

# Priorities of Industrial Development of West Azerbaijan Techniques Using Fuzzy Topsis<sup>1</sup>

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## ABSTRACT

Today, one of the main indicators for measuring national development, development of different sectors of the economic aspects of national, regional and international levels. So the decision was made to conduct this research in order to identify the capabilities and functions of manufacturing and commercial industries, The way to select the right investment and industrial development in Western Azerbaijan province paved. In this study population, different parts of West Azerbaijan industry is, In the fourth period of the years 2009, 2010, 2011, 2012 has been considered and evaluated. To set goals and priorities of industrial development of the industry, the industrial and economic experts (Delphi method) was used. This study aims at identifying the industrial development and industrial sectors of the technique (Fuzzy Topsis) West Azerbaijan industrial development priorities are identified and ranked. According to the study, the group of food industry, medicine and health, with the largest weight (0.6960), the paper products industry (0.6101), Department of Textile Industries (0.5978), West Azerbaijan development priorities are, The priority objectives of the industry including increasing income, increasing employment and establishment of new industries, which are the first and third priorities. Overall, the results suggest that it is The West Azerbaijan Province of good potential for its proper role within the regional planning And national industrial development in order to achieve the objectives of Vision is a country.

**KEYWORDS:** industrial development, fuzzy TOPSIS, development.

## INTRODUCTION

Policy makers and economic agents trying to find a solution to mitigate these limitations have been through optimal allocation of resources. One of the main criteria for assessing national development, industrial development, economic aspects of national, regional and international levels. Dynamics, power and reliability of the financial sector, the engine of development in other sectors of the economy and the stimulus undeniable factors in the development of social, scientific, cultural and even political (Razavi and gahramanpoor, 2011). Today, the economic basis for the development of industrial production and permeability products in foreign markets and has built a large part of the global trade in industrial products and to form. Countries that have been successful in achieving high levels of economic develop they have often been in the country for decades before its industrial development plan planning and capital investment in the sector has encouraged and essential have extended. In other words, these countries besides the advantages have known her, to the benefit of industrial products in the areas of many and easily successful in gaining share in the market for Its – Say (Erensal et al., 2006).

Development Planning and Policy industrial investment in the process of economic development of the country has been one of the objectives. The purpose of this policy is applied to the Seeking also now has support for more than a century, starting the process over half a century of industrialization and planned development in the country going, not only not been achieved unfavorable performance of the department to conduct a new round of planning and program industrial strategy has provided the Iranian economy. Evaluate the performance of various sectors in the Iran shows that the structure of the departments and related mechanisms could provide favorable conditions for the development of Although the structure of the industry should not ignore the effect of macroeconomic conditions in the country Which over time evolved into the current (Hussain, 2011).

One of the requirements of national and regional economic planning of the production capabilities of different industrial sectors. Therefore, key industries and a leading position in this industry to guide investments toward different areas of special importance is the optimal allocation of resources. Guidance of investment and private sector investment in industrial activities according to each province's economic structure, Require a study to determine the ability of each state and each state specialize in one or more specific activities. Therefore, the change in industrial production and to achieve desired development in this area, Being dependent on the industry, the status of each of the factors influencing the performance of each of these factors to determine strategies for industrial development, Studying and understanding the needs of the industry and it is essential to analyze the structure of the industry has been And its strengths and weaknesses are revealed and explained the priorities of industry, the focus of public and private investment activities should The most efficient and leads to higher value added and finally the limited financial resources, the capacity to increase export potential (Beheshti & et al., 2009).

In the industrial development process After determining the scope of industrial development, the essential question is how to realize the desired image, the optimal direction of the status quo of how it should be, which sets policy decisions - investment and institution-building in the economy. local, or national or sector level, in coordination with the possible future evolution of the global economy, industrial development goals and makes common environment requirements of the region's economic, social

1- This paper is based on research from the University is Maku

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and political development as the underlying successful industrial What and how should it be created? The important thing the action itself does not form a complex, it requires an effective role in policy makers and officials in the region. Explain the role and responsibilities of the policy investors and regional authorities in the development of the industry as one of the controversial issues of recent literature in the area can (Rahimzadeh Oskooi, 1995).

Experience has shown that the rapid growth of the industry, an important tool to achieve living standards, income and employment is increasing and changing social and economic conditions but primarily through the development of rapid industry, agriculture, and the of not. Industrial development with a focus on developing regional competitiveness, should be developed in consultation with industry representatives so that industrial policy should be based on the attitude or the outcome of short-term political interests of particular groups formed (Batra & Zeba Khan, 2005).

West Azerbaijan province and one of the zones with abundant natural resources and commercial and industrial centers can be considered as one of the centers of sense to export and export industry to become one of the platforms. As can be seen, but due to some factors, such as the State has failed to appear and be heard. Issues such as lack of investment, poor management skills and lack of motivation by Industry Leaders And issues such as economic instability caused by industrial development and industries have not been able to play its role in the development of the province. So if we accept that the main factors in the growth and development of the industry in each country and region is taken into account, Then, with appropriate policy framework to eliminate the barriers to progress in the industry, we will be able to achieve this important. Therefore, this study is inadequate understanding of the industry and develop solutions and its relationship with other existing mechanisms for dealing with the problem.

### Background Research

Kamal addin Rahmani and S. Mamly In 2009 a research on the comparative advantage of the food industry in North West of Iran in East Azerbaijan (based on indirect commercial advantage and SCS) to evaluate the relative advantage of the food industry in the North West Iran The main branches of industry deals. is classified. In the first clustering using factor analysis, and then the final prioritization using Subcategory numerical taxonomy and status of comparative advantage in the industry is presented. not be short term.

In other research Benedictis in a study titled "Three decades of Italian comparative advantages" of Italy focusing on the structure of revealed comparative advantage and export structure has changed and its stability over time. In this regard, the actual statistical tools and techniques used to estimate the empirical distribution of the Balassa Parametric mobility and routing for three decades (since 1970) have developed efficient and is used. The researchers also sought to examine the issue of how industrial country such as Italy, traditional and labor-intensive goods exported to? This is the view of the three theories, the Avhlyn Hykshr factors, the degree of dynamism of the economy and improving the quality of Marshall's theory of vertical difference is. Achieved using the index of comparative advantage revealed high relative advantages appear symmetric for Italian manufacturer based codes, the four-digit SITC in 1989 and 1998, to study the stability and the degree RCA estimated industries in Italy during the period under study. Finally, the comparison with OECD countries and has a newly industrialized country (Benedictis, 2005).

Advantage, providing fertile ground for the development of the industrial North West of Iran. Documentary research population consisted of all industrial workshops with ten or more employees in the North West of Iran, Kerman ISIC four-digit codes (Third Edition), based on statistical years 1998, 1999 and 2002 is as. Analysis tools, integration of the Numerical Taxonomy and factor analysis. The results show that the structure of the industry in the North West of Iran, although the type of industrial activity variation was observed, but changes in the levels of priority, the priority given relatively stable industries, such that certain agricultural and industrial products industries associated with the mining and processing of mineral products are ranked higher than other industries have.

### Research Questions

Considering that the aim of the research is to prioritize the development of the industrial sector, the questions were designed: Fuzzy Topsis sector development priorities of the techniques which are a part of the industry?

## MATERIALS AND METHODS

In this study population, different sectors of the industry is in West Azerbaijan. It is noted that the current level of more than 2677 industrial units in various industry sectors (industrial machinery and equipment, textile, leather, food, medicine and health, etc.) are active. According to information obtained Individuals who have expert information relevant to the criteria And for the allocation of work and preferably involves activities associated with it are, About 74,514 thousand people in different parts of the industry are The period of 4 years, 2009, 2010, 2011, 2012 has been considered and evaluated. To set goals and priorities of industrial development of the industry, the industrial and economic experts (Delphi method) was used. Population of approximately 382 people above the standard table Morgan and farmers were selected as samples. If individuals choose to deliberately self-questioning, were stratified quota. How to choose the way in which the objectives of the project and must also be quantitative or qualitative criteria to be classified, Then fit the criteria of being in each class, a good portion of those polled were allocated to them. The data analysis was conducted using the Fuzzy Topsis techniques.

### - What are appropriate criteria and indicators for evaluating the various sectors of the industry?

In order to answer the research questions, data collection tools, including questionnaires are as follows:

Using the Delphi method and indices measure the importance and influence of experts prepared A questionnaire was developed and used. The questionnaire was designed based on the theoretical framework and research experts and included 15 questions affecting the development of standards in the industry Respondents their opinion about the importance of each indicator as well as the current status of the companies they represent. Likert response option 7 is based.

According to the indicators used in the questionnaire were selected based on previous research, it has content validity. To evaluate the construct validity of the exploratory factor analysis was used. According to Table (1) more than 0/7 KMO significance level for 0/0001, indicating the adequacy of the sampling This analysis indicates that the data would be useful. All indicator factor loadings greater than 0/5, and thus none of the parameters were calculated from the questionnaire were excluded.

**Table 1: KMO and Bartlett's Test measures the questionnaire.**

|        |                 |                      |
|--------|-----------------|----------------------|
| 0/803  | <b>KMO</b>      |                      |
| 1/512  | <b>The test</b> | <b>Bartlett test</b> |
| 0/0001 | <b>Sig.</b>     |                      |

**- Selection Criteria**

Priority ranking criteria by the Delphi method with the highest grade of selected criteria Friedman test is as follows.

**Table 1: Friedman test**

| Criteria               | Mean Rank |
|------------------------|-----------|
| Efficiency             | 11.33     |
| Currency outgo         | 5.10      |
| Employment             | 12.08     |
| New industry           | 12.10     |
| Social welfare         | 5.05      |
| Industrial structure   | 12.20     |
| Profitability          | 7.65      |
| Export                 | 12.28     |
| Natural resources      | 9.13      |
| Investment             | 6.23      |
| Design and development | 9.78      |
| Added value            | 11.18     |
| Environmental          | 5.03      |
| Revenue                | 12.78     |
| Development industries | 6.45      |
| Political and social   | 4.65      |
| Raw material           | 10.03     |

The following table, the number of given by each variable, the chi-square statistic ( $\chi^2$ ), and sig degrees of freedom is presented. According to the table, because the sig is less than 5%, reject and reject experts are assumed to be identical.

| Test Statistics <sup>a</sup> |         |
|------------------------------|---------|
| <b>N</b>                     | 30      |
| <b>Chi-Square</b>            | 131.974 |
| <b>df</b>                    | 16      |
| <b>Asymp. Sig.</b>           | .000    |
| <b>a. Friedman Test</b>      |         |

**- Selection criteria (objectives sectors of industry, North West of Iran)**

1- Increase Revenue 2- Increase exports 3- Improve the industrial structure 4- New industries by laying 5- Increase occupation 6- Increase efficiency 7- Increase value added 8- Access to raw materials 9- Development and adoption of design possibilities

**- Options (Department of Industry)**

1- Food and drink Industry 2- Leather and Tanning Industries 3- Paper products industry 4- Industrial chemical products 5- Basic metal industries 6- Nonmetallic Mineral Products Industry 7- Industrial machinery, generators, and electric power transmission 8- Wood and Furniture Industry 9- Tobacco industry 10- Industrial machinery and equipment 11- Textile Industry 12- Industrial motor vehicle, trailer 13- Optical instruments and medical devices industries 14- Recycling Industry 15- Rubber and plastic industry

- In order to rank the factors affecting the development of each of the nine industry sectors And various segments of the industry, using Fuzzy TOPSIS verbal expressions and their corresponding fuzzy numbers according to Table (3) is used:

**Table 3: verbal expressions and corresponding fuzzy numbers**

| Fuzzy numbers  | Verbal expressions | Likert scale |
|----------------|--------------------|--------------|
| (0, 0/5, 1/5)  | Very little        | 1            |
| (1, 2, 3)      | little             | 2            |
| (2, 3/5, 5)    | Modest             | 3            |
| (3, 5, 7)      | Average            | 4            |
| (5, 6/5, 8)    | Large-scale        | 5            |
| (7, 8, 9)      | High               | 6            |
| (8/5, 9/5, 10) | Very much          | 7            |

- Ranking of the most important factors that influence the development of industry and different sectors of Industry using Fuzzy TOPSIS

In this section the importance of performance (status) of each of the indicators, Most important criteria in each of the nine provinces and 15 industries The importance of the above factors and the industries in which we have a rating. Fuzzy TOPSIS method is used to determine their priorities.

Fuzzy TOPSIS successive steps in brief are as follows: Chen, 2000; Chu, 2002; Chu & Lin, 2003; Lin, Chiu & Tseng, 2006; Yang & Li, 2002)

- Calculate the mean importance and benefits of options:

$$w_j = \frac{1}{k} [w_j^1(+) w_j^2(+) \dots (+) w_j^k] \quad x_{ij} = \frac{1}{k} [x_{ij}^1(+) x_{ij}^2(+) \dots (+) x_{ij}^k]$$

- Normalized fuzzy decision matrix:  $\tilde{R} = [r_{ij}]_{m \times n}$

- Weighted matrix:  $\tilde{V} = [r_{ij}]_{m \times n}$

- The positive and negative ideal alternatives and calculating the distance from the ideal positive and negative:

$$A^+ = [v_1^*, v_2^*, \dots, v_n^*] \quad A^- = [v_1^-, v_2^-, \dots, v_n^-]$$

$$v_j^* = (1,1,1) \quad v_j^- = (0,0,0)$$

$$d_i^* = \sum_{j=1}^n d(v_{ij} - v_j^*) \quad i = 1,2,\dots, m \quad d_i^- = \sum_{j=1}^n d(v_{ij} - v_j^-) \quad i = 1,2,\dots, m$$

- Calculation of proximity and sorting options based on larger amounts CCi:

$$CC_i = \frac{d_i^-}{d_i^* + d_i^-} \quad i = 1,2,\dots, m$$

The results of the ranking of each factor (effective index) and industries fuzzy TOPSIS technique as specified in Tables 4,5 and 6 are:

**Table 4: Ranking of criteria using fuzzy TOPSIS algorithm**

|  | $d_i^+$ | $d_i^-$ | $cc_i$ | Priority |
|--|---------|---------|--------|----------|
| Increase Revenue                                 | 0/6713  | 0/2166  | 0.7642 | 1        |
| Increase occupation                              | 0/1767  | 0/1589  | 0.4734 | 2        |
| Access to raw materials                          | 0/1521  | 0/1062  | 0.4117 | 3        |
| New industries by laying                         | 0/1497  | 0/1029  | 0.4076 | 4        |
| Increase exports                                 | 0/1493  | 0/1023  | 0.4065 | 5        |
| Improve the industrial structure                 | 0/1656  | 0/0897  | 0.3514 | 6        |
| Increase value added                             | 0/1682  | 0/0869  | 0.3412 | 7        |
| Increase efficiency                              | 0/1651  | 0/0849  | 0.3377 | 8        |
| Development and adoption of design possibilities | 0/1724  | 0/0764  | 0.3071 | 9        |

**Table 5: Matrix Scale different parts industry algorithms using fuzzy TOPSIS**

|   | Increase Revenue | Increase exports | Improve the industrial structure | New industries by laying | Increase occupation | Increase efficiency | Increase value added | Access to raw materials | Development and adoption of design possibilities |
|---|------------------|------------------|----------------------------------|--------------------------|---------------------|---------------------|----------------------|-------------------------|--|
| Basic metal industries  | 0/5189           | 0/4148           | 0/4164                           | 0/5175                   | 0/215               | 0/2319              | 0/4441               | 0/2442                  | 0/3259   |
| Tobacco industry  | 0/4141           | 0/5135           | 0/3174                           | 0/5152                   | 0/4286              | 0/4146              | 0/1812               | 0/5621                  | 0/2579   |
| Industrial machinery, generators, and electric power transmission | 0/5175           | 0/4178           | 0/4140                           | 0/4152                   | 0/5148              | 0/4544              | 0/3073               | 0/3187                  | 0/2498   |
| Food and drink Industry   | 0/4173           | 0/3184           | 0/4216                           | 0/5168                   | 0/3166              | 0/2455              | 0/1093               | 0/2159                  | 0/4473   |
| Industrial motor vehicle, trailer                                 | 0/4140           | 0/4162           | 0/5178                           | 0/4162                   | 0/4050              | 0/5140              | 0/2252               | 0/1098                  | 0/1580   |
| Optical instruments and medical devices industries                | 0/4179           | 0/4140           | 0/41982                          | 0/3152                   | 0/2148              | 0/1169              | 0/3343               | 0/3076                  | 0/4356   |
| Textile Industry  | 0/4162           | 0/5163           | 0/4142                           | 0/4132                   | 0/4473              | 0/4273              | 0/1858               | 0/1546                  | 0/5589   |
| Paper products industry   | 0/1043           | 0/1288           | 0/2032                           | 0/1081                   | 0/2358              | 0/4458              | 0/4265               | 0/3965                  | 0/2248   |
| Industrial chemical products                                      | 0/3096           | 0/2349           | 0/2138                           | 0/2389                   | 0/0169              | 0/1269              | 0/4136               | 0/1126                  | 0/4191   |
| Wood and Furniture Industry                                       | 0/1471           | 0/2283           | 0/2011                           | 0/3096                   | 0/1421              | 0/3050              | 0/2446               | 0/3182                  | 0/1486   |
| Nonmetallic Mineral Products Industry                             | 0/4041           | 0/0532           | 0/4572                           | 0/2167                   | 0/1755              | 0/4263              | 0/1251               | 0/1476                  | 0/4053   |
| Leather and Tanning Industries                                    | 0/1513           | 0/1510           | 0/2031                           | 0/2228                   | 0/1677              | 0/3239              | 0/1240               | 0/2215                  | 0/2436   |
| Recycling Industry  | 0/2214           | 0/3119           | 0/4244                           | 0/3242                   | 0/4150              | 0/1019              | 0/1141               | 0/2242                  | 0/2459   |
| Industrial machinery and equipment                                | 0/3321           | 0/3114           | 0/3537                           | 0/3440                   | 0/2086              | 0/2346              | 0/4180               | 0/2314                  | 0/4079   |
| Rubber and plastic industry                                       | 0/1443           | 0/2088           | 0/4138                           | 0/2281                   | 0/3148              | 0/4144              | 0/2173               | 0/1287                  | 0/1098   |

Thus, the  $CC_i$  values, the options can be ranked as follows Table (6) do:

**Table 6: Final ranking of industries**

| Industry  | $d_i^+$ | $d_i^-$ | $CC_i$ | Priority |
|---|---------|---------|--------|----------|
| Food and drink Industry   | 0.0586  | 0.0434  | 0.6960 | 1        |
| Paper products industry   | 0.0351  | 0.0475  | 0.6101 | 2        |
| Textile Industry  | 0.0325  | 0.0423  | 0.5978 | 3        |
| Wood and Furniture Industry                                       | 0.0322  | 0.0487  | 0.5658 | 4        |
| Leather and Tanning Industries                                    | 0.0293  | 0.0365  | 0.5453 | 5        |
| Tobacco industry  | 0.0292  | 0.0372  | 0.5448 | 6        |
| Industrial chemical products                                      | 0.0241  | 0.0310  | 0.5365 | 7        |
| Rubber and plastic industry                                       | 0.0270  | 0.0261  | 0.4890 | 8        |
| Nonmetallic Mineral Products Industry                             | 0.0293  | 0.0254  | 0.4689 | 9        |
| Basic metal industries  | 0.0284  | 0.0227  | 0.4559 | 10       |
| Industrial machinery and equipment                                | 0.0278  | 0.0214  | 0.4475 | 11       |
| Industrial machinery, generators, and electric power transmission | 0.0237  | 0.0130  | 0.4308 | 12       |
| Optical instruments and medical devices industries                | 0.0218  | 0.0130  | 0.4178 | 13       |
| Industrial motor vehicle, trailer                                 | 0.0216  | 0.0120  | 0.4109 | 14       |
| Recycling Industry  | 0.0210  | 0.0102  | 0.3327 | 15       |

### RESULTS AND DISCUSSIONS

Although it is possible to determine the ranking of the activities and priorities of industry, of which the first priority is to have an objective view of the rankings, there is not, This paper has been enjoying a bit of fuzzy logic and linguistic variables of intuitive judgments, providing the basis for prioritizing the development of the industrial sector. Interpretation of qualitative variables, and intuitive judgments into quantitative variables among the biggest problems is the Human Sciences Research, The present study was an attempt to be accurate quantification using mathematical models. Due to the properties of fuzzy logic and its capabilities, can be best qualitative variables into quantitative variables with minimum error to convert. The conclusions of these variables is closer to reality and has high accuracy. As mentioned in the research after the 9 variables and measures opinions of experts on the development of the industrial sector (rising incomes, increasing exports, improving the industrial structure, foundation laying of new industries, increase employment, increase efficiency, increase value-added access to raw materials, the development and adoption of design features) were identified. After consideration of the various industries (15 industries) from different geographical areas were chosen, the basis of the analyzes that were performed following results are presented:

The findings show that the main research question, four groups of industry priority weights that are too close together, Industry groups, including the food, pharmaceutical and healthcare with the highest weight (0.6960), the paper products industry (0.6101), Department of Textile Industries (0.5978), Department of Wood and Furniture (0.5658), four groups of industries can be this expert group on development priorities are in the leather tanning industry, tobacco industry, industrial chemical products, rubber and plastic industries, non-metallic mineral products, basic metal industries, machinery and equipment, industrial machinery, generators, and electrical power transmission, medical instruments industries and optical instrument industries, motor vehicle, trailer and recycling industries ranked have been next. Prioritize the different objectives in the industrial sector shows the greatest weight in the revenue obtained from the questionnaires (0.7642) is the first priority, And as an important criterion in the selection of more importance to the development of the industry, is considered. r important goals and standards of industry sectors including; Increase occupation with weight 0.4734, Access to raw materials by weight 0.4117, And to establish new industries have a weight of 0.4076, which is the next priority. Increase exports, improve the industrial structure, enhance value, improve efficiency, growth and adaptation of design features, the rankings are next.

This study was to investigate and identify the priorities of industrial development of the province to be, Considering the results of it, that there is good potential for industrial development in West Azerbaijan province following recommendations can be made:

- Considering that most industries and major industrial sites in and around the provincial capital city of Urmia, has been focused, With regard to the other cities of West Azerbaijan province of high potential and competitive advantages in the industry have, Therefore, planning authorities and by attracting foreign and domestic investment and attract significant advantage in facilitating grant activities and studios industries in other province be.
- Based on available information, the percentage of employment in this sector is more favorable compared to other neighboring provinces located on the surface, Therefore, despite the upstream and downstream industries producing raw materials needed by industry in the province and around the city of Urmia, It is necessary to invest in industrial activities has a comparative advantage, With occupation, Reduce unemployment and increase income And prosperity for the people of the potential complementary role to play in the production and export of manufactured goods used in the model.
- Given that Azerbaijan is the Western Frontier Province and the existence of a free trade area in industrial and Maku And there are several customs, the customs sero, Tamrchyn and ..., Consideration, there are a large business that specializes industries with comparative advantage, It is necessary to study border and regional marketing and the proper way to earn more foreign exchange to the country's provinces.

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