Analyzing the impact of competitive intelligence on innovation at scientific research centers
In Isfahan science and technology town

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Abstract
Objective: Competitive intelligence is a business tools that help organizations in the process of strategic management and increasing business performance through enhancing knowledge, internal communications and strategic plans quality. Competitive intelligence led targeting of the organization and shows the competition positions and makes the company to be able for forecasting and developing their markets through analyzing the behavior of the competitions and environment to identify opportunities that in long run will lead to innovation. This paper presents a model to assess the effect of competitive intelligence and its components on the innovation in Isfahan Science and technology Town. Methods: Required information is acquired using a questionnaire and collected information is investigated through software LISREL. Results: The results indicate that the use of a competitive intelligence leads to achieving innovation and ensures the survival of the organization. In other words, planning and focus, collection, analysis and evaluation and dissemination of information strengthen the innovation of the company to get the best position in the market. Conclusion: The paper recommends the impact of competitive intelligence on innovation programs. And result of data analyzing shown that among constituent components of competitive intelligence, gathering information has a significant relationship with competitive intelligence. But the relationship between the distribution of information and competitive intelligence is the least significant. It is essential that corporate efforts to improve the information publication process.
Keywords: Competitive intelligence, innovation, competitive advantage, quality, efficiency, responding to customers

1- Introduction
Countries rely on innovation, want to increase productivity and improve their economic situation and one of the main reasons for this attention is, increasing competition between societies (hamidizadeh, 2008). Innovation is known as a critical factor for companies to create value and sustain competitive advantage in today's highly complex and dynamic environment (Ranjit, 2004). Companies with accepting the innovation, in response to environmental changes and develop new capabilities that will help them to achieve higher performance will be more successful.
Innovation is a mental process that leads to the creation of a new phenomenon; this phenomenon may be a new material or spiritual product, (the new service or new techniques). In fact, innovation is analysis or combination of some concepts and creating new thinking and concept that was not previously available (John Kao, 2001). Many organizations, whether public or private use their competitive intelligence services for acknowledging decision makers. Competitive intelligence is process of control the competitive environment with the aim of providing useful information from competitors (Bose, 2008). Competitive intelligence is a necessary concept in the management process and strategic planning of company. Companies with using competitive intelligence and analysis of competitor's strengths and weaknesses are able to predict opportunities of market development and having better performance rather than competitors (Britt, 2006) Development of information technology and its applications in recent years has contributed to competitive intelligence, so that with the explosion of information that are available through blogs, email and other electronic communications, competitive intelligence is more significant (Wright & Calof, 2006).

Social thinkers and management professors express that if a production company wants to be successful in today's competitive market should be able to react to threats and opportunities quickly and be able to offer new and innovative products to market in a short time. There is only one way to achieve this goal and that is innovation. Its importance since appears that the increasing technological change in recent decades have given (Homayoonfar, 2008). Considering that one factors of innovation for companies is competitive intelligence, this paper surveys the effect of competitive intelligence on innovation, and the factors that cause superior to the competition and innovation are identified in the form of a conceptual model.

2- Literature review

2.6 Innovation

Innovation is the process of understanding or creating knowledge and converts it into new or improved products and services, for people who want them. Innovation is process of obtaining idea from its creator and converts to products, services and new methods of operation. Innovation can create the talent and ability of change or adapt.

Innovation = Conception + Invention + Exploitation

In above definition the concept of conception is access to new ideas with respect to some frame of mental reference. The concept of invention is each new idea that can become reality, and exploitation means use of invention (post area, 2008).

Innovation is important because can provide better products and better services, introduce improved models for business and can provide more efficient production processes for business owners. For all economic sectors is necessary to look to innovation as an inevitable necessity (Homayoonfar, 2008).

The complexity of today's competition, innovation is as one of the main advantages for companies' life. All organizations need innovative ideas for survival. New and innovative ideas are like spirit in the body of organizations and it can save them. Appearance of innovation not only enables organizations to gain competitive advantage over competitors, but also provides useful tools for improving organizational performance.

From the perspective of organization and the application innovation can be divided as follows (Hadizadeh & Rahimi, 2005):

- Fundamental innovation: This innovation leads creating new markets.
- Performance development Innovation (product): When there is innovation in products, companies are trying to increase the use of this new product.
- Innovation of review of manufacturing technology: Review of manufacturing technology requires entering materials or equipment from other areas of the industry to produce each new product.
- Innovation in the name, advertising and product labels: Innovation in product labeling, cause the tendency to buy a certain product. Research shows about 24 percent of sales is related to advertisements.
- Innovation in the manufacturing process: Innovation in the manufacturing process causes the company to gain some advantages over competitors, which include: Speed up production processes and increased production flexibility from one product to another product.
• Innovation in Design: One of the important issues in design is flexibility, that means goods be able to adjust according to market conditions and changing consumer interests.

• Innovation in the review of the formula: The review of the formula contains changing in present product structure without changing in its components.

• Innovation in services: Researches show that the cost of attracting a customer is seven times of the cost maintaining it, so innovation in services is one of the important issues in competition.

• Innovation in packaging: Generally changing in packaging cause alter the rate of goods purchase or amount of using this in one period and opening up new markets on the goods.

2.7 Competitive intelligence

Competitive intelligence is art of collecting, processing and storage of information that people in all levels of the organization have access to it, according to their needs and helps them shape their future and will protect them against competitive threats. This information is about competitors, customers, suppliers, technology, and environment or potentially communication related to business (Saayman et al, 2008).

Forums competitive intelligence (SCIP, 2008), states that competitive intelligence is a systematic process for collecting, analyzing and managing external information that affects programs, decisions and actions of company. The aim of competitive intelligence is management and reduction of risk, create useful knowledge, safety information and use of shared information (Priporas et al, 2005). Companies that use a competitive intelligence program, has better understanding of the competitive landscape (Vedder et al, 1999), and with moving toward a wise strategies, they develop programs to increase their competitive advantage (Wright & Calof, 2006).

2.8 Competitive intelligence process

Competitive intelligence process is the activities of gathering, analyzing and applying information about products, competitors, suppliers, partners and customers for short- and long-term planning needs of an organization (Kahaner, 1988). Society of competitive intelligence experts believes this effective process moves over a continuous cycle calls competitive intelligence cycle (Figure1) (Bose, 2008) The main output of this process is the ability to make decisions that concerned on future that lead to strategic decisions and market leadership. Competitive intelligence cycle includes the following steps:

• First step, planning: In this stage the company needs is defined in terms of, what information is needed?, Why is this necessary? And when this information is true?

• Second step, collection activities: Involves identifying all potential sources of information and then investigate and collect correct data from all available sources and placing it in a regular form.

• Third step, activities of analysis: It is an essential step, which includes analysis of collected data to determine patterns, relationships and its present activity, that will improve planning and decision making and makes it possible to development strategies that offer a sustainable competitive advantage. Benefit analysis requires creativity, knowledge and ability to search more.

• The fourth step, the publication: it means communicate the competitive intelligence to decision makers that it is easily understood and it is understandable to them and use it for decision making.

• The fifth step, feedback or evaluation of the final stage: this stage includes gain and reflect the views and customer information to improve the competitive intelligence process (Bose, 2008)

According to studies on the competitive intelligence process, in this study the process listed above is used as competitive intelligence cycle, which includes planning, collection, analysis, publication and evaluation.

2.9 The impact of competitive intelligence on the innovation in organization

Competitive intelligence cycle that is used, includes planning, collection, analysis, publication and evaluation, can be effective on creating innovation in organizations. Studies of Michak Lysin (Michaklisin, 1996), show, organizations which have developed systems for monitoring the activities of their competitors are better able to create competitive advantage through innovation. Pierce et al study (Piercy et al, 1998), also states, that organizations which have intelligent employees are able to make competitive advantage through innovation better than others. This advantage leads to higher quality, lower costs in business process and improves general vision and creates the innovation. Improvement of vision through the use of appropriate information causes facilitation in the...
process of organizational innovation, which has a positive relationship with competitive advantage and helps to improve business planning and making decision (Zangoueinezhad & Moshabaki, 2009). Competitive intelligence is a strategic tool that allows senior management to improve organization's competitive advantage by focusing on the external environment, forecasting future market direction and innovation [12]. This paper provides a conceptual model to evaluate the impact of competitive intelligence on innovation. Innovation in product, process, service and fundamental innovation that are used in this model are more useful in cases of research. The proposed model is shown in Figure 2.

2.10 Hypotheses
Study has been following six hypotheses:
1. Analysis of information is a positive indicator for innovation in scientific research centers in Isfahan science and technology town.
2. Evaluating information is a positive indicator for innovation in scientific research centers in Isfahan science and technology town.
3. Gathering information is a positive indicator for innovation in scientific research centers in Isfahan science and technology town.
4. Planning is a positive indicator for innovation in scientific research centers in Isfahan science and technology town.
5. Publication is a positive indicator for innovation in scientific research centers in Isfahan science and technology town.
6. A positive relationship is between innovation and competitive intelligence in scientific research centers in Isfahan science and technology town.

3- Methodology
This study is practical and methods of data collection are descriptive and survey. The population is all managements of present research companies in the Isfahan science and technology town. In order to study the effects of competitive intelligence on innovation, a questionnaire in three parts in form of five-choice Likert range from very low to very high were prepared. The first part included questions about characteristics of respondents, the second part contains questions related to the competitive intelligence, and the third section includes questions related to innovation. To determine the number of sample, questionnaire was randomly distributed between 20 individuals of population. After collecting and analyzing related statistical data, sample size was estimated 60. For evaluating the validity of questionnaire, the method of formal validity was used. The research questions have necessary credit according to Cronbach's alpha presented in Table 1.

Test results of validated and scales validity with a significant level 95% confidence are shown in Table 2.

4- Findings and Analysis

4.1 Model evaluation
[Insert table 4]
Structural equation modeling is a statistical modeling technique that infers causal relationships between variables that are not directly observable, due to errors and analyze correlation and impact on each other. In this study, Relationships among the variables and significant of hypothesis have been tested by using the software LISREL. Based on output of the software, the research model is presented in Figure 3, which presented relationships among the variables and coefficients each of them.

4.2 Findings
The "chi-square" test simply shows whether statement the model can describe the structure of relationships between observed variables or not. If the chi-square be less is better. "Relative chi-square" value that is adjusted of chi-square also is as a fit scale for modifying and adapting it to sample size. According to output of LISREL Relative chi-square is calculated equal to 1.007, which represents the best fit model. Because the Relative chi-square is less, provided model is more appropriate. According to the following results are obtained of LISREL software output,
RMSEA=0.011 Value -P = 0.45 and Relative chi-square=1.007 are calculated. Quantity of Value – P is more than the standard significance level (α=5%), so provided model is a suitable.

4.3 Hypothesis testing
To evaluate the significant of each parameters of model, t statistic is used. This statistics is obtained from ratio of the coefficient of each parameter in the parameter error standard deviation, which must be greater than 2 in t-test till these estimates be significant in terms of statistical. According to the observed t quantity in the output of LISREL, all the estimates are presented in terms of statistical are significance. Table 3 shows summary of variables significant and their relationships. According LISREL output and above significantly table, we can conclude that all factors related to competitive intelligence has quite significant impact on competitive intelligence. In addition, the constituent factors of competitive intelligence are indirectly linked with the innovation that this connection is established through competitive intelligence. So we can conclude the factors of planning and focus, collection, analysis and communication directly affect the competitive intelligence and then competitive intelligence effect on the innovation. So, all hypotheses of research are confirmed.

4.4 Assess the suitability of final model fitting
Based on suggestion of Gerbing and Anderson (Anderson & Gerbing, 1988). and Cheng (Cheng, 2001), evaluation of a perfect model starts with the assessment fitting of model. General conceptual model also have been analyzed with structural equation modeling approach based on relevant indicators. According to the results in Table 4, almost all indicators except one were satisfactory and indicating general model is acceptable.

5- Conclusion
Findings from this research show that competitive intelligence is a key factor for innovation in scientific research centers in Isfahan science and technology town. In this study, the model of competitive intelligence was considered includes five key factors planning, collection, and analysis, publication and evaluation data. The results confirm that among constituent components of competitive intelligence, gathering information has a significant relationship with competitive intelligence. But the relationship between the distribution of information and competitive intelligence is the least significant, which suggests there are problems in publication of getting information about competitors and the external environment of the people, by the company. It is essential that corporate efforts to improve the information publication process. Although this study provides insight to understand the impact of competitive intelligence on innovation, but has some limitations such as: generalizing and sample size. This research provides an opportunity for researchers to study the effect of other factors, except the factors mentioned in this study and test the effect of competitive intelligence on each of them and compare the results with each other and this is an offer for future research.
References


Post Company, Young Advisor Arena, (2008). What is Innovation?


Annexure

Figure 1: Competitive intelligence cycle

Figure 2: The initial conceptual model for research
Variable Cronbach’s alpha
- Competitive intelligence 0.91
- Innovation 0.94
- The entire questionnaire 0.95

Table 1. Cronbach’s alpha for each variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Innovation in product INNOPROD</th>
<th>Innovation in process INNOVPRO</th>
<th>Fundamental Innovation INNOVRAD</th>
<th>Innovation in service INNOVIDE</th>
<th>Analysis</th>
<th>Evaluation</th>
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<tbody>
<tr>
<td>Innovation in product INNOPROD</td>
<td>1.30</td>
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<td>Innovation in process INNOVPRO</td>
<td>0.53</td>
<td>0.73</td>
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<td>Innovation in design INNOVRAD</td>
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<td>0.41</td>
<td>3.65</td>
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<td>Innovation in service INNOVIDE</td>
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<td>0.50</td>
<td>0.42</td>
<td>1.22</td>
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<tr>
<td>Analysis</td>
<td>0.34</td>
<td>0.41</td>
<td>0.46</td>
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<tr>
<td>Evaluation</td>
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<td>0.34</td>
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<td>Collection</td>
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<td>0.38</td>
<td>0.24</td>
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<td>0.35</td>
<td>0.36</td>
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<td>Publication</td>
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<td>0.30</td>
<td>0.64</td>
<td>0.20</td>
<td>0.42</td>
<td>0.34</td>
</tr>
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</table>

Table 2. Test results of validated and scales validity

Figure 3. Research model (Standard terms)
Table 3. Variables significant

<table>
<thead>
<tr>
<th>Relationship name</th>
<th>Standard of T scale</th>
<th>T scale in this model</th>
<th>Conclusion</th>
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<tbody>
<tr>
<td>meaningful between analysis of information and competitive intelligence</td>
<td>More than 2</td>
<td>8.18</td>
<td>It is meaningful</td>
</tr>
<tr>
<td>meaningful between evaluation of information and competitive intelligence</td>
<td>More than 2</td>
<td>6.91</td>
<td>It is meaningful</td>
</tr>
<tr>
<td>meaningful between gathering of information and competitive intelligence</td>
<td>More than 2</td>
<td>7.75</td>
<td>It is meaningful</td>
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<td>meaningful between planning and competitive intelligence</td>
<td>More than 2</td>
<td>7.30</td>
<td>It is meaningful</td>
</tr>
<tr>
<td>meaningful between publication of information and competitive intelligence</td>
<td>More than 2</td>
<td>6.47</td>
<td>It is meaningful</td>
</tr>
<tr>
<td>meaningful between competitive intelligence and innovation</td>
<td>More than 2</td>
<td>3.98</td>
<td>It is meaningful</td>
</tr>
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Table 4. The comprehensive fit scales of general model

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<th>Fit Scale</th>
<th>The Acceptance Criteria</th>
<th>Statistics</th>
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<tr>
<td>$\chi^2/df$</td>
<td>$\chi^2/df \leq 3$</td>
<td>1.007</td>
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<td>P Value</td>
<td>P Value $\geq 0.5$</td>
<td>0.64</td>
</tr>
<tr>
<td>GFI</td>
<td>GFI $\geq 0.90$</td>
<td>0.91</td>
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<td>AGFI $&gt; 0.85$</td>
<td>0.84</td>
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<tr>
<td>RMSEA</td>
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<tr>
<td>CFI</td>
<td>CFI $\geq 0.95$</td>
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</tr>
<tr>
<td>NFI</td>
<td>NFI $\geq 0.90$</td>
<td>0.91</td>
</tr>
</tbody>
</table>