Impact of Information Technology Development on Stock Market Development. Empirical Study in the World's Leading Capital Markets

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[1]Faculty of Administration and Economic science, University of Isfahan, Iran, [2,3]Faculty of Administration and Economic Science, Department of Management, University of Isfahan, Isfahan, Iran, [1]Faculty of Administration and Economic science, University of Isfahan, Iran, [2,3]Faculty of Administration and Economic Science, Department of Management, University of Isfahan, Isfahan, Iran
[1]Email: Ho.rezaie@gmail.com, f.faghani1367@gmail.com, Mehdi_5701@yahoo.com, Ho.rezaie@gmail.com, f.faghani1367@gmail.com, Mehdi_5701@yahoo.com

Abstract

The purpose of this paper is improvement of technology concepts, understanding, traditional and electronic stock trading. This paper examines the impact of information technology development on capital market development. Appropriate applying of IT will be stake for developing electronic trading processes. No doubt, the cultural, understanding IT concepts and applying of this will increase stock market efficiency. In this paper after review from research literature and prior researches, have been tried to examine effect of IT on stock market development by considering development indexes. Statistician Sample is 60 countries using financial development report World Bank. Stock market turnover ratio, the ratio of Stock market capitalization to GDP, the ratio of Stock market value traded to GDP, Ease of access to local equity market have been used for measurement stock market development considered. In addition, Present paper considered mobile – cellular telephone subscriptions, fixed (wired)-broadband subscriptions, fixed-telephone subscriptions, fixed (wired) Internet subscriptions and Percentage of Individuals using the Internet as development indicators of IT. Result of correlation (0.436) and regression confirmed hypothesis. In the end of article, after explain of prior researchers findings have been presented the solutions for IT development in stock market.

Keywords: Information Technology, Stock Market, Development Indicators

Introduction

In present era, one of the most important business processes in IT management is implementation, development and maintenance of information systems. Thus, managers and organizations are faced with new challenges in this field. These challenges are considered in the areas of organization, management and technology (Bahrami, 2008). Today, it is changing

increasingly the global and these changes are observable in economic, culture and social fields. Nevertheless, It is at first the way. In industrial era, the basic condition for the trade is the exchange of property in the market area, and the government's role is to protect property market. However, living in the electronic area needs access to available information in communication networks. In addition, in traditional economic, individual must find the big market for profit. Even so, in internet economic, successful businessman such as Amazon have been find profit is in create SME markets. Over the past few decades, the world stock markets have surged, and emerging markets have accounted for a large amount of this boom. The speed and extent of stock market development in developing countries have been unprecedented and have led to fundamental shift both in the financial structures of less developed countries and in the capital flows from developed nations. Stock markets are expected to accelerate economic growth by providing a boost to domestic savings and increasing the quantity and the quality of investment. In particular, stock markets can encourage economic growth by providing an avenue for growing companies to raise capital at lower cost. In addition, companies in countries with developed stock markets are less dependent on bank financing, which can reduce the risk of a credit crunch. Internet indexes are due to create low-cost and small markets by one to one and one to many communications for around the world millions persons. ICT provides lot opportunities for limit of economic and social inequalities and supports to logical wealth. However, Economic changes are destroyed the more business, but they have created numerous job opportunities. Possibility, IT is a factor that it has a strong effect on the development stock market. Theoretically, some research purposed argument about potential benefits of impact IT on financial section. For example, Lonis (1997) suggest telecommunication and computers changes affected financial services quality and financial systems structure. In addition, global bank (1998) has announced advertisement in field of communication is a force for economic positive changes transfer to other countries. Thus, in this paper have been tried to after explore of literature and background research, examine the impact IT development on the stock market development.

Literature Review
Information Technology

The history of information technology precedes the invention of the computer. The basic concept of IT can be traced to the World War II alliance of the military and industry in the development of electronics, computers, and information theory. Information technology is the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data often in the context of a business or other enterprise. The term is commonly used as a synonym for computers and computer networks, but it also encompasses other information distribution technologies such as television and telephones. Several industries are associated with IT, such as computer hardware, software, electronics, semiconductors, internet, telecom equipment, E-commerce and computer services (Chandler and Munday, 2012). The target of IT application is increase awareness of human. The reason IT disadvantages is incorrect use of this system, frequently. Incorrect and incomplete design by information systems designers and IT engineers or incorrect use of IT by users often creates problems and disorders. The business value of IT is to automate business processes, provide information for decision-making, connect business with their customers, and provide productivity tools to increase efficiency. After the 1940s, the military remained the major source of research and development funding for the expansion of automation to replace work

force with machine power. In the late 1960's IT made up only 2–3 percent of equipment investment. Today it accounts for more than half (Greenwood and Jovanovic, 1999).

Stock Market

The stock market is also expected to ensure through the takeover mechanism that past. A stock market or equity market is a public for the company stock (shares) trading and derivatives at an agreed price. The stocks are listed and traded on stock exchanges which are entities of a corporation or mutual organization specialized in the business of bringing buyers and sellers of the organizations to a listing of stocks and securities together. These are securities listed on a stock exchange as well as those only traded privately. The stock market is an organized market for saving holders can be search a good place for investment. They should by brokers to Buy and sell of stock. Stockholders benefiting with buy of stock and sell of that in right time and by take dividend after end of financial year. In stock market, stock price are affected of internal factors (the status of Companies listed on the Stock Exchange) for example: changes in the status of directors board, financial status of companies and financial policies, external factors like economic and political factors.

The size of the world stock market was estimated at about $36.6 trillion at the beginning of October 2008. The total world derivatives market has been estimated at about $791 trillion face or nominal value, 11 times the size of the entire world economy. The largest stock market in the United States, by market capitalization, is the New York Stock Exchange (NYSE). In Canada, the largest stock market is the Toronto Stock Exchange. Major European examples of stock exchanges include the Amsterdam Stock Exchange, London Stock Exchange, Paris Bourse, and the Deutsche Börse (Frankfurt Stock Exchange). In Africa, examples include Nigerian Stock Exchange, JSE Limited, etc. Asian examples include the Singapore Exchange, the Tokyo Stock Exchange, the Hong Kong Stock Exchange, the Shanghai Stock Exchange, and the Bombay Stock Exchange. In Latin America, there are such exchanges as the BM&F Bovespa and the BMV. Australia has a national stock exchange, the Australian Securities Exchange, due to the size of its population.

There are now stock markets in virtually every developed and most developing economies, with the world's largest markets being in the United States, United Kingdom, Japan, India, China, Canada, Germany (Frankfurt Stock Exchange), France, South Korea and the Netherlands. The stock market is one of the most important sources for companies to raise money. This allows businesses to be publicly traded, or raise additional financial capital for expansion by selling shares of ownership of the company in a public market (Simkovic, 2009). The liquidity that an exchange affords the investors gives them the ability to quickly and easily sell securities. This is an attractive feature of investing in stocks, compared to other less liquid investments. Some companies actively increase liquidity by trading in their own shares (Cesari et al., 2010).

An economy where the stock market is on the rise is considered to be an up-and-coming economy. In fact, the stock market is often considered the primary indicator of a country's economic strength and development. Rising share prices, for instance, tend to be associated with increased business investment and vice versa. Share prices also affect the wealth of households and their consumption. Therefore, central banks tend to keep an eye on the control and behavior of the stock market and, in general, on the smooth operation of financial system functions. Financial stability is the raison d'être of central banks. Exchanges also act as the clearinghouse for each transaction, meaning that they collect and deliver the shares, and guarantee payment to the seller of a security. This eliminates the risk to an individual

buyer or seller that the counterparty could default on the transaction. The smooth functioning of all these activities facilitates economic growth in that lower costs and enterprise risks promote the production of goods and services as well as possibly employment.

Background Research

There are some researchers that have been examined the relation between IT and stock market. Table-1 summarizes the prior researches in this field. Econometric analysis did not reveal any robust systematic relationship between indicators of SMD and those of ICT development (Hobjin and Jovabonic, 2000). Kummerow and Lun expressed that Improvements in information and productivity may lead to important long-run changes in business processes and industry structure tending to favor larger firms and promoting specialization of functions. Changing the information structure of real estate decision systems could change system dynamics and allocation improves efficiently. On the other hand, under different institutional arrangements, better information could increase the amplitude of real estate cycles and destabilize economies (Kummerow and Lun, 2005). Bahrami used of consumer spending overall indicator for examining the overall effect of ICT on Securities. She selected the Mobile and Telephone penetration, the number of Internet users and the number of PC as ICT development indexes. In addition, she selected activity ratio, liquidity ratio and the number of companies listed on the exchange as Securities Exchange development indexes. Then, she divided the countries based on indicators of financial development (the ratio of cash to GDP) to two groups countries (bank-driven and exchange-driven). She has also examined Impact of ICT on this country economic growth. Her statistical population was the countries that in view of Iran's exchange organizational were the low per capita income countries that includes; Argentina, South Africa, Brazil, Peru, Thailand, China, Sri Lanka, Philippines, Malaysia, India and Iran (Bahrami, 2008). Ashraf and Joarder have been focused on Internet. Their hypothesis was the different between mean of trade volume from 2004 Jun to 2005 October and mean of trade volume from 2005 November to 2007 Joan (Ashraf and Joarder, 2009). Bharadwaj et al analyzed 213 newspaper reports of IT failures by publicly traded firms, which occurred during a 10-year period. In another study, has suggested that stock markets are neither a necessary no sufficient condition for promoting the development of ICT (Hobjin and Jovabonic, 2000). Most of previous research confirmed the effect of IT on stock market. But, there was no research about of impact of IT development on SMD. Thus, this paper tried to full this gape.

Table 1. The summarized of background research

Researchers	subject	result
Hobjin and Jovabonic (2000)	The Information Technology Revolution and the Stock Market: Evidence	Their findings show the more application of IT due to more decrease of value, but IT destroyed the old firm and will enter new firm the market
Lucas et al. (2002)	IT and the new York stock exchange's strategic resources from 1982-1999	The results provide insights for firms that invest in IT to create a system of traditional and IT resources to obtain a sustainable competitive advantage
Ngassam and Gani (2003)	effect of information and communications technology on SMD in a sample comparing of emerging markets and high-income economies	Their model confirms that personal computers and internet hosts as the two ICT variables having strong positive effects on SMD. Their results also indicated strong positive effects of market capitalization and credit to the private sector as non-ICT contributors to SMD. Controlling for income and technological differences, the finding show emerging market economies have already seized an opportunity to leap frog the high-income countries that is, by going straight from underdeveloped networks to fully digitized networks, by passing the traditional analog technology. As such, this leap frogging is positively enhancing their stock markets
Hovav and D'Arcy (2005)	Capital market reaction to defective IT products: The case of computer viruses	Their results show that the market reacts negatively to the production of flawed IT in approximately 50 %of the cases. However, this negative market reaction is not statistically significant over extended periods and is limited to announcements involving certain types of defects (i.e., IT products that contain computer viruses). There was not statistically significant negative market reaction for announcements involving IT products that are susceptible to computer viruses.
Toivonen et al., 2007	The Impacts of IT on the Stock and Flow of a Firm's Intellectual Capital	Based on their examination, the main part of IT applications serves dissemination, storing and acquisition of explicit knowledge. They present two ways: the use of IT for the development of social capital in a firm, and the use of external experts—knowledge-intensive business services (KIBS)—as supporters in firms' knowledge functions linked to IT.
Lo and Lie (2008)	Selection of communication technologies: A	According to the results, communicators will choose a tool with high information richness when faced with a long-distance

	perspective based on information richness theory and trust	communication situation involving a highly equivocal task and a low degree of trust for the other party. However, media selection decisions for communication over short distances are not affected by either task equivocally or trust
Bahrami (2008)	The impact of information and communication technology development on stock market expansion (Iran's study case)	Her findings suggest that all indicators of ICT development have been significant effect on Securities Exchange development indexes. In addition, in two group's countries, effect of ICT on economic growth is positive.
Ashraf and Joarder (2009)	The effect of IT on stock market trade volume and volatility: case for Dhaka stock exchange in Bangladesh	Their results showed that the "Net" has a significant impact on these two parameters of volume and volatility of Dhaka stock market
Bharadwaj et al (2007)	The Effects of IT failures on the market value of firms	Their study analyzes how firms are penalized by the market when they experience unforeseen operating or implementation-related IT failures. Their findings show that IT failures result in a 2% average cumulative abnormal drop in stock prices over a 2-day event window. The results also reveal that the market responds more negatively to implementation failures affecting new systems than to operating failures involving current systems. Further, the study demonstrates that more severe IT failures result in a greater decline in firm value and that firms with a history of IT failures suffer a greater negative impact
Narcys and Heniz, 2009	Stock market reaction to IT investments: towards an explanatory model	They proposed a conceptual model describing the factors that are influenced IT investments based on market reaction findings of major event studies on IT implementation announcements

Methodology of Research

Figure 1 presents the study's conceptual framework, showing the hypotheses relationships between the constructs.
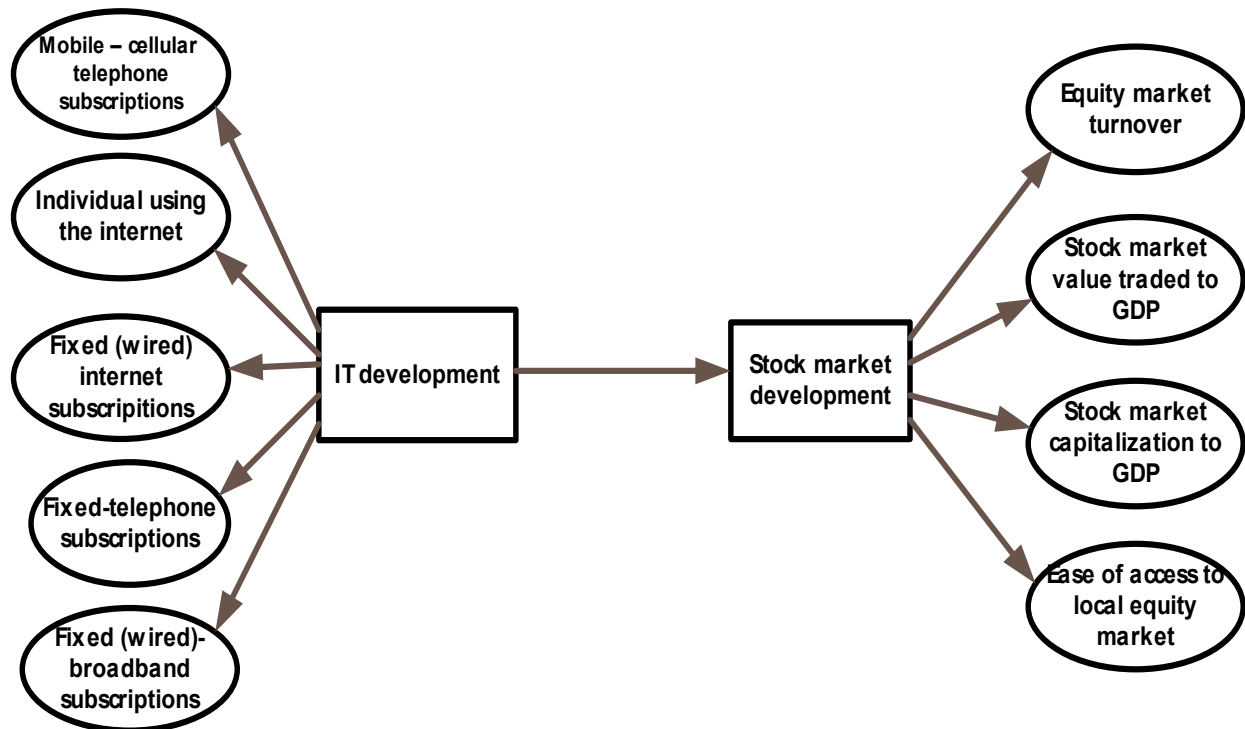

Figure 1. The conceptual model

This study has been use *The Financial Development Report 2011* of World Bank. This report show financial the Financial Development Index on which it is based provide a score and rank for 60 of the world's leading financial systems and capital markets. The Index analyzes drivers of financial system development that support economic growth. For measurement of ITD have been use 4 indexes as follow:

• Stock market turnover ratio: The total value of shares traded during the period divided by the average market capitalization for the period | 2009

• Stock market value traded to GDP: Total value of shares traded on stock market exchanges as a percentage of GDP | 2009

• Stock market capitalization to GDP: This indicator is the value of listed shares as a percentage of GDP| 2009

• Ease of access to local equity market: Raising money by issuing shares on the stock market in your country is (1 = impossible, 7 = very easy)

Table 2. SMD degree of sample countries

Countries/economics	Stock market turnover ratio	Stock market capitalization to GDP	Stock market value traded to GDP	Ease of access to local equity market
Argentina	42	46	40	57
Australia	9	10	7	13
Austria	22	34	25	48
Bahrain	48	54	46	15
Bangladesh	53	52	47	18
Belgium	13	30	21	38
Brazil	27	12	48	25
Canada	24	4	13	6
Chile	38	19	28	11
China	54	55	49	34
Colombia	49	35	41	44
Czech Republic	35	41	34	49
Denmark	21	26	20	26
Egypt	44	25	29	23
Finland	11	11	4	30
France	15	23	12	8
Germany	12	32	18	31
Ghana	55	51	50	35
Hong Kong, China	23	1	51	1
Hungary	10	45	26	56
India	41	4	16	12
Indonesia	20	33	52	19
Ireland	56	40	19	54
Israel	36	7	22	17
Italy	1	42	9	45
Japan	14	28	17	10
Jordan	43	8	24	41
Kazakhstan	57	36	35	55
Korea (Rep.)	7	21	5	46
Kuwait	17	56	53	36
Malaysia	18	5	54	7
Mexico	33	38	36	50
Morocco	28	9	31	24
Netherlands	3	20	2	29
Nigeria	45	57	55	37
Norway	16	24	15	4
Pakistan	37	43	33	39
Panama	50	47	44	28
Peru	47	13	38	40
Philippines	32	27	56	33
Poland	31	39	32	42
Romania	39	48	39	52

Countries/economics	Stock market turnover ratio	Stock market capitalization to GDP	Stock market value traded to GDP	Ease of access to local equity market
Russia	30	14	23	53
Saudi Arabia	19	3	14	3
Singapore	4	17	11	5
Slovak Republic	52	53	45	58
South Africa	25	3	10	2
Spain	8	16	6	51
Sweden	5	18	8	9
Switzerland	6	2	2	14
Tanzania	57	58	57	47
Thailand	40	31	30	22
Tunisia	46	50	43	20
Turkey	29	44	27	32
Ukraine	51	29	42	59
United Arab Emirates	34	59	58	27
United Kingdom	59	22	59	16
United States	2	15	3	21
Venezuela	60	60	60	60
Viet Nam	26	49	37	43

Source: The financial report, world economic forum, 2011

Table 2 shows SMD indicators degree of sample countries. In this paper using of four indicators mean for overall index of SMD. Present paper considered *Mobile – cellular telephone subscriptions* (MCTS), *Fixed (wired)-broadband subscriptions*(FBS), *Fixed-telephone subscriptions* (FTS)*, fixed (wired) Internet subscriptions* (FIS) *and Percentage of Individuals using the Internet* (PLUS) as ITD indexes. The need data were collected from ITU database. These data were sort ascending then were ranked. In order to achieve the intended objective, the current study uses the correlation coefficient and ANOVA technique to show the relationship ITD and SMD. In addition, uses the One-Sample Kolmogorov-Smirnov Test for examine of be normal. The result of this test shows that all data are normal. Then uses the regression analysis for examination effect of ITD on SMD. SPSS 19 software was used to accomplish all the above-mentioned tests. Table3 shows results of correlation between all indicators. As you see, SMTR has direct relationship with FBS, FTS and PLUS. In addition, SMCTG has direct relationship with FBS and PLUS. SMVTTG has relationship with FBS, FTS and Plus. Nevertheless, there is no relationship between EALEM and all ITD indictors. These Correlations are significant at the 0.01 level.

Table 3. Correlations data

		MCTS	FBS	FTS	FIS	PLUS
Stock market turnover ratio	Pearson Correlation	.024	.484**	.345**	-.159	.558**
	Sig.	.853	.000	.007	.223	.000
Stock market capitalization to GDP	Pearson Correlation	.112	.299*	.364**	.207	.276*
	Sig.	.395	.020	.004	.112	.033
Stock market value traded to GDP	Pearson Correlation	-.039	.353**	.335**	.059	.466**
	Sig.	.767	.006	.009	.654	.000
Ease of access to local equity market	Pearson Correlation	-.046	.058	.037	.028	.173
	Sig.	.726	.661	.781	.832	.186

Sig (0.00) in Table 4 indicates that there is significant relationship between SMD and ITD. Overall Coefficient correlation is 0.436. Therefore, use of regression for showing impact is logical. Regression result also shows ITD has impact on SMD with constant coefficient (20.99) and variable coefficient (0.229).

Table 4. ANOVA data

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2663.233	1	2663.233	13.634	.000
	Residual	11329.680	58	195.339		
	Total	13992.913	59			

Table 5. Regression results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	20.993	3.018		6.957	.000
	ITD	.229	.062	.436	3.692	.000

Figure 2 presents the best model for showing relationship between independent variable and dependent variable. This model has a good level of fit ($\chi 2$= 43.32, d.f= 16, CMIN/DF= 2.708, p=0.000, GFI=0.901, RMSEA=0.05, NFI=0.912, CFI=0.908).
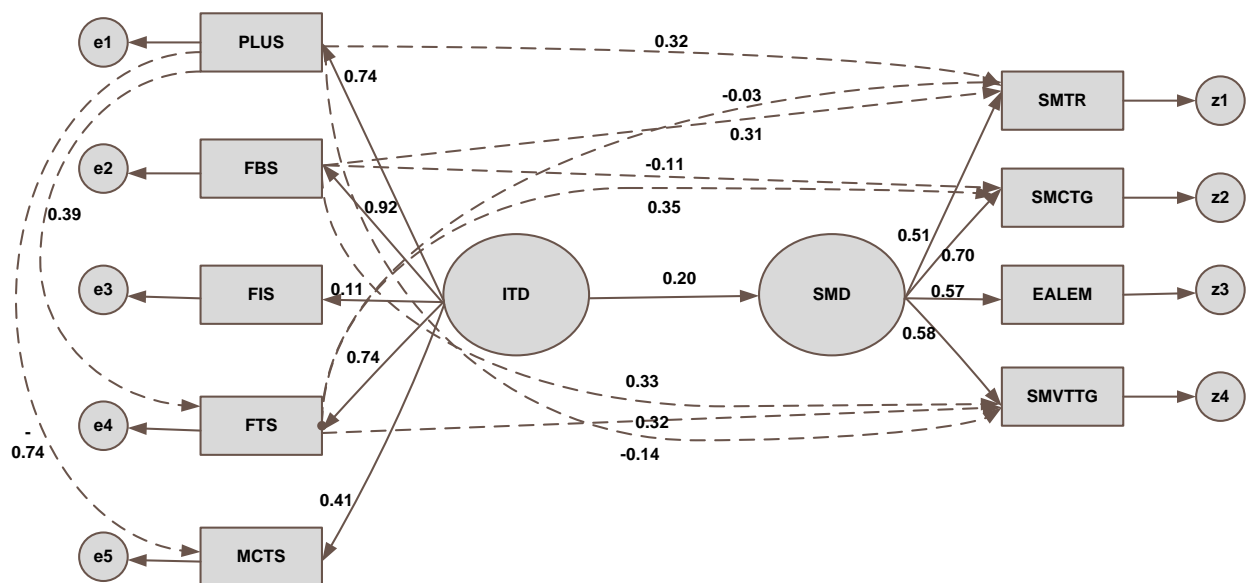
Figure 2. Structural model

Conclusions

The world is rapidly becoming an information society with the growth ITC in all aspects of human life. Today, Internet access and use of information resources in all human societies have an increasingly growth and different communities used of the benefits of information and communication technology with attention of the established infrastructure. IT infrastructure development is a multi-step process. Establish of communication, legal and education infrastructure and workforce Training are examples of the efforts made in this regard. In knowledge-based communities, issues such as educational development and cultural development must be attention. Today, it is necessary that must be preparing intellectual and cultural fields of ITD, because there are a direct relationship between the nation economic health and the level of their skills. Proper utilization and managed development of IT can have beneficial effects in economics body.

The purpose of the present paper is examination of impact of ITD on SMD. Five factor was considered for measurement of ITD including Mobile – cellular telephone subscriptions (MCTS), Fixed (wired)-broadband subscriptions(FBS), Fixed-telephone subscriptions (FTS), fixed (wired) Internet subscriptions (FIS) and Percentage of Individuals using the Internet (PLUS). In other hand, Stock market turnover ratio (SMTR), Stock market capitalization to GDP (SMCTG), Stock market value traded to GDP (SMVTTG) and Ease of access to local equity market (EALEM) was considered as SMD indexes. Result of correlation (0.436) and regression confirmed that SMD have been influenced of ITD.

Today, all people want to take advantage of each other. Create IT systems especially in capital market are a factor for made easier to works and easier to achieve goals. This is possible with internet trading development and reassuring investors about their safety and property information. Therefore, the analysis performed expertly is necessary for create change and innovation in methods and executive mechanisms exchange. This paper suggests that all transactions processed of brokerage institutions must be computerization and their trading systems should be electronic, for the reason that such institutions are important in capital markets. Today, in addition to, buy and sell must be done by Internet; all trading

systems must be computerized. Organizations need to experienced managers for modern methods growths. Therefore, they should investment in manager education (Wallis, 2005).

References

Ashraf, M. A., & Joarder, H. R. (2009). The Effect of Information Technology on Stock Market Trade Volume and Volatility: Case for Dhaka Stock Exchange in Bangladesh, Technical Report, AU J.T. Vol. 12, No. 4, pp: 265-270.

Bahrami, A. (2008). The impact of information and communication technology development on stock market expansion (Iran's study case), MA thesis, university of Isfahan (in Persian).

Bharadwaj, A., Keil, M., Mähring, M. (2007). Effects of information technology failures on the market value of firms, Journal of Strategic Information Systems. Vol, 18 . pp: 66–79.

Cesari, A. D., Espenlaub, S., Khurshed, A., Simkovic, M. (2010), "The Effects of Ownership and Stock Liquidity on the Timing of Repurchase Transactions", Paolo Baffi Centre Research Paper No. 2011-100.

Chandler, D., Munday, R. (2012) "Information technology", A Dictionary of Media and Communication (first ed.), Oxford University Press.

Charles, A. Y. (2008), The Determinants of Stock Market Development in Emerging Economies: Is South Africa Different?, International Monetary Fund, IMF Working Paper. pp:1-31.

Greenwood, J., & Jovanovic, B. (1999). The Information-Technology Revolution and the Stock Market, Aea Papers and Proceeding , Vol. 89, NO. 2, pp:116-122.

Hobjin and Jovabonic. (2000),The Information Technology Revolution and the Stock Market: Evidence, American Economic Review, v91, pp: 1203-1220.

Hovav, A., & D'Arcy, J. (2005). Capital market reaction to defective IT products: The case of computer viruses, Computers & Security, Vol. 24, pp: 409- 424.

Kummerow, M., & Lun, C. J. (2005). Information and communication technology in the real estate industry: productivity, industry structure and market efficiency, Telecommunications Policy Vol, 29, pp: 173–190.

Loa, Sh. K., & Lie, T. (2008). Selection of communication technologies: A perspective based on information richness theory and trust, Technovation, Vol. 28, pp: 146–153.

Lucas, H. C. Jr., Oh, W., Simon, G., Weber, B. W. (2002). information technology and the new York stock exchange's strategic resources from 1982-1999, cis-2002-08.

Narcyz, R., & Roland, H. W. (2009). Stock market reaction to information technology investments: towards an explanatory model, ECIS 2009, pp: 883-894.

Ngassam, Ch., & Gani, A. (2002). Effect of Information and Communications Technology on Stock Market Development: Evidence from Emerging Markets and High-Income Economies, International Journal of Economic Development, Vol., No. 1.

Simkovic, M. (2009). "The Effect of Enhanced Disclosure on Open Market Stock Repurchases". Berkeley Business Law Journal 6 (1).

Toivonen, M., Smedlund, A., Jarvenpaa, E. (2007). The Impacts of Information Technology on the Stock and Flow of a Firm's Intellectual Capital, IGT.

Wallis, P. (2005). Internet Psychology, translation of b.Ohadi, and F. Ghanadi, published Sun, Isfahan (in Persian).