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Performance appraisals of ICT companies in the Tehran stock market: contradiction with the global trend

Sepehr Ghazinoory^a, Amir Khorasani^a, Ali Asghar Anvari Rostamy^a,
Ghazaleh Taheriattar^b and Mona Rashidirad^c

^aDepartment of Information Technology Management, Tarbiat Modares University, Tehran, Iran; ^bFaculty of Management, University of Tehran, Tehran, Iran; ^cBrighton Business School, University of Brighton, Brighton, UK

ABSTRACT

The impact of information & communication technology (ICT) in increasing financial transactions in different fields, shows the positive developments of this industry in Iran. But could the ICT industry also be effective in the economic capital of the country? This could occur when the ICT industry has a good performance in the capital markets. In this research, the ICT industry in the Tehran Stock Exchange was used to assess its performance in the economy's capital. The data and documents related to the profitability of corporates in ICT industry for six years over the range studied. A total of eight corporate companies with the nature of ICT, and 68 other corporate companies from a total of 17 industries were selected. To discover the informational efficiency, runs test, for analysing trend, linear regression and for comparative assessment, a TOPSIS model has been used. The results showed that the ICT industry in the Tehran Stock Exchange does not have even a weak level of efficiency of information. In addition, it has had a declining trend and finally, in comparison to other industries, it has delivered a poor performance; the results are completely inconsistent with results from other countries and show that Iran's ICT status needs fundamental reflection.

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1. Introduction

One of the important elements of each country's capital market is its stock exchange. A stock exchange is developed based on a correct policy; it will lead to the development of the national economy. Therefore, strategic planning in this market has been considered by economic policymakers. They endeavour to apply policies to help industries' economies and in line with it, the country's economy. Applying correct policies leads to different results and one of these results is stock efficiency. Stock efficiency means that when it is possible to achieve optimum allocation of capital and liquidity, the market is efficient (Alexeev & Tapon, 2011). One of the important objectives in strategic management to increase efficiency is depending to the stock exchange's components. We can examine the efficiency of different

CONTACT Sepehr Ghazinoory  Ghazinoory@modares.ac.ir

companies and industries by evaluating each of them (Doran, Peterson, & Wright, 2010). If there is no optimum efficiency in part of a market, planners should adopt plans to improve the status quo. In fact, attending to the entire market will determine the overall level of performance and does not indicate that a company or industry will impact negatively or positively on the status quo.

On the other hand, in order to determine how investors tend to operate in capital markets, their attitudes and behaviour should also be noted. From the perspective of investors, behaviour of financial indicators in different industries and companies is very important in decision-making, in order to review their performance separately or comparatively. If the investor pays attention to an industry or firm they can help its activity lead to profit.

Regarding the impact of information & communication technology (ICT) on society, almost all aspects of human life have changed, therefore, firms in the ICT industry have achieved significant improvements. We should mention the changes of shareholder value of companies like Apple, IBM, Intel, Google, etc. that have increased dramatically with the arrival of the era of information technology and perched in the world's top 100 companies (den Hengst & Sol, 2001; Tsai & Hua, 2006 and interbrand.com). ICT's impact on the efficiency and volume of stock transactions and its attractive products, led these products and related companies to enter the stock exchange. ICT in Iran also could positively affect the volume of trade exchange and increase the Tehran Stock Exchange index.¹

The success of this technology and its dramatic changes in world's stock exchanges resulted in researchers examining the ICT industry in capital markets. On the other hand, ignoring the developments of the ICT industry in the Tehran Stock Exchange, despite the recent government investment in this field,² and also government strategic planning on putting this industry in the top 10 exports from Iran, has motivated us to examine the impact of ICT industry on the efficiency of the Tehran Stock Exchange and to evaluate the performance of this industry from the investors' point of view.

2. Introduction of Tehran Stock Exchange

The basic idea of the establishment of the Tehran Stock Exchange goes back to 1936 and van Luther Field. The Belgian worked on establishing the Tehran Stock Exchange and also designed its statute. The Act of Securities Exchange was passed in 1966 and sent to the Central Bank. Activities in the Tehran Stock Exchange by the end of 2001 could not be formed coherently. This was caused by the Iranian people's tendency to invest in real estate, gold and currency (Keshavarz Haddad & Satari, 2010). But in recent decades, Iran's capital market is considered to be a growing market that has gained valuable experience in business decline, growth and fluctuations. In fact, this market is moving forward with privatisation plans in the Islamic republic of Iran. By the Tehran Stock Exchange, a number of public companies are assigned to the private sector every year. Although, privatisation did not have a positive impact on the stock market due to restlessness, lack of a comprehensive plan, allocating insufficient expertise, etc. (Nasrollahi, aqayi, & Baqeri zamani, 2009), but then over time, privatisation has led to the positive development of the market vision. The index changes in the Tehran Stock Exchange in recent years reflect its impact (Figure 1).

In recent years many people have begun to buy shares of companies in various industries. Previously, activities on the stock exchange were performed by attending in exchange trade location of tasks which were traditionally done in previous years. Until recently, with



Figure 1. Changes in the Tehran Stock Index over the six years from 21 March 2007 to 19 March 2012 at current prices. Source: Authors' calculations, adapted from <http://www.iranbourse.com>.

increased use of ICT by Iranian people, exchange activity was also affected and after some time, the Stock Exchange Organisation launched the official website for the securities trading. The influx of a particular stratum of society that had a better relationship with the Internet affected stock value and then forums, chatting rooms, blogs and websites related to stock exchange grew rapidly. ICT Login developments increased so much that other professions such as stock exchange concepts e-Learning became common jobs and stakeholders received possible analysis of moment-to-moment changes easily by mobile Internet and SMS. Electronic tools and techniques facilitated the buying and selling of shares in recent years and is one of the main reasons for increased investment (Madhooshi & Mohammadi, 2008).

Despite Iranian shareholders' willingness to invest in this market in recent years, this stock market is less attractive for foreign investors. One of the main reasons for this is inefficiency and poor quality standards and accounting information (Anvari Rostami & Lari Semnani, 2004). Iranian companies' lack of transparency and rent in the information in various industries makes investors seek informal and hidden information. This has caused many foreign investors, who are unfamiliar with Iranian relations, to withdraw (Farid, Bordbar, & Mansoori, 2009).

One way to increase the efficiency of information is to study different industries, and in the later stages, different companies. If specified that an industry or a company will delay in releasing accurate and timely information, we can help the efficiency of capital markets by adopting appropriate policies. Thus, it is necessary to review different industries during research. On the other hand, the use of ICT products and tools can be used to disclose and distribute the information more effectively. Thus, for closer examination of the performance of the Tehran Stock Exchange, it is better to start from the ICT industry to find out about suppliers of ICT products and the extent to which improving the conditions of the market would impact them.

3. The ICT industry's position in the other world stock exchanges

There is a small amount of industries and organisations that ICT has not penetrated yet. The ICT industry had left tremendous changes on global areas (Mahmood zadeh, 2009) and

its impact was so great on macro-areas, that because of this sector's corporates activities, a bubble appeared in 1999–2000 (Prabahar, Dhinakaran, & Pandian, 2008). This bubble was a resurgence for the productivity of American and European organisations (Antonopoulos & Sakellaris, 2009). ICT penetration in organisations has positive effects in terms of profitability, productivity and the value of the corporations (Melville, Kraemer, & Gurbaxani, 2004). Research in countries such as Italy, Spain, America, Greece, etc. confirms this matter (Antonopoulos & Sakellaris, 2009; Badescu & Garces-Ayerbe, 2009; Brasini & Freo, 2012). In recent years in Iran, ICT has entered society more than ever and this has caused a lot of transactions in organisations in the field of ICT. Maybe the impact of ICT on productivity is low in Iran (Mahmood zadeh & Asadi, 2007). However, many companies have emerged in this field and even the Tehran Stock Exchange has become electronic by using ICT tools.

Usage of ICT and the importance of capital markets led many researchers to study a combination of these two categories. In the beginning, research demonstrated that login or improving ICT tools caused an increase in the volume and speed of transactions and better dissemination of information in the London Stock Exchange (Michie, 1997). The results of these studies were repeated in the stock exchanges of New York and Nigeria (Ezirim, Elike, & Muoghalu, 2009; Lucas, Oh, & Weber, 2009).

After that, more attention was paid to the behaviour of the stock in the ICT industry, such as risk factor. Attending to risk of ICT industry in the stock exchange was started by Hobijn and Jovanovic (2001). They studied Intel stock price by change in CPUs technology. They studied the Intel stock price falls which occurred in late 1971, and the reason was the development of microprocessors. They found that the arrival of new technologies may create volatility in the value of the relevant companies. Further investigations in price volatility and risk of the ICT industry revealed that the most dangerous investment is in the field of ICT. Figure 2 show all venture capital investments and results which show that the IT sector is high risk (Gaba & Meyer, 2008).

The industry survey also showed that risk in investing in the Indian stock market is very high and needs risk management from experts. Investigating firms in this industry in the Indian Stock Exchange suggests that the stock price of ICT industry was much more

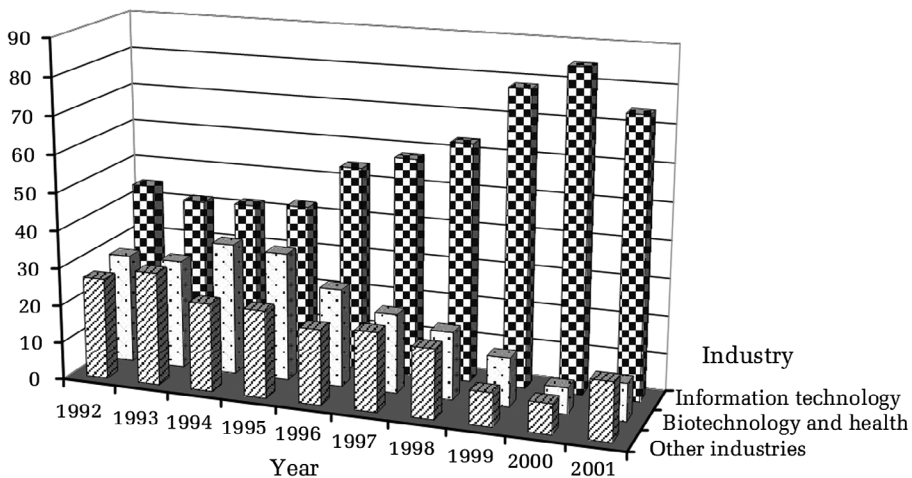


Figure 2. Percentage of venture capital investments. Source: Gaba & Meyer, 2008.

volatile than the overall market. In fact, the results showed that even well-funded organisations should not invest precipitously and without risk management in ICT (Kumar, 2010; Prabahar et al., 2008).

Qiao, Smyth, and Wong (2008) began to study and analyse shares and risk in this industry within the markets of Canada, France, Hong Kong, Japan, Taiwan and America. They question that, along with the development of ICT in these countries, what oscillations have been happening in the value of ICT firms' shares? Results show that in all these markets, the ICT industry value of shares climbed unusually, and that became the famous IT bubble (Figure 3). The researchers proved that the risk of investment in the Canadian market is high and if major changes occur in this industry it will have more effective impact on the Hong Kong market than the American market.

Comparing the IT industry of capital markets to each other and each behaviour towards developments in this industry, led economists and investors to valuable conclusions about the mutual impact of equity markets and the ICT industry. But, at the micro and macro levels in each country for national decisions, different industries should be analysed accurately. The sample for this analysis can be found in the research of Rozanova (2010) – a study of 100 companies operating in the ICT field in the Russian stock market showed that the ICT market in Russia is a multiple monopolies polarised market. Macy, Terry, and Owens (2010) also looked at America's stock prices stock of software companies. They conducted the study in a different era. The results imply that the software companies show a strong tendency to experience high industry correlation in a bear market and little correlation in a bull market and have characteristics that are consistent with being a blockbuster instead of a commodity.

Fernandez, Callen, and Lainez Gadea (2011) also evaluate the performance of ICT listed companies in Europe through the eyes of investors. They studied the impact of non-financial

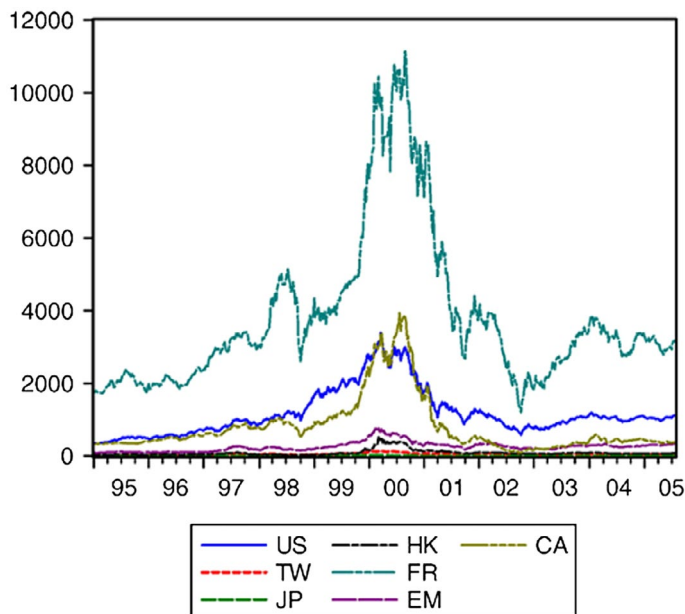


Figure 3. Stock price indices of ICT sectors. Source: Qiao et al., 2008.

information on their shares value. Their research showed that investors represent a negative reaction about the information on production and new product updates. Because such action may have high risk.

Unlike European, East Asian and American studies, industries' performance review in the Tehran Stock Exchange is limited. Although we can mention research from Karim zadeh and Soltani (2010) (scrutiny of financial intermediation industry) and Dastgir, Sajjadi, Khodadadi, and Khalili (2009) (scrutiny of the risks of the petrochemical industry), but in any period, the ICT industry has not been studied in capital economics perspectives. Although traces of the ICT industry have been observed in some studies, the effects were not a comprehensive review of the ICT industry and in fact, they are summarised as a general comparison and ranking. For example, Hooshmand and Khodadoost (2008) compared various industries including the computer technology industry. Different parameters such as Dividend, Capital amounts, total return, etc. were evaluated for 19 industries. Finally, it was determined that the computer technology industry as classified in the last quarter to achieve the desired goals.

According to the literature of research in America, Europe and East Asia, it was determined that more attention has been paid to indicators of profitability and risk. On the other hand, Iranian scientists are also looking at the profitability and information efficiency of industries. Iranian investors pay special attention to profitability indicators and this issue persuades researchers to attend changes in profitability indicators. In this way, because there is a significant relationship between type of industry and financial structure and profitability of Iranian companies (Ahamd Pour & Salimi, 2007), and knowing that considering industry in stock exchange is a method to improve the performance of capital market, to evaluate the performance of the ICT industry in the Tehran Stock Exchange we first must examine the informational efficiency of ICT industry. Then we must examine the profitability indicators and finally, rate this industry compared to other industries.

4. Methodology

This study was performed to evaluate the performance of the ICT industry and finally we ranked 17 Tehran Stock Exchange industries to determine the position of the ICT industry. Studies and analysis of this research have been collected from data, records and financial statements of companies in Tehran Stock Exchange during the period 21 March 2007 to 19 March 2013. During the study only companies were evaluated that have the following conditions:

1. Companies are not a subset of investing and financial intermediation.
2. There must be adequate access to financial statements and documents.
3. Their financial year ends on 19 March.

4.1 Information efficiency

Capital market should be efficient if we want capital allocation to be optimised (Doran et al., 2010). Efficient market theory was first introduced in the 1970s by Fama. In an efficient market, all information should be transparent and perfect, so that share prices are transparent and one group would not be more aware of the market than another group, whereby

the market will be affected by their influence. Timely disclosure of information means that financial statements are timely, appropriate, reliable, comparable and understandable (Banimad & Mohseni Sharif, 2011). Efficiency is proposed in three levels: weak, semi-strong and strong. To measure the efficiency of information, we should start from the weak-level and if market has a weak-level, the next levels must be evaluated. Markets certainly will not be efficient in the next levels of efficiency if it is not efficient in the weak-level and the next levels' test would be meaningless. The weak efficiency is that successive price changes are independent of each other and Information about past prices is examined. There are several methods for measuring efficiency of information regarding the distribution of data can be parametric or non-parametric. Parametric tests are used if the data are normal and non-parametric tests are used if they are abnormal (Macy et al., 2010; Rozanova, 2010). The Kolmogorov–Smirnov test is used to determine the distribution of data. Some methods for measuring efficiency of the weak-level are as below:

Runs Test, Serial Correlation, Filter Rule, Spectral Analysis, Moving Average.

Because of abnormal data, non-parametric methods have been used. Due to the widespread use of runs test in many researchers' studies (Khan & Vieito, 2012), this method was chosen. In this test, a significant difference between the expected runs and real runs, indicates that stock price changes are dependent on each other and capital markets is un efficient in weal-level (Mobarek & Keasey, 2008). Runs tests were performed in two ways for the ICT industry:

First method: a run occurs when the signs of data changed.

Second method: a run occurs when data change than mean (Mobarek & Keasey, 2008).

The number of expected runs is given by the formula 1. Then K must be calculated and if its absolute value exceeds 1.96, the efficiency in weak-level will reject.

$$m = \frac{N(N + 1) - \sum_{i=1}^3 n_i^2}{N} \quad (1)$$

$$\delta_m = \sqrt{\frac{\sum_{i=1}^3 n_i^2 [\sum_{i=1}^3 n_i^2 + N(N + 1)] - 2N \sum_{i=1}^3 n_i^3 - N^3}{N^2(N - 1)}} \quad (2)$$

$$K = \frac{(R + A) - m}{\delta_m} \quad (3)$$

N is Number of observations, m is expected runs, δ_m is expected standard deviation, K is Variable Statistics R is Total observations on a variety of runs and A is Steady and continuous balancing. If $m < R$ then $A = -1/2$ and if $m \geq R$ then $A = +1/2$.

In tests market efficiency must be noted in two cases: first, these tests are mostly used to find the difference between natural logarithms of successive stock prices (Fama, 1965). Second in order to import prices and analyse data, changes such as pay dividends, splits or combinations of shares, bonus shares, issuance of new shares, etc. was considered in prices.

4.2 Profitability

To evaluate the indicators related to profitability, we used return on equity (ROE), return of total assets ratio (ROA), earnings per share (EPS), price to earnings ratio (P/E) and net income to sale (NIS) and to also evaluate ICT Sector Performance by indicators related to the profitability, we used Annual Growth Rate (Formula 4).

$$\hat{g} = e^B - 1 \quad (4)$$

$$B = \frac{COV(Y, X)}{\sigma^2(X)} = \frac{\sum_i (Y_i - \bar{Y})(X_i - \bar{X})}{\sum_i (X_i - \bar{X})^2} \quad (5)$$

4.3 Ranking

To choose the best option in management science, gradually and by advancement of science in operations research (OR), Different ways was developed which have attempted to model the problem. One of these methods is TOPSIS³ which we use in order to compare the performance of the ICT industry with other industries in the Tehran Stock Exchange. This algorithm is a very powerful multi-criteria decision-making technique for prioritising options by making it look like the perfect answer (Opricovic & Tzeng, 2004). In this method options should have minimum distance from the positive ideal solution and maximum distance with negative ideal solution.

The TOPSIS method, like all Multiple Attribute Decision Making (MADM), requires information which is obtained based on the relative importance of each indicator. When the data of a decision matrix is fully specified, we can use the entropy method to evaluate the weights.

To use the Shannon entropy you must first enter the normalised data. In this entropy, normalisation is performed by using Quadratic Norm.

$$P_{ij} = \frac{r_{ij}}{\sum_{i=1}^m r_{ij}} \quad j = 1, \dots, n \quad (6)$$

Then we compute the E_j entropy as follows:

$$K = \frac{1}{\ln m} \quad (7)$$

$$E_j = -k \sum_{i=1}^m P_{ij} \ln P_{ij} \quad \forall_j \quad (8)$$

Next the degree of diversification should be calculated that shows notification power of indicator.

$$d_j = 1 - E_j \quad \forall_j \quad (9)$$

$$W_j = \frac{d_j}{\sum_{j=1}^n d_j} \quad (10)$$

To solve the desired matrix by this method, First the initial matrix should be transformed into a non-Scaled matrix (N_D) that it is performed using Euclidean Norm in TOPSIS method.

$$r_{ij} = \frac{r_{ij}}{\left(\sum_{i=1}^m r_{ij}^2\right)^{\frac{1}{2}}} \quad i = 1, \dots, m \tag{11}$$

Then we have to obtain weighted non-Scaled matrix.

$$V = N_D \times W_{n \times n} \tag{12}$$

Where in $W_{n \times n}$ is diagonal matrix of calculated weights in Shannon entropy. Afterwards positive ideal solution (A_i^+) and negative ideal solution (A_i^-) and also the distance for every positive and negative ideal solution should be specified for each options.

$$A^+ = \left\{ \left(\max_i V_{ij} | j \in J_1 \right), \left(\min_i V_{ij} | j \in J_2 \right) | i = 1, \dots, m \right\} = \{v_1^+, \dots, v_n^+\} \tag{13}$$

$$A^- = \left\{ \left(\min_i V_{ij} | j \in J_1 \right), \left(\max_i V_{ij} | j \in J_2 \right) | i = 1, \dots, m \right\} = \{v_1^-, \dots, v_n^-\}$$

$$J_1 = \{1, \dots, n | \text{For every Indicators positive elements}\}$$

$$J_2 = \{1, \dots, n | \text{For every Indicators negative elements}\}$$

$$d_i^+ = \left\{ \sum_{j=1}^n \left(v_{ij} - v_j^+ \right)^2 \right\}^{\frac{1}{2}} \quad i = 1, \dots, m \tag{14}$$

$$d_i^- = \left\{ \sum_{j=1}^n \left(v_{ij} - v_j^- \right)^2 \right\}^{\frac{1}{2}} \quad i = 1, \dots, m \tag{15}$$

Finally, the relative closeness (A_i) to the ideal solution would be computed as follows:

$$C_i = \frac{d_i^-}{(d_i^- + d_i^+)} \quad i = 1, \dots, m \tag{16}$$

C_i Will be between 0 and 1 and any option that its C_i is closer to 1, Will rank higher (Olson, 2004; Opricovic & Tzeng, 2004).

5. Research findings

The ICT industry has sub-industries, such as manufacturing activities, software, information services, telecommunications, consulting, etc. which includes the companies shown in Table 1.

Table 1. List of Companies operating in the ICT industry in the Tehran Stock Exchange.

Company Name	Symbol	Field of Activity	website
1 Iran Argham	IAGM1	Informatics hardware production	iranargham.com
2 Information Services	INFO1	ICT services to financial institutions	isc.co.ir
3 Parsian Ecommerce	EPRS1	E-Card services	pec.ir
4 Data Processing of Iran	DADE1	Provide all the hardware and software services	dpi.ir
5 Iran telecommunication Factories	KMOA1	Manufacturer of fixed and mobile stations	itmc.ir
6 Payam Industries	PYAM1	Audio and Video Production and Distribution	payam.co.ir
7 Pars Electric	PELC1	Audio and Video Production and assembly	parselectric.com
8 Iran telecommunication Co.	MKBT1	Creation and distribution of communication services	tci.ir

Source: Authors' calculations, adapted from <http://www.iranbourse.com>.

Table 2. Kolmogorov–Smirnov test results.

	INFO1	PELC1	MKBT1	PYAM1	KMOA1	DADE1	IAGM1	EPRS1
N	1,042	781	866	60	914	1182	1090	134
K-S Z	10.59	10.25	6.47	3.69	7.65	5.33	7.25	2.86
Asymp. Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Authors' calculations.

To investigate the efficiency of information, distribution of data should be specified. Therefore, the Kolmogorov–Smirnov test was used. Considering that the significant estimates (Asymp. Sig) in Table 2, is below 0.05, it can be concluded the studied data did not follow a normal distribution and nonparametric methods should be used to measure efficiency (Drezner & Turel, 2011).

The results of the first and second method of runs test were presented in Table 3. They show the absolute value of Z statistic is more than 1.96 for all firms. This means that none of the companies in the ICT industry do not have efficiency of information even in weak-level.

After determining the ICT industry information inefficiency in the Tehran Stock Exchange, we attempted to evaluate the profitability of it. The overall trends are summarised in Table 4 by using the regression method. The results showed that all indices have a negative annual rate of growth and it expressed a downward trend in profitability indicators in the ICT industry. Similar results can be found in Karimi Dastjerdi and Ghatreh Nabi's (2010) research, but in contradiction with the global trend according to the research of Macy et al. (2010).

The last part of the study is dedicated to comparing ICT industry to other industries. Reviewing an industry alone could not provide a comprehensive view for macro policy-makers and decision-makers, because cyclical fluctuations may happen in the market. For example, a country's stock may rise or fall at any time and may affect all industries in the same situation. We cannot definitely attribute changes in industry indices to the firms' management. Thus, in the following, a comparison of the ICT industry to other industries is discussed.

First, the criteria's weights were determined by using Shannon entropy. For this purpose, the data were moderated and normalised and criteria weight was determined by calculating the entropy, constant K and the degree of diversification (Table 5).

Also in the TOPSIS method initial data should be moderated and normalised and then the distance between the positive and negative ideal solution should be calculated for each industry and finally, according to this distance, rating and ranking of each industry

Table 3. Runs test results.

Company Name	Total Cases (N)	Number of Runs (R)		Number of Expected Runs (m)		Z	
		First method	Second method	First method	Second method	First method	Second method
INFO1	1042	330	229	683	451	-23.38	-15.94
PELC1	781	213	161	517	315	-23.19	-13.73
PYAM1	60	13	13	28	18	-5.39	-2.21
KMOA1	914	288	234	610	373	-22.57	-11.31
DADE1	1182	391	339	743	584	-22.05	-14.50
IAGM1	1090	364	300	718	506	-22.82	-13.46
EPRS1	134	48	37	74	63	-5.10	-4.83
MKBT1	865	257	210	559	386	-22.02	-13.45

Source: Authors' calculations.

Table 4. Rate of growth indices related to profitability.

	Sale	NIS	ROA	ROE	EPS	P/E
Annual rate of growth	-0.0888	-0.0778	-0.1877	-0.1588	-0.5921	-0.4467

Source: Authors' calculations.

Table 5. Degree of diversification and criteria's weights.

	NIS	ROA	ROE	EPS	P/E
Entropy (E)	0.90787	0.94793	0.98398	0.90321	0.97933
Degree of Diversification (d)	0.09212	0.05206	0.01601	0.09678	0.02066
Criteria's weight (W)	0.33177	0.18753	0.05768	0.34858	0.07442
			K= 0.3529561		

Source: Authors' calculations.

Table 6. The final score for each industry.

Rank	Industry	Score	Rank	Industry	Score
1	Metallic mineral	0.88008	10	Foods except sugar	0.24164
2	Chemical	0.66738	11	Vehicle and Parts Manufacturing	0.22416
3	Pharmaceutical	0.58810	12	ICT	0.19139
4	Cement	0.57803	13	Metal products	0.07869
5	Petroleum	0.51662	14	Machinery	0.07827
6	Sugar	0.45713	15	Tiles and ceramics	0.07527
7	Technical and Engineering	0.43875	16	Rubber	0.06930
8	Electrical devices	0.32333	17	Non-metallic mineral	0.05207
9	basic metals	0.27247			

Source: Authors' calculations, adapted from companies listed in the Tehran Stock Exchange, 2015.

should be determined (Table 6). The results showed that the ICT industry is at the end of the third quarter and its performance in the Tehran Stock Exchange is inappropriate. ICT rank in our study is slightly better than the results of Hooshmand and Khodadoost's (2008) research.

6. Discussion

Development and dynamics of capital market plays a key role in the financing of investment projects and stable economic growth. As the capital market has more expansion and

mobility and macro policymakers and decision-makers adopt more suitable policies, there would be more hope for the future trend of economic activity. One of the requirements for such mobility is information efficiency.

According to previous reports, inefficiency of the Tehran Stock Exchange has been repeatedly proven. Researchers have attempted to study price changes by using various approaches. In most cases, lack of efficiency even in a weak level has been proved (Allahyari, 2009; Fadayi Nejad, 1994; Namazi & shooshtarian, 1995). However, since the nature of ICT is related to information transmission, we expect this industry also uses the tools of new technology in the Tehran Stock Exchange to disclose financial information and take weak-level of efficiency. In fact, our expectation was that the ICT industry is not only timely and accurate in disclosure of the information, but affects positively on the whole efficiency improvements of the Tehran Stock Exchange. While, the results imply the inefficiency of it. This means the ICT industry in the Tehran Stock Exchange has a lack of transparency, incomplete and lack of timely disclosure of information. Thus, it became clear that the ICT industry also lacks information transparency and the information rents which are the most significant obstacles in efficiency of the Tehran Stock Exchange. Not only has the ICT industry not used its tools to overcome this obstacle, but it has also has attempted to trade secret information (Farid et al., 2009).

Next we examined evaluating of profitability indicators. After the collapse of stock values of many companies in the ICT industry in 2000 and 2001, profitability indices grew again (Qiao et al., 2008). However, these conditions were not prevailing in the Tehran Stock Exchange. The study found that the overall trend of ICT Industry profitability indices in the Tehran Stock Exchange were negative on six-year terms. Disadvantages of the ICT industry in these years is at odds with the worldwide trend and shows that Iran is not in line with the world's stock markets, especially in the hardware sector. The test results were consistent somehow with study of Noroosh and Hesarzadeh (2011) which showed companies with limited financing and disadvantageous firms have less profitable transparency than other companies.

Finally, ranking of industries in Tehran Stock Exchange revealed that the ICT industry in Iran's capital market cannot meet the expectations of investors and by virtue of being in final rankings of industries, basic decisions need to be made for it.

Inappropriate trend of ICT industry in the Tehran Stock Exchange indicated that it has a high risk in Iran and it is in line with the results found by Gaba and Meyer (2008), Kumar (2010), Prabahar et al. (2008) and Fernandez et al. (2011) and investors should not invest in this sector without robust analysis.

Nonetheless, the ranking of ICT industry revealed that it does not have an appropriate place in the Tehran Stock Exchange and maybe it is not desired by the investors. Comparing these results with the research of Prabahar et al. (2008), Qiao et al. (2008), Antonopoulos and Sakellaris (2009) and Greenwood and Jovanovic (1999), made it clear that the ICT industry in Iran does not have an appropriate infrastructure. This is especially the case in the hardware sector where a small number of companies operating in the stock do not have competitive power against other companies. Non-Iranian examples and need to be reviewed, re-engineered and even stop working.

7. Conclusion

Despite a 6% increase in the annual cost related to ICT worldwide (Rozanova, 2010), why has ICT industry growth not been observed in the Tehran Stock Exchange? Declining profitability indicators can be attributed to inflation due to the inflation rise in Iran in the period under study. But the ratings industries indicated that the downward trend indicators, even if affected by overall unfavourable and critical market conditions, certainly poor management and performance in the industry affected the declining trend too.

Negative ICT performance in the Tehran Stock Exchange has different effects. One of the main reasons for this is lack of appropriate intellectual capital that will suffice for bankruptcy ICT companies individually (Jamali & Hashemi, 2012). Especially in hardware manufacturing, this capital does not follow updated knowledge and the knowledge of activation personnel is improper (Jafari, Asadnejad, & Yazdani, 2012). On the other hand, the risk of ICT investments is very high according to the research conducted. Timely and transparent information is one way to reduce risk (Mahdavi Adeli & Fahimi Dooab, 2010) and also there is inefficiency of information in this industry. It should be noted that new technologies in Iran can easily penetrate the country, via such channels such as importing and contraband. Many local companies cannot align themselves with updated, diverse and often expensive technology.

Studies indicated that the ICT industry in Iran is not in line with the general trend of this industry in the world. In the period under review the ICT industry had a declining trend which was at odds with the worldwide trend. On the other hand, according to predictions, in 2013 ICT companies worldwide would not be in an appropriate situation due to changes in areas such as entering Cloud Services field (www.pwc.com).

After review and evaluation of the ICT industry in the Tehran Stock Exchange and identifying some shortcomings, the following suggestions can be presented as ways to improve the ICT industry:

- More government and organisations attention to budget allocations in order to improve infrastructures which will ensure the effectiveness and success of the projects such as increasing new knowledge of employees instead of increasing the number of workers.
- Property management reform, reform or re-engineer old structures and explanation of management team related to ICT sciences.
- Planning by the Tehran Stock Exchange officials and policymakers to publish transparent, complete and timely information.
- Develop short-, medium- and long-term perspectives due to the development of related technologies and prepare the organisation to face changes within this growing industry.
- ICT industry firms' continuous information flow via television, radio, newspapers, websites, email, social networks, mobile phone, etc.
- Update products and services in order to increase sales
- Prevent equipment and knowledge from becoming obsolete
- Consider products and services that are a part of the basic needs of country and that most people are using; and also compete with foreign models due to the existing infrastructure.
- Adopt policies to smooth the entry of successful ICT companies which are not currently present in the Tehran Stock Exchange.

Notes

1. TEDPIX.
2. Investments such as, government, integrating education information, etc.
3. Technique for Order Preference by Similarity.

References

- Ahamd Pour, A., & Salimi, A. (2007). Impact of size and industry on capital structure: The evidence from Iran, *Journal of Social Science and Humanities*, 26, 13–35. Retrieved from http://www.sid.ir/fa/VEWSSID/J_pdf/51513865002.pdf.
- Alexeev, V., & Tapon, F. (2011). Testing weak form efficiency on the Toronto Stock Exchange. *Journal of Empirical Finance*, 18, 661–691. doi:<http://dx.doi.org/10.1016/j.jempfin.2011.05.002>.
- Allahyari, A. (2009). To study the weak form of efficiency of the capital market in Tehran Stock Exchange. *Quarterly Journal of Securities Exchange*, 1, 75–108. Retrieved from <http://journal.seo.ir/page/article-frame.html?langId=en&articleId=242>.
- Antonopoulos, C., & Sakellaris, P. (2009). The contribution of Information and Communication Technology investments to Greek economic growth: An analytical growth accounting framework. *Information Economics and Policy*, 21, 171–191. doi:<http://dx.doi.org/10.1016/j.infoecopol.2008.12.001>.
- Anvari Rostami, A., & Lari Semnani, B. (2004). What makes stock exchanges attractive? The case of the Tehran Stock Exchange (TSE). *The Iranian Accounting and Auditing review*, 11, 101–116. Retrieved from <http://www.noormags.ir/view/en/articlepage/338825/what-makes-stock-exchanges-attractive-the-case-of-the-tehran-stock-exchange-%28tse%29>.
- Badescu, M., & Garces-Ayerbe, C. (2009). The impact of information technologies on firm productivity: Empirical evidence from Spain. *Technovation*, 29, 122–129. doi:<http://dx.doi.org/10.1016/j.technovation.2008.07.005>.
- Banimad, B., & Mohseni Sharif, M. (2011). An investigation of effective factors on ranking of firm disclosure quality and timeliness Tehran Stock Exchange. *Management Accounting*, 3, 51–63. Retrieved from <http://en.journals.sid.ir/ViewPaper.aspx?ID=206308>.
- Brasini, S., & Freo, M. (2012). The impact of information and communication technologies: an insight at micro-level on one Italian region. *Economics of Innovation and New Technology*, 21, 107–123.
- Companies listed in the Tehran Stock Exchange. Retrieved from <http://www.iranbourse.com/default.aspx?tabid=36>
- Dastgir, M., Sajjadi, H., Khodadadi, V., & Khalili, P. (2009). Studying the influence of risky factors on returns of the petrochemical companies. *Journal of Economic Sciences*, 9, 35–58.
- Doran, J., Peterson, D. R., & Wright, C. (2010). Confidence, opinions of market efficiency, and investment behavior of finance professors. *Journal of Financial Markets*, 13, 174–195.
- Drezner, Z., & Turel, O. (2011). Normalizing variables with too-frequent values using a Kolmogorov-Smirnov test: A practical approach. *Computers & Industrial Engineering*, 61, 1240–1244.
- Ezirim, C., Elike, U., & Muoghalu, M. I. (2009). Capital market growth and information technology: Empirical evidence from Nigeria. *International Journal of Business and Economics Perspectives*, 4(1), 1–17.
- Fadayi Nejad, M. (1994). Empirical test of ETH in the Tehran Stock Exchange. *Financial Research*, 2, 6–26.
- Fama, E. F. (1965). The behavior of stock-market prices. *The Journal of Business*, 38, 34–105.
- Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, 25, 383–417.
- Farid, D., Bordbar, G., & Mansoori, H. (2009). Identifying and evaluating weak-form efficiency barriers of Tehran Stock Exchange Using BSC and MADM techniques. *Biquarterly Journal of Economic Essays*, 6, 157–194.
- Fernandez, B. C., Callen, Y. F., & Lainez Gadea, J. A. (2011). Stock price reaction to non-financial news in European technology companies. *European Accounting Review*, 20, 81–111.

- Gaba, V., & Meyer, A. D. (2008). Crossing the organizational species barrier. *Academy of Management Journal*, 51, 976–998.
- Greenwood, J., & Jovanovic, B. (1999). The information-technology revolution and the stock market. *American Economic Review*, 89, 116–122.
- den Hengst, M., & Sol, H. G. (2001). The impact of information and communication technology on inter-organizational coordination: Guidelines from theory. *Informing Science*, 4, 129–138.
- Hobijn, B., & Jovanovic, B. (2001). The information-technology revolution and the stock market: Evidence. *American Economic Review*, 91, 1203–1220.
- Hooshmand, M., & Khodadoost, H. (2008). Ranking of projected indicators for industries listed in Tehran stock Exchange. *Knowledge and Development*, 15, 190–210.
- Jafari, H., Asadnejad, M., & Yazdani, H. (2012). Exploring the effect of using information technology on functional and strategic performances of the human resource management units in automaker and automotive supplier companies in Tehran. *Quarterly Journal of Information technology management*, 3, 69–88.
- Jamali, Q., & Hashemi, M. (2012). Measuring relationship between factors affecting risk of Mellat Bank IT Projects in bushehr province using fuzzy DEMATEL. *Quarterly Journal of Information technology management*, 3, 21–40.
- Karim zadeh, M., & Soltani, A. (2010). Estimation long run relationship between stock price index of financial industry and monetary macroeconomic variables by ARDL approach. *Financial Accounting*, 2(6), 1–18.
- Karimi Dastjerdi, D., & Ghatreh Nabi, P. (2010). A conceptual Model to Study the Effect of Enterprise Risks on Performance of IT Companies. *Quarterly Journal of Information, technology management*, 1, 119–134.
- Keshavarz Haddad, G., & Satari, M. (2010). The inflation-hedging effectiveness of land, gold and stock in Iran. *Iranian Journal of Economic Research*, 15, 135–171.
- Khan, W., & Vieito, J. (2012). Stock exchange mergers and weak form of market efficiency: The case of Euronext Lisbon. *International Review of Economics and Finance*, 22, 173–189. doi:<http://dx.doi.org/10.1016/j.iref.2011.09.005>.
- Kumar, N. M. (2010). An efficient way to minimize the impact of risks in Information and Communications Technology (ICT) sector. *Advances In Management*, 3, 17–20.
- Lucas, H. C. J., Oh, W., & Weber, B. W. (2009). The defensive use of IT in a newly vulnerable market: The New York Stock Exchange, 1980–2007. *The Journal of Strategic Information Systems*, 18, 3–15. doi:<http://dx.doi.org/10.1016/j.jsis.2009.01.003>.
- Macy, A., Terry, N., & Owens, J. (2010). Stock market performance of computer software firms across multiple periods. *Journal of Finance and Accountancy*, 4(1), 1–17.
- Madhooshi, M., & Mohammadi, A. (2008). Impact of information technology on securities markets. *Journal of Economic*, 8, 161–188.
- Mahdavi Adeli, M., & Fahimi Dooab, R. (2010). Comparing the effects of formal information and rumors on choice of real stock buyers in Tehran Stock Exchange, *Knowledge And Development*, 17, 67–85. Retrieved from http://www.sid.ir/fa/VEWSSID/J_pdf/66413893203.pdf.
- Mahmood zadeh, M. (2009). The effects of Information and Communication Technology (ICT) on the Total Factor Productivity (TFP) in IRAN. *Journal of Executive Management*, 2, 107–130.
- Mahmood zadeh, M., & Asadi, F. (2007). The effects of Information and Communication Technology (ICT) on the labor productivity growth in Iran. *Iranian Journal of Trade Studies (IJTS)*, 43, 153–184.
- Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Information Technology and Organizational performance: An integrative model of IT business value. *MIS Quarterly*, 28, 283–322.
- Michie, R. C. (1997). Friend or foe? Information technology and the London Stock Exchange since 1700. *Journal of Historical Geography*, 23, 304–326.
- Mobarek, A., & Keasey, K. (2008). Weak-form market efficiency of an emerging market: evidence from dhaka Stock market of Bangladesh. *Journal of Emerging Market Finance*, 7, 17–41.
- Namazi, M., & shooshtarian, Z. (1995). The investigation of the efficiency of Iran's stock exchange. *Financial Research*, 2, 82–104.
- Nasrollahi, K., & aqayi, K. & Baqeri zamani, N., (2009). Evaluate the performance of the privatized companies' shares through the stock exchange. *Journal of Financial Accounting research*, 1, 42–59.

- Noroosh, I., & Hesar zadeh, R. (2011). Investigation of accounting transparency dimensions and relationship with corporate specification. *Quarterly Journal of Securities Exchange*, 3, 5–24.
- Olson, D. L. (2004). Comparison of weights in TOPSIS models. *Mathematical and Computer Modelling*, 40, 721–727.
- Opricovic, S., & Tzeng, G. (2004). Compromise solution by MCDM methods: A comparative analysis of VIKOR and TOPSIS. *European Journal of Operational Research*, 156, 445–455.
- Prabakar, R., Dhinakaran, J., & Pandian, P. (2008). Return and risk analysis of indian information technology sector stocks. *The ICAI Journal of Financial Risk Management*, 5, 41–49.
- Qiao, Z., Smyth, R., & Wong, W. K. (2008). Volatility switching and regime interdependence between information technology stocks 1995–2005. *Global Finance Journal*, 19, 139–156.
- Rozanova, N. (2010). Competitive interactions in the information technology sector: International experience and Russia. *Problems of Economic Transition*, 52, 44–64.
- Tsai, H. C., & Hua, M. S. (2006). Can intellectual capital powerfully explain the stock price of electronic companies? *Taiwan Academy of Management Journal*, 6, 237–250.