

Surveying the Role of Creativity and Innovation Strength on Iran's Carpet Industry Compatibility

Nima Saeedi^{*1}, Saeid Askari Masouleh², Hamidreza Mahdavi Koochaksaraei²,
Seyyed Iman Mousavian¹

¹Young researchers club, Islamic Azad University, Central Tehran Branch, Tehran, Iran

²Master, EMBA (Strategic trends), Islamic Azad University, Central Tehran Branch, Faculty of management

ABSTRACT

The current paper discusses about the effect of creativity and innovation strength on Iran's carpet industry compatibility. Results of applying Pearson and regression tests show that there are positive and meaningful correlation between creativity and innovation strength and all its dimensions with compatibility. Then the creativity and innovation strength and dimensions levels were calculated in which no variable was placed in the suitable situations. Finally all 13 sub criteria were ranked that "R & D strength", "Information acquisition from markets" and "knowledge creation" were chosen the top sub criteria of creativity and innovation strength.

The most important strategies for improving competitive strength of Iran's carpet industry are: "creating customers' database to identify their needs and desires", "raising advertisement and marketing researches", "production in terms of global customer needs" and "making exporters accustom to modern international marketing methods and e-commerce to maintain market segments".

KEYWORDS: Creativity and innovation strength, compatibility, hand-made carpet industry, fuzzy TOPSIS.

1. INTRODUCTION AND PROBLEM STATEMENT

The economy of Iran is in a condition where, on the one hand, trade liberalization is under severe international pressure and, on the other hand, in order to have sustainable development, Iran needs considerable development of non-oil exports and increasing its share of the total exports. Considering huge resources, capacities and potentials, it seems that, through proper support, direction and management, Iranian industries can achieve an acceptable level of competitiveness in the international market and have considerable effects in improving the economy of Iran. (Aghazadeh et al, 2007)

Iran's hand-made carpet industry influenced by remarkable cultural and artistic characteristics of the past centuries and decades, has always been a especial production in the non-oil export basket; so that over the years it has had the first and highest rate of attracting currency and is responsible for 7% of all employment in the country and is the source of income for several million Iranians (Almasi et al, 2010).

During the recent years, exports of Iranian hand-made carpet has had a decreasing trend and lower prices of the carpets made by rivals from other countries as well as their compatibility with the taste of the international market are among reasons behind the development of some competitor states in the international market. Besides, among reasons behind the failure of Iranian production and service companies in the international market, one can refer to their lack of competitiveness in the international markets.

Unfortunately because of shortage in organizational, structural, managerial and especially commercial, Iran's carpet industry has situated in retrenchment period. In other side, ignoring the commercial and business fundamentals which include production process, its competitive advantages have been decreased (Hossaini, Haghshenas and Saeedi, 2010).

As lack of advertising and marketing research and utilizing IT in all activities cause that Iran descend in the third place in top exporters table, we are trying to study the hand-made carpet industry problems.

The purpose of this paper is to survey the influence of creativity and innovation strength on Iran's carpet industry compatibility and categorizing its dimensions by fuzzy TOPSIS technique.

2. LITERATURE REVIEW

2.1. Compatibility

The 21st century seems to have begun with events indicative of the turbulence, challenges and opportunities ahead. Excesses during long economic boom in America surfaced with the dot-com crash. The attacks of September

***Corresponding Author:** Nima Saeedi, Young researchers club, Islamic Azad University, Central Tehran Branch, Tehran, Iran
Email: Nimasaidi@gmail.com Tel: +98-911-1933684; Fax: +9888888364

2001 and the collapse of giants such as Enron and WorldCom have shaken confidence in business. With Japan passing through a decade-long painful transition, two biggest economies of the world are in poor shape (Ambashta and Momaya, 2004).

Survival and success in such turbulent days increasingly depend on competitiveness. Competitiveness has been described many by researchers as a multidimensional and relative concept. The significance of different criteria of competitiveness changes with time and context. Theories and frameworks must be flexible enough to integrate the change with key strategic management processes if their utility is sustained in practice (Barney, Wright and Ketchen, 2001).

Compatibility can be considered as a multidimensional concept. It is looked at from three different levels: country, industry, and firm level. Competitiveness rooted from the Latin word, “competer”, which means involvement in a business rivalry for achieving more market share. It can be described that economic strength of an entity with respect to its rivals in the international market economy in which goods, services, people, skills, and ideas move across geographical borders freely (Murths, 1998).

Compatibility can be defined as the ability to design, produce and or market products superior to those offered by competitors, considering the price and non-price qualities (D’Cruz and Rugman, 1992).

Compatibility processes are the processes, which help identify the importance and current performance of core processes such as strategic management, human resources, operations management and technology management processes. The competitiveness process can be viewed as a balancing process which complements traditional functional processes such as operations management and human resources management. It increases the ability of an organization or industry to compete more effectively (Ambashta and Momaya, 2004).

2.2. Creativity and innovation based view

In today’s complex world that organizations and industries do their best to defeat their rivals, creativity and innovation in productions and services will be required more than before.

This view can be considered as a part of resource-based view typically. If resources be classified into two tangible and intangible, so creativity and innovation strength will be a subset of intangibles assets (Dess and Lumpkin, 2003).

Creativity and innovation strength may relate to human resource or organizations’ assets. Human resource creativity strength cause producing differentiate goods and services and innovation in organization assets decrease operational costs, producing and delivering time, product development and market penetration (Mehri, 2004).

Some researchers believe that innovation is base of competitive advantage. Because in long time, competitiveness will be continued by innovation strength (Haghshenas et al, 2010).

This view includes research and development strength, IT applying strength and knowledge management (McGahan and Silverman, 2006). The importance of the view for carpet industry is because of decision makers and managers pay attention just internal resources and has ignored other facets of achieving competitive advantage like e-commerce, internet marketing and knowledge which leads to descending of export rate (Almasi et al, 2010).

Recent research demonstrates that a firm’s financial market value is positively influenced by its patented innovations (Hall et al, 2005) and creativities (Saeedi, 2009). Up to now, there are just little empirical evidence regarding the relationship between a firm’s financial-market value and patented innovation by its competitors (exceptions include Austin, 2000). Obtaining additional reliable evidence about this relationship is important in part because the effect of innovation and creativity by existing and potential competitors on a firm’s financial-market value is theoretically ambiguous. On one hand, “market-stealing” effects may dominate: Patenting by a competitor may generate property rights which give the competitor an advantaged position in the industry, thus reducing the focal firm’s financial value. On the other hand, “spillover” effects may dominate: a breakthrough by a competitor may trigger greater technological opportunity for the firms in an industry, or the disclosure of innovation and creativity by a competitor through patenting may provide information on which a firm can build, thus enhancing the firm’s financial value. Identifying the effects of patenting by potential competitors is further complicated by the prospect of post-innovation cooperation between the potential competitor and focal incumbent firm (Mc Gahan and Silverman, 2006).

2.3. Creativity and innovation based view dimensions

To survey the effective dimensions of the view, we utilized Mehregan et al (2008) model in which creativity and innovation based view has three dimensions: “R & D strength”, “IT strength” and “knowledge management”. All dimensions will be described broadly in continue:

2.3.1. Research and development strength

This criteria is related to information acquisition from markets (for example market intensity and attractiveness). Also identifying customers’ needs and desires and in continue producing the goods in base of their

wants, marketing research and new production development can be considered as parts of this dimension (Mehregan et al, 2008).

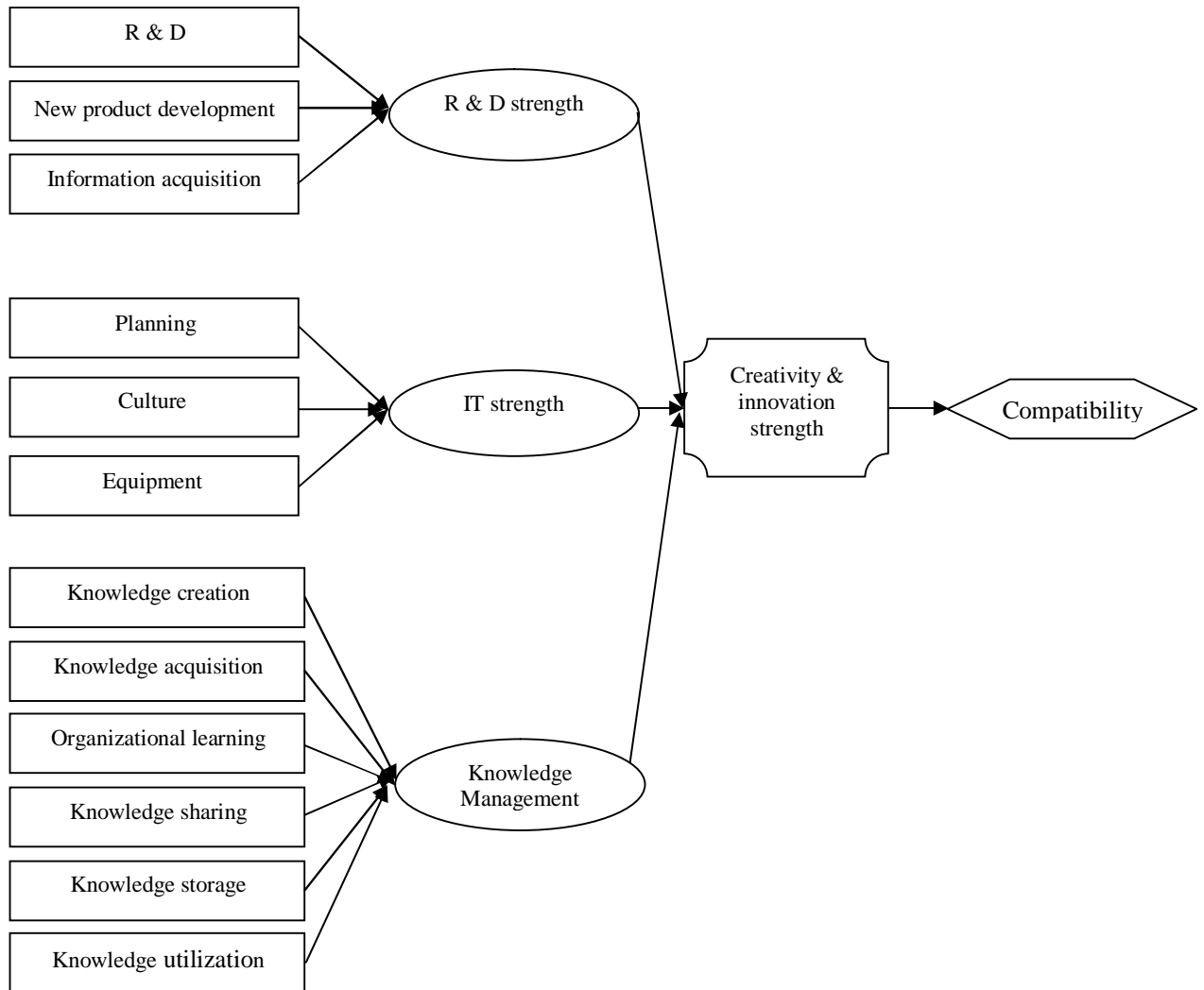
The base of research and development strength is market development and market penetration which is absolutely important for Iran's carpet industry as the traditional rivals (China and India) were better exporters in recent years and made Iran to be dropped into the third place among the top carpet exporters around the world.

2.3.2. Information technology strength

Information and communication technology is the essential tool for economic development and material well-being in our age; it conditions power, knowledge and creativity; it is, for the time being, unevenly distributed within countries and between countries; and it requires, for the full realization of its developmental value, an inter-related system of flexible organizations and information-oriented institutions (Castells, 1999).

2.3.3. Knowledge management

The knowledge management process helps the organizations to recognize, select, organize and propagate the information and important specialties. These information and specialties are part of the organizational memory and usually are unstructured (Turban and Mclean, 2002). In another way, the knowledge management has been defined as the process of awareness of existing knowledge in the organization, create, share, transfer and employ that knowledge, and finally obtain new knowledge and save and store it for the organization, in which all those actions happen within the learning process of an organization, considering its culture and strategies (Sallis and Jones, 2002).



Conceptual framework of research (Mehregan et al, 2008)

2.4. Conceptual framework and hypotheses

Considering the research literature, the conceptual model below can be chosen for the purpose of the current study. This model measures the effect of “creativity and innovation strength” on Iran’s carpet industry compatibility.

The chart above is a part of final model of Mehregan et al research (2008). As it mentioned, in this model, “creativity and innovation strength” contains three main criteria include “research and development strength”, “information technology strength” and “knowledge management” and 13 sub criteria.

Within this model, “creativity and innovation strength” is independent variable and compatibility is the dependent variable.

2.4.1. Main hypothesis:

1. There are positive and meaningful correlation between “creativity and innovation strength” and compatibility.

2.4.2. Secondary hypotheses:

- 1.1. There are positive and meaningful correlation between “research and development strength” and compatibility.
- 1.2. There are positive and meaningful correlation between “information technology strength” and compatibility.
- 1.3. There are positive and meaningful correlation between “knowledge management” and compatibility.

3. RESEARCH METHODOLOGY

The study is in a society involving 67 people from chairmen of Iran National Carpet Center (INCC) and business room of Qom province in Iran. Whereas this number seems to be inadequate, the sampling was done through an integral counting method.

Current study can be considered as a descriptive survey if to view from data collection aspect and as an applied research if to investigate the goals of the study. To collect the data library method (to refer to books, articles, libraries, etc...) and fieldworks (questionnaire) was being used. For gathering data, 2 questionnaires were designed:

The first one was about statistical parts with 5 point likert scale and includes 13 questions which “R & D development strength” and “IT strength” had 3 and “knowledge management” had 6 ones (for utilizing χ^2 and average tests, this questionnaire applied).

The other one designed for fuzzy TOPSIS categorizing with the same 13 questions. It is important to mention 7 point likert scale was used for this questionnaire.

To analyze the data SPSS 17 χ^2 and Average tests and fuzzy TOPSIS technique were applied.

The management experts were being asked to evaluate the validity of questionnaire. For this mean, the questionnaire was given to some professors and experts in management, and after their modifications were being utilized and they confirmed it, the questionnaire was given to the participants.

To determine the questionnaires' reliability, the 'Cronbach's Alpha technique' was used. For this purpose, 30 people were chosen by random (from the participants) and the questionnaires were given to them. The 'Cronbach's Alpha' values for all variables were calculated in table 1:

Table 1: the results of reliability

Variables	Cronbach's Alpha
Questionnaire as a whole	0.79
Research and development (R & D) strength	0.82
Information technology (IT) strength	0.81
Knowledge management	0.74

These values support the reliability of questionnaire, because the calculated results for Cronbach's alpha are more than (0.7) (Nunnally and Bernstein, 1994).

3.1. Decision making process by fuzzy TOPSIS technique

Technique for order performance by similarity to ideal solution (TOPSIS), one of known classical MCDM method, was first developed by Hwang and Yoon (1981) for solving MCDM problems. TOPSIS is known as one of the most classical MCDM methods, which is based on the idea, that the selected alternative should have the shortest

distance from the positive ideal solution and on the other side the farthest distance of the negative ideal solution. The TOPSIS-method will be applied to a case study, which is described in detail. In classical MCDM methods, the ratings and the weights of the criteria are known precisely (Jahanshahloo et al, 2006),

Decision making process steps by fuzzy TOPSIS technique are shown below:

Step 1: calculating weights vector $w_{\sim j}$

$$\tilde{R} = \left[\tilde{r}_{ij} \right]_{m \times n} \quad (1)$$

Step 2: normalizing the calculated matrix

$B \subseteq \{1, \dots, n\}$ is related to benefit-based indices and $C \subseteq \{1, \dots, n\}$ is related to cost-based indices.

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{d_j^*}, \frac{b_{ij}}{d_j^*}, \frac{c_{ij}}{d_j^*}, \frac{d_{ij}}{d_j^*} \right), \quad j \in B \quad (2)$$

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{d_{ij}}, \frac{a_j^-}{c_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{a_{ij}} \right), \quad j \in C \quad (3)$$

Step 3: so normalized weighted matrix is calculated as formula 4:

$$\tilde{V} = \left[\tilde{v}_{ij} \right]_{m \times n}, \quad i = 1, 2, \dots, m, \quad j = 1, 2, \dots, n \quad \tilde{v}_{ij} = \tilde{r}_{ij} \otimes \tilde{w}_j \quad (4)$$

Step 4: determining the fuzzy positive ideal solution \tilde{v}_j^* (FPIS) and fuzzy negative ideal solution \tilde{v}_j^- (FNIS) (formulas 5, 6):

$$\tilde{v}_j^- = \begin{cases} \min_{i=1, \dots, m} \tilde{v}_{ij}; & j \in B \\ \max_{i=1, \dots, m} \tilde{v}_{ij}; & j \in C \end{cases} \quad \tilde{v}_j^* = \begin{cases} \max_{i=1, \dots, m} \tilde{v}_{ij}; & j \in B \\ \min_{i=1, \dots, m} \tilde{v}_{ij}; & j \in C \end{cases} \quad (5)$$

$$FNIS = \{ \tilde{v}_j^- \mid j = 1, \dots, n \} \quad FPIS = \{ \tilde{v}_j^* \mid j = 1, \dots, n \} \quad (6)$$

Step 5: calculating the alternatives from positive and negative ideal by applying formulas 8,9:

$$d_i^* = \sum_{j=1}^n d(\tilde{v}_{ij}, \tilde{v}_j^*), \quad i = 1, \dots, m \quad (7)$$

$$d_i^- = \sum_{j=1}^n d(\tilde{v}_{ij}, \tilde{v}_j^-), \quad i = 1, \dots, m \quad (8)$$

Step 6: Calculating the relative closeness to the ideal solution:

$$Cc_i = \frac{d_i^-}{d_i^- + d_i^+} \quad (9)$$

In real-word situation, because of incomplete or non-obtainable information, the data (attributes) are often not so deterministic, there for they usually are fuzzy /imprecise. So, we try to extend TOPSIS for fuzzy data to categorize the driving factors affecting on Iran carpet industry compatibility. Linguistic variables for the important weight of each criteria are shown in table 2:

Table 2: Linguistic variables for the importance weight (Chen, 2000)

Very Low	VL	(0, 0, 1, 2)
Low	L	(1, 2, 2, 3)
Medium Low	ML	(2, 3, 4, 5)
Medium	M	(4, 5, 5, 6)
Medium High	MH	(5, 6, 7, 8)
High	H	(7, 8, 8, 9)
Very High	VH	(8, 9, 10, 10)

4. DATA ANALYSING

4.1. χ^2 correlation test

Regarding the study of the effect creativity and innovation strength on Iran’s carpet industry compatibility, χ^2 test was used. Results are shown here:

Table 3. χ^2 result for hypotheses.

Hypotheses	R	sig	Result
Main hypothesis	9.616	0.000	Accepted
First secondary hypothesis (R & D strength)	8.483	0.000	Accepted
Second secondary hypothesis (IT strength)	9.719	0.000	Accepted
Third secondary hypothesis (knowledge management)	11.732	0.000	Accepted

Table 3 has shown there are positive and meaningful correlations between creativity and innovation strength and Iran’s carpet industry compatibility.

4.3. Average test

Table 4 shows the levels of creativity and innovation strength and its dimensions.

Table 4: levels of compatibility and its dimensions

Variables	Z _{0.05}	Z	result
Creativity and innovation strength	1.645	1.212	Rejected
R & D strength	1.645	0.814	Rejected
IT strength	1.645	1.229	Rejected
Knowledge management	1.645	1.407	Rejected

As the table above shows, “creativity and innovation strength” and its dimensions are placed in the unfavorable situations.

4.4. Ranking creativity and innovation strength

After distributing questionnaire among samples and gathering data, decision making matrix with fuzzy weights was calculated by utilizing formula 1. Table 5 shows the results of calculation.

Table 5: Decision making matrix and fuzzy weiths

variables	8	9	10	10	4	5	5	6	7	8	8	9
	R & D development				IT strength				Knowledge management			
P1	8	9	10	10	7	8	8	9	8	9	10	10
P2	2	3	4	5	4	5	5	6	8	9	10	10
P3	8	9	10	10	7	8	8	9	7	8	8	9
P4	4	5	5	6	8	9	10	10	1	2	2	3
P5	1	2	2	3	7	8	8	9	4	5	5	6
P6	1	2	2	3	8	9	10	10	5	6	7	8
P7	8	9	10	10	4	5	5	6	7	8	8	9
P8	4	5	5	6	2	3	4	5	8	9	10	10
P9	5	6	7	8	5	6	7	8	8	9	10	10
P10	2	3	4	5	1	2	2	3	8	9	10	10
P11	0	1	1	2	2	3	4	5	8	9	10	10
P12	1	2	2	3	1	2	2	3	8	9	10	10

As table 6 shows, the samples selected “R & D development” as the most important criteria of creativity and innovation strength (Very High).

Also fuzzy weighted normalized matrix was calculated by applying formulas 2, 3 and 4.

It is necessary to mention because of extra volume of calculation, weighted normalized matrix was ignored.

Table 6: Fuzzy weighted normalized matrix

variables	R & D development				IT strength				Knowledge management			
P1	0.64	0.81	1	1	0.28	0.4	0.4	0.54	0.56	0.72	0.8	0.9
P2	0.16	0.27	0.4	0.5	0.16	0.25	0.25	0.36	0.56	0.72	0.8	0.9
P3	0.64	0.81	1	1	0.28	0.4	0.4	0.54	0.49	0.64	0.64	0.81
P4	0.32	0.45	0.5	0.6	0.32	0.45	0.5	0.6	0.07	0.16	0.16	0.27
P5	0.08	0.18	0.2	0.3	0.28	0.4	0.4	0.54	0.28	0.4	0.4	0.54
P6	0.08	0.18	0.2	0.3	0.32	0.45	0.5	0.6	0.35	0.48	0.56	0.72
P7	0.64	0.81	1	1	0.16	0.25	0.25	0.36	0.49	0.64	0.64	0.81
P8	0.32	0.45	0.5	0.6	0.08	0.15	0.2	0.3	0.56	0.72	0.8	0.9
P9	0.4	0.54	0.7	0.8	0.2	0.3	0.35	0.48	0.56	0.72	0.8	0.9
P10	0.16	0.27	0.4	0.5	0.04	0.1	0.1	0.18	0.56	0.72	0.8	0.9
P11	0	0.09	0.1	0.2	0.08	0.15	0.2	0.3	0.56	0.72	0.8	0.9
P12	0.08	0.18	0.2	0.3	0.04	0.1	0.1	0.18	0.56	0.72	0.8	0.9

And finally by applying formulas 7, 8 and 9, fuzzy positive ideal solution, negative ideal solution and the relative closeness to the ideal solution were determined which are shown in table 7:

Table 7: fuzzy positive ideal solution, negative ideal solution and the relative closeness to the ideal solution

Variables	D_i^+	D_i^-	Cc_i	Final rank
R & D	1.089336272	2.046102721	0.652572965	1
New product development	1.711887867	1.376530039	0.445707181	6
Information acquisition	1.178236871	1.945654615	0.62283041	2
Planning	1.921931622	1.136086901	0.371510798	9
Culture	2.017916178	1.036088772	0.339255761	12
Equipment	1.846867359	1.227943972	0.399355876	7
Knowledge creation	1.324522026	1.794993027	0.575407715	3
Knowledge acquisition	1.6471057	1.432877844	0.465222565	5
Organizational learning	1.377607121	1.731577934	0.556923407	4
Knowledge sharing	1.859904598	1.228049934	0.39769042	8
Knowledge storage	2.01041788	1.075145526	0.348443829	11
Knowledge utilization	1.993863555	1.07693039	0.350700962	10

As table 7 shows, “R & D”, “Information acquisition from markets” and “knowledge creation” were chosen the top sub criteria of creativity and innovation strength. Also “culture”, “knowledge storage” and “knowledge utilization” were selected as the least important indices.

5. Conclusion and suggestion

The current paper with purpose of surveying the role of creativity and innovation strength on Iran’s carpet industry compatibility was accomplished in a society includes 67 people from chairmen of Qom province business room and Iran National Carpet Center (INCC). The results of utilizing χ^2 test showed that there is positive and meaningful relationship between creativity and innovation strength with Iran’s carpet industry compatibility. Also the Average test showed that creativity and innovation strength and all its dimensions were placed in unfavorable situations.

Finally by applying fuzzy TOPSIS technique, the indices were ranked in which “R & D”, “Information acquisition from markets” and “knowledge creation” were the most important indices of creativity and innovation strength.

By accepting hypotheses and proving the positive relationship between creativity and innovation strength and Iran’s carpet industry compatibility, we can claim that “creating customers databases to identify their needs and desires and then producing in base of them”, “developing marketing researches and creating research centers for innovation in producing and marketing” and “making exporters more familiar with new techniques of international

business, internet marketing and e-commerce” are the most important strategies to enhance carpet industry market share and increase its compatibility.

As present paper is trying to analyze the ideal situation of carpet industry – not current situation-, and “R & D development” was placed at the first rank, “increasing marketing activities, advertising and internet marketing to compete with internet exporters”, “emphasis on quality, sustainability and beauty of Iranian carpets in global markets to highlight rivals weaknesses” and “produce in terms of international customers needs and desires” are some suggestions to increase market share.

“Information acquisition from markets” was placed in second place which explained high importance of utilizing IT in marketing. Applying information technology and internet in related to goods, price, promotion and distribution and from the other side, in related to customers-oriented activities, distribution channels and suppliers can solve lots of the industry’s problems. “Creating customers’ databases to identify goal customers all over the world” is another strategy to develop competitive strength. As lack of business information networks and unfamiliar exporters with e-commerce are parts of most important problems of carpet industry compatibility (Haghshenas and Saeedi, 2011), so we can claim that “making exporters more familiar with new marketing techniques like e-commerce, internet marketing and international business” is an affective suggestion for increasing compatibility.

By placing “knowledge creation” in third place, we are able to say this dimension of knowledge management can improve carpet industry compatibility. Utilizing “knowledge, experience and skilled carpet makers”, “expertise of educated young people” and “applying high-quality materials in producing process”, would lead to developing several dimension of carpet competitiveness like quality, standard, beauty and sustainability. From other side, increasing knowledge for improving marketing activities, advertising and internet marketing will be affected on present markets development and penetrate in new markets.

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