

## INVESTIGATING THE RELATIONSHIP BETWEEN TECHNOLOGY INTELLIGENCE AND BUSINESS PERFORMANCE

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### **Abstract**

Changes in technology, which is induced by constant innovations, influence everyone's business. Intelligent organizations do not wait for change; rather they actively monitor and keep track of changing environment and new innovations to take advantage of them. Technology (Competitive) intelligence pursues the following objectives: becoming timely aware of the technological events, identifying new products and processes, and understanding trends and events relevant to competitive environment. Companies that use this method meticulously, they can be optimistic about making firmer decisions, and moving ahead alongside the changing environment. In this study the effect of technology intelligence on business performance was examined. The statistical population of this research study involved the companies of industrial city of Ardabil. This study was based on the data collected from a sample of the managers and engineers in the late 2012 and early 2013. The data required for evaluation was gathered through questionnaires and analyzed by SPSS. The results showed a significant relationship between technology intelligence and four aspects of business performance.

**Keywords:** *Competitive Intelligence, technology intelligence, business performance*

### **1- Introduction**

Today, small and medium industries in most of the countries are playing an essential role in social aspects, production, industry, and offering services. In many countries, these industries are the main suppliers of new jobs, the starting point for evolution and innovation, and pioneer in new technologies. These industries with remarkable amount of exportation take a significant part in the economic development of their countries. Inasmuch as an organization, in spite of operating well, needs to be aware of its competitors' activities and purposes, acquiring competitive intelligence becomes one of necessary requirements for organizations. It is through gathering and analyzing data as well as increasing knowledge and awareness that they can add to their capabilities. Moreover, it is in the light of this knowledge that a comprehensive picture of current and future state of competition field can be built for managers, so they can make quick and early decisions, and set the scene for growth and development of their organizations.

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Changes in technology which is triggered by constant innovations, affect everyone's business. Intelligent organizations do not await change; but they actively monitor and keep an eye on changing environment and new innovations to benefit from them (Veugelers et al., 2010). While only few companies make use of technology competitive intelligence, other companies invest their intelligent efforts merely on their current status. There are scanty numbers of organizations that employ their intelligent resources for seizing technological opportunities. Since technology intelligence has recently emerged in Iran, it seems necessary to examine and identify technology intelligence in details to provide industry and specialists with sufficient amount of information on it. Although some studies have investigated types of intelligence in Iran, to best of our knowledge no study has been conducted on technology intelligence to date. In fact it can be said that this issue has been treated ignorantly in Iran (despite worldwide attention to it), and the present study is examining technology intelligence and its effect on business performance for the first time in Iran.

## 2- Competitive Intelligence

Competitive Intelligence denotes the skill of collecting, processing and storing the information which individuals according to their needs, at all levels of organization, can have access to. The intelligence assists them to create their future and protect them against competitive threats. Competitive intelligence should follow the rules and comply with the ethics. Competitive intelligence transfers knowledge from environment to the organization using specific rules (Weiss, 2002). The companies that make use of competitive intelligent program have a better understanding of the competitive vision and moving toward management strategies, they create plans for increasing competitive advantage. Some researchers have classified competitive intelligence into three types:

1. **Market intelligence:** The intelligence draws an outline of current and future trends, customers' needs and preferences, new markets, innovative market sectioning opportunities, and main moves and changes in the area of marketing and distribution.
2. **Strategic intelligence:** This type of intelligence assesses the changes in competitive strategy at the specified time interval, which is in turn the result of changes produced in competitor's structures, having alternatives for products, and newcomers in industry.
3. **Technology intelligence:** In this type of intelligence the cost/benefit of current and new technologies are evaluated and the changes of technology are predicted.

### Technology intelligence

Technology intelligence is the part of competitive intelligence that supports the projects and scientific investment decisions and helps decision makers in estimating the relative strengths of other organizations. It suggests that the innate nature of all effective measures has its root in intelligence. Among the major types of intelligence (including, military intelligence, political intelligence, economic intelligence, etc.), technology and scientific intelligence plays such a specific role that often becomes an indispensable part of other types of intelligence.

Technology intelligence, as a branch of competitive intelligence, places its emphasis on research operations and development of organizations, but it can involve other activities such as strategic planning, technology acquisition, and investment on technology and equipment. Inasmuch as technology intelligence is constituent of competitive intelligence, most of research studies on competitive intelligence refer to technology intelligence as well.

Intelligent technology is a process which is introduced for improving the performance and development of the technologies accompanied by innovation via identifying potential options of new technologies, and reducing the possibility of failure in the case of technological

inconsistencies. This definition includes technology monitoring, technology assessment and technology prediction (Majidfar, 2010, p. 2).

Technology intelligence is defined as information sensitive to business about the development of external sciences and technology that can affect the company's competitive position. Adopting technology intelligence is nothing more than an informal technology monitoring and is also a structured process that involves four major steps (Norling et al, 2000):

1. Planning, organizing and conducting competitive intelligence efforts.
2. Intelligent information gathering.
3. Analysis of data.
4. Dissemination of results for practical uses.

Ashton and Klavans have defined technology intelligence as business sensitive information on scientific or external technology developments, opportunities and threats that can influence a company's competitive position. They have accentuated that technology intelligence has its focus on external organization problems, and is sensitive to business and pragmatic.

The Coburn' definition of technology intelligence is presented below:

"The analytic process that changes the scattered information on competitor's technologies into appropriate and applied strategic technology about position, inclinations and amount of their activities."

There are two noticeable differences between two above definitions: firstly, Ashton and Klavans define technology intelligence as information, but Coburn defines it as a process. Secondly, while Coburn explains technology intelligence in relation to information, Ashton and Klavans ascribe it to any relevant external data, and emphasize that competitive advantage can be affected by the actions of competitors, as well as the influence of government, customers, suppliers, and scientific advancements (Courseault 2004, p. 7).

### 3- Business Performance

Business can be described as a kind of architecture for product, service and information flow that contains a description of various business agents, their roles, the potential benefits of each of these agents and their income sources (Shafi'i and Zamanloo, 91, p. 117). Many mistakenly believe that an organization's performance equals to its profitability. In fact, the company's performance is evaluated depending on the type of organization, management thoughts, philosophy and mission of the organization, environmental conditions, and a lot of other factors. Neely (1995) has stated that performance should embrace both efficiency and effectiveness of an action.

There are numerous variables that can improve the competitive power of a business such as macro environmental factors which are national or international (like economic, sociocultural, political, and technological factors), micro environmental factors or components of industry (such as suppliers, competition within the industry, new competitors, alternative products, sales dealers and customers) and factors related to inside of the enterprise (both tangible and intangible assets and competencies).

Organizational performance has multiple facets: customer (levels and trends in customer satisfaction, maintaining customer, service performance and positive output parameters that are important to customers), financial (ROI, profitability, liquidity, market share, and business development), human resources (staff satisfaction, staff development, job rotation, organizational learning, and work arrangement) and organizational effectiveness (indicators of operational performance in designing, production, delivery, and support of business processes such as productivity, time cycle, supplier, and other performance indicators for implementing organizational strategies (Khosh-sima, 2002, p 86). Considering that the

dimensions mentioned in various studies are scattered and not consistent enough, with the aim of observing the integrity and comprehensiveness, this research evaluates the business performance of the model proposed by Divandari and his colleagues in 2008. The stakeholder-driven approach is adopted to shape a framework for business performance. Based on this approach, the output competitiveness or business performance including business performance considering market, business performance in respect of customers, business performance regarding competitors and internal business performance (for the shareholders and employees) is (Divandari et al, 2008, p 42). As they themselves have also mentioned all the components of business were new but in compiling and aggregating them, the available principles were used.

The environment where enterprises are active in is called market. Market analysis requires identifying its structure. And the market structure is similar to a system comprising concordant and interrelated components (Chavoshi and Javadi- Pourfar, 2011, p.3). The performance of enterprises facing market is based on providing intelligence throughout organization compatible to current and future needs of customers, and disseminating it among different sections of organization and responding to it. This kind of performance catches the attention both inside and outside the organization. The sub-indicators of this index are components like performance of market share, performance of developing services in market, improving reputation and image of enterprise in the market, following ethics and showing social responsibility towards market (Abbasi, et al. 2012, p.5).

Operating in the area of marketing and selling information is key factor in the success of companies. Customer information helps staff to establish better communication with customers and have better planning for business future of company (Rasouli and Bagherinejad, 2010, p 57). Company's performance for its customers is a function of customers and shareholders' values it is the financial strength that determines ability to act and react in the competitive environments, and factors such as competitive price, costs reduction, meeting customers' expectations, and establishing valuable relations with customers,... are effective factors in a company's performance from customers' perspective (Abbasi et al, 2012, p 5).

Excellent performance of an enterprise in front of customers, in competitive world requires an effective combination of interior elements of the organization. This combination enables us to keep pace with changes of customer preferences and market dynamic variables (Haji Pour, et al., 2012, p.67).

The internal performance and state of an enterprise or institute can be determined by describing the objective indicators such as per capita sales, opening assets, the rate of domestic sales and subjective criteria like management's perceptions of productivity, profitability, employees' satisfaction and participation, employees' skills and their other personality features (Abbasi et al, 2012, p 5).

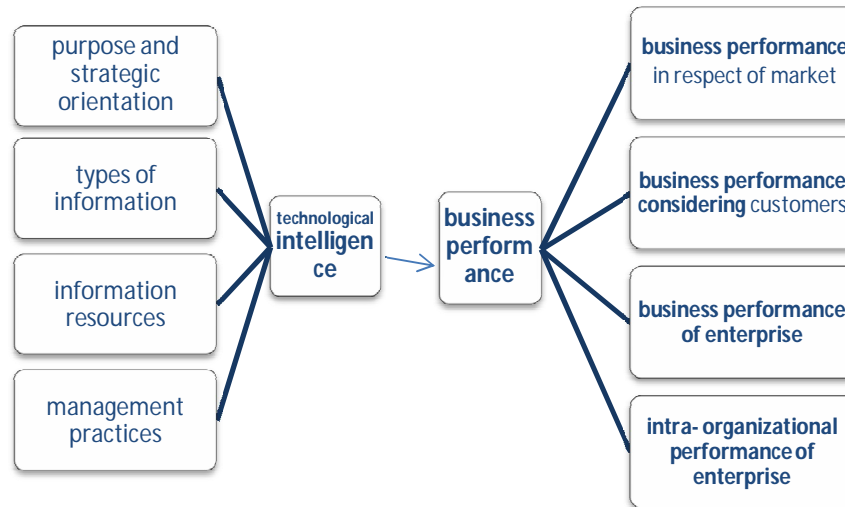
#### **4- The conceptual model**

In this study, technology intelligence is considered as an independent variable and its impact is examined on dependent variable of business performance.

The Savioz and his colleagues' (2003) model for technology intelligence and Divandari and his colleagues' model for business performance were chosen in the present study.

The technological components are presented as follows:

1. Purpose and strategic orientation
2. types of information
3. information resources
4. management practices



**Figure 1. The conceptual model of study**

Companies can have different strategic goals and orientations toward supervising and monitoring environment. Depending on the purpose that they have of this monitoring (such executive, competitive etc.), different types of information can be collected and analyzed. The researchers stress that these information are related to financial and human resources, and innovation in products, processes and marketing.

The second and third items are defined in respect of limit of activities within which the technology intelligence can be used. In other words, the questions that arise in these areas determine the sources and types of information needed.

Management skills, participation of employees, the level of complexity in organization, degree of formality, and frequency of technology intelligence activities, and the amount of attention to technology intelligence in the strategies adopted by organization are the components that can be measured (Savioz et al., 2003).

For evaluating the business performance seven indicators in two separate categories were employed: 1. Marketing performance, including customer returns, customer satisfaction and trust. 2. Financial performance, including return on investment, return on sales, sales growth and market share (Divandari et al, 2008).

The comprehensive stake holder-driven approach was adopted for developing a framework for business performance.

The components of business performance in this study are as follows:

1. business performance in respect of market
2. business performance considering customers
3. competitive performance of enterprise
4. intra-organizational performance of enterprise ( regarding shareholders and employees)

## 5- Method

Taking the subject and objectives of the study, survey design was adopted. The study was conducted with applied purposes. In this study, the tools and methods of data collection were questionnaires. In this present field study, questionnaires were used to measure the variables of study and gather the required data. The study was undertaken in the industrial city of Ardabil from December 2012 to June 2013. The statistical population of this study involved managers and engineers working in Ardabil industrial corporates during the above-mentioned span of time. The number of participants was 480. The instrument used for initial field data collection was questionnaire with the five-level Likert scale. The questions related to

technology intelligence comprised 32 items (strategic goals and orientations, 7 items; types of information, 9 items; information resources, 5 items; and management skills, 11 items) and questions pertaining to aspects of business performance included 36 items (business performance in respect of market, 9 items; business performance considering customers, 6 items; competitive performance of enterprise, 9 items; intra-organizational performance of enterprise, 12 items). To test the reliability of the questionnaire, an initial sample of 21 questionnaires were administered as pretest; subsequently, obtained data were analyzed using SPSS and their dependability coefficient was calculated using Cronbach's alpha. The reliability of the questionnaire and the dimensions of the variables are presented in Table 1.

Table 1, reliability coefficients of questionnaire, each variable and their dimensions

intra-organizational performance of enterprise	competitive performance of enterprise	Business performance considering customers	business performance in respect of market	Management skills	Information resources	Types of information	Strategic goal and orientation	Dimension
12	9	6	9	11	5	9	7	Number of items
0.852	0.709	0.763	0.707	0.819	0.708	0.723	0.786	Cronbach's alpha coefficient
0.943								Total coefficient

**6- Results**

In this study, Pearson correlation coefficient was used to analyze the obtained data and examine the existence or non-existence of relationship between variables. Table 2. Pearson correlation coefficient and the results of significance of regression by F-test

	r	adjusted determination coefficient	error of SD	Durbin-Watson	Sum of squares	d f	Mean of sum of squares	F	Sig .
Main	0.861	0.737	7.60311	1.583	22693.008	4	5673.252	98.141	0.0
1	0.735	0.553	2.40848	1.546	1021.720	4	255.430	44.034	0.0
2	0.697	0.500	2.99420	1.582	1281.862	4	320.465	35.745	0.0
3	0.691	0.470	2.68674	1.814	918.487	4	299.622	31.810	0.0
4	0.778	0.648	3.50855	1.699	3203.099	4	800.775	65.51	0.0

According to the results summarized in Table 2, since the criterion value (sig) is less than 0.05, the obtained correlation coefficient is statistically significant. As it can be seen, there is a significant relationship between technology intelligence and business performance (and its dimensions), in the 99% level.

## 7- Conclusions

The main hypothesis - there is meaningful relationship between technology intelligence and business performance in industrial city of Ardabil – was supported in the present study. In general, previous studies have come up with the effectiveness of technology intelligence in organizations. For example the Brushoff's (1991) study revealed three major types of benefit for the organizations with technology intelligence:

1. the rise of decision making power in the field of competition,
2. a major expansion in knowledge compared with doing a variety of competitive activities,
3. increase of alerts and warnings/caveats.

The outcomes of research study carried out by Kodama (1992) in Japan have confirmed the effectiveness of technology intelligence and have exerted great impact on the Japan's factories and industries.

The following sub-hypotheses were examined and approved in this study: There is a relationship between technology intelligence and business performance in industrial city of Ardabil with respect to market dimension: obviously those who know how to evaluate market, how to think about it, and how to interact with it, have the capability to improve their performance levels as well. Iranian companies, due to lack of experience or having very little activity in competitive markets, have not felt the necessity of addressing these issues, but with increasing competition in the markets, privatization, and the presence of foreign companies in the international markets, they need to focus on market demands and have overall trend toward it, for having a successful and competent presence.

There is a relationship between technology intelligence and business performance in industrial city of Ardabil with respect to customer dimension: Technology intelligence is a key mechanism that organizations resorting to it can identify their potential customers as properly as they can recognize their current customers. Moreover, it assists staff to increase their ability to respond to customers, and helps the companies enhance their ability to respond to the environment.

There is a relationship between technology intelligence and business performance in industrial city of Ardabil regarding competition dimension: It is apparent that today's business world doesn't welcome those who treat the issues negligently and thoughtlessly. Additionally, there is no doubt that only those who have learned competition and battle rituals can survive. Although it is condemned to expand such attitude in the society, the business world automatically chooses the companies which have those abilities. Thus, managers must not only reinforce their ability to adapt to the environment, but also improve their skills in responding to environmental challenges. Furthermore, they can increase their potential to meet the challenges of the environment by delving into future and using available information in the shortest possible time. And it is the technology intelligence that provides managers with the required tools to do so.

There is a relationship between technology intelligence and business performance in industrial city of Ardabil in terms of intra-organizational performance: The companies in order to survive need to be knowledge-oriented and have specialists at their disposal for directing and supervising the performance of organizations which can be achieved through systematic feedback from coworkers, customers and managers. Without having such a strategic approach, the organizational changes take place in a risky situation, and make accomplishing the organizational goals less likely. The top managers are expected to implement an intelligent, competitive and technological program in their organization and improve the effectiveness of the program, to the extent that they can.

In order to develop technology intelligence in organizations, in the first place, it is recommended that organizations and companies take adequate measures with the purpose of managing both internal and external knowledge and information available to them. In the second place, the organizations and companies can move ahead with operationalizing competitive intelligence and technology intelligence (As a branch of the competitive intelligence needed for today's growing world). Consequently, in light of these actions, they can observe the results in the area of business performance. The recommended measures include initial actions for creating, developing and improving organizations' knowledge management system and database, as a background for technology intelligence.

- Storing implicit knowledge of managers and employees for maintaining their experiences and transferring their knowledge to employees and coming generations.
- Creating a comprehensive database of previous projects that have achieved fruitful results or that have failed to meet predictions and ultimately have been defeated.
- Since every company's policy, the methods it follows in doing activities, the goals that it sets for itself, and generally all the actions of the company are taken according to the company's strategy. Thus, it is more suitable that the company's managers, in setting strategy, take the environment and interaction with it as a binding issue.
- The organizations should be always looking for legal means to examine and acquire information about the activities of their competitors, and the suppliers and the distributors of their products and services.
  - To acquire technical and business information related to their work field, they should take advantage of technical magazines and publications, internet sites, competitors' firms, leading technical equipment manufacturers.
- Technological changes, slight changes in consumers' preferences, tacit knowledge of experienced staff, and new ideas are points that considering to them (while it is likely not to be beneficial in the short run) will be effective in the business performance of the companies in the long run.
- It is appropriate that managers attend to examination of the external environment and emerging modern technologies based on long-term visions and macro-goals, because careful investment in the new technologies can lead to many future progresses.
- As we know nowadays the life cycle of information has reduced to great extent, to the extent that yesterday's information is less likely to be helpful, accordingly, it is suggested that organizations carry out regular evaluations in the specified intervals to make necessary modifications in the information system for offering needed information.

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