. In contrast, the telecommunication and connectivity, cultural, legal and civil infrastructures did not have such a potential. After all, the conclusion was drawn that the essential infrastructures are not present for setting up an electronic stock exchange market in Iran.

The Friedman ranking test was used to rank each of the components of essential infrastructures of electronic stock establishment and it was revealed that regarding the financial and banking infrastructures (electronic banking), electronic money transfer costs are in a better condition in comparison with credit card and electronic money and the possibility of funds and deeds transfer in our bank network.

With regard to the telecommunication and connectivity infrastructures, fixed lines and cell phone networks have a better condition than the other three factors. The other three factors are internet failures and disconnections, high speed and appropriate internet access and internet costs.

Regarding cultural infrastructures, people are perfectly accustomed to electronic trading and password memorization. The six other factors are the people awareness of

how economical it would be when they use new technologies, the people knowledge about new technologies, the people trust and believe in electronic trading, holding training courses for raising professional individuals, their resistance against trading method changes from traditional to electronic and the previous educational courses for people.

As for technical and security infrastructures, having professional and expert work forces has the best condition. Seven other factors are having necessary facilities for saving customers' secret information, creating the possibility of having safe communications, having essential software technologies, the ability to identify and approve the authenticity of the customers by getting digital signature from them, having insurance facilities to attract the customers trust and finally having credible offices that can issue digital signature certificates.

As for legal and civil infrastructures, the clear tax status in electronic stock trading has the best condition to other factors. The four other factors are having appropriate legal grounds for patching up problems and claims in electronic trading, having digital signature laws, having necessary laws for communication operators on service failures and low quality of services and finally judiciary electronic deeds' acceptance of deeds which have a credit equal to paper deeds.

After all, for ranking the preparation for the most important and necessary, an infrastructure of electronic stock establishment in Iran, the Friedman ranking test was given and there were rank differences between these infrastructures from experts' point of view and the conclusion was that the technical and security infrastructure had the best condition among all. Financial and

banking infrastructures (electronic banking), telecommunication and connectivity infrastructures, legal and civil infrastructure and cultural infrastructures were after that respectively.

SUGGESTIONS

Here are some suggestions to improve the present necessary infrastructures' conditions for electronic stock exchange establishment in Iran.

One thing that can be done is improving bank data exchange network, increasing the use of credit cards, paying on the internet and decreasing the electronic money transfer costs.

(1) Decreasing the public internet accessibility costs, providing people with high speed internet, decreasing internet disconnections and developing city fixed and cell phone network throughout the country.

(2) Publishing books, leaflets, brochures, educational CDs on electronic stock exchange, holding educational courses for the public about electronic stock exchange and its advantages, trading methods, holding national and international conferences about electronic stock exchange and training experts and professional individuals to be employed for electronic stock exchange.

(3) Since digital signature has been recently used in our country, there must be attempts to teach the public how to use it. Also credible offices that can issue digital signature certificates must be established so that customers and dealers can benefit from them. Also measures must be taken to insure the electronic trades so as to attract the customers' attention to the trades and increase people trust.

(4) Preparing appropriate legal grounds for patching up problems and claims in electronic trading, training judges who have a perfect knowledgeable of IT, ratifying digital signature laws and the related legal requirements, making necessary laws for communication operators on service failures and low quality of services so that people can claim their rights. As in electronic trading we deal with electronic documents, conditions must change so that judiciary accepts them with a credit equal to paper documents.

REFERENCES

- APEC (2000). APEC Readiness Initiative: E-Commerce Readiness Assessment Guide, available at: http://www.internetpolicy.net/readiness/readiness_guide_5.pdf.
- Beck, Levine R (2004). Stock markets, banks, and growth: panel evidence, *J. Bank. Fin.* 28, pp. 423–442.
- CIDCM (2001). Negotiating the Net Model, University of Maryland.
- Commerce.Net (2000). Barriers to Electronic commerce, available at: www.commerce.net
- CSPP (1998). "Readiness Guide for Living in the Networked World, Computer Systems Policy Project, Washington, DC, available at: www.cspp.org/projects/readiness.
- DiTullio S (2005). Pure Direct Market Access On the Rise, available at <http://www.futuresindustry.org/fi-magazine-home.asp?a=1080>.
- EIU (2008). E-readiness rankings 2008, Maintaining momentum, A white paper from the Economist Intelligence Unit, Written in co-operation with The IBM Institute for Business Value.
- Heeks R (2001). Building e-governance for development: a framework for National and Donor Action, (Working Paper) University of Manchester.
- Hendershot T (2003). Electronic Trading in Financial Markets, IEEE Computer Society, available at: <http://faculty.haas.berkeley.edu/hender/ITpro.pdf>.
- Itoh M (2002). Technology and e-finance in Japan, available at: www.bis.org/publ/bppdf/bispap07i.pdf.
- Kim K (2007). Electronic and algorithmic trading technology: the complete guide, Academic Press.
- Krishnamurti J, Sequeira, Fangjan F, (2003). Stock exchange governance and market quality, *J. Bank. Fin.* 27 (2003), pp. 1859-1878.
- McConnell and WITSA (2000). Risk E-Business: Seizing the Opportunity of Global e-readiness, Available at: www.mcconnellinternational.com/ereadiness/EreadinessReport.htm.
- Oxley JE, Yeung B (2006). E-commerce readiness: institutional environment and international competitiveness, *J. Int. Bus. Studies*, 32(4): 705-724.
- Show MJ (2000). Electronic Commerce: State of the Art, Handbook on electronic commerce. Bevlín Heidelberg, New York; Springer.
- Sucllion M, Nicholas D (2001). The impact of the web on the stock broking industry: Big Bang 2, *Aslib Proc.*, 53(1): 3-22, Jan.
- Tierney P (2008). Financial Transaction Infrastructure and the Impact of Technology, Asia Pacific, NYSE Euro next.