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Application of Fuzzy Decision-making Algorithms to Analyze Indicators of Industry: Quantitative Approach in Fuzzy Space

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ABSTRACT

Governments always Have been looking for appropriate ways to increase Orderly and sustainable development of the industry through investments so that the efficiency and profitability of production may increase and lowest risk amount in investments. The purpose of This analyzes study Selected industrial projects criteria. The study sample are managers, professionals and industry experts And tools used questionnaire The 50 questionnaires distributed among professionals. And finally 21 questionnaires were collected. To answer Research questions and analysis of information DEMATEL were used in fuzzy space.

According to the criteria analysis and Using the technique of Fuzzy DEMATEL, The results indicate that the role of land and buildings, Market values and entry into international markets, Economic risk, Economy, government restrictions, Attitude, people, infrastructure, political risk, Legal laws and government regulations in Priority line of of industrial projects the Utmost importance. Results Can be used for investment companies, Industry executives, industry analysts, banks and bankers and Industry researchers.

Keywords: Priority Industry indicators, Fuzzy DEMATEL, Models of decision making, MADM Fuzzy.

1. IMPORTANCE AND REASONS FOR CHOOSING THE TOPIC

The importance of research And increase of research activities is that the development and Progress, True self-sufficiency and independence In each country depend to it (Sabzevari et. al, 2000; Ebrahimzadeh et. al 2016 (Development of each society Thanks to research (Abedini et. al., 2016).

Increase of the quality and quantity production happens When that industry is chosen With regard to its own capacity and competitive advantage, and investment in it is the optimal decision. In summary, can be Said in today's world, economic growth and development Depends on investment in industries with Competitiveness Positions (Competitive advantage) in Global goods and services Production. Underdevelopment Countries Mainly need the resources and optimal allocation of The resources to stimulate economic growth, they face with limitation to invest in industrial projects. Therefore, the priority industries and The basic and productive sectors must be Identified and optimal allocation of the Limited resources will be made. Due to lack of Investment resources, investment priorities must be identify Properly And by guiding resource to The most productive and most efficient sectors, Regarding the optimal use of limited resources investment be provided in order to accelerate economic growth (Piety and Mohammadi, 2009) Pay more attention to industries that Greater priority for investment are, While benefiting from economies of Of scale, can be addressed local needs. And the presence of competition In global markets is also provided. (Hoshmand and Azeri, 2005; Tamasoki Bidgoli et. al., (2012)The aim of this study, Analyze and explain priorities to indices industry. In this study, we identify and analyze the components In the field of industrial countries and Indicators have been evaluated too. The study included two main phases. In the first phase of the research, Spss tools were used to identify statistical indicators And most important sub-criteria, in the second phase Mathematical tools and Multiple Attribute Decision Making named MADM Fuzzy, which is a soft model technique was used to analyze causal relationships. In addition, Experts provides the use of phased approach in the Priorities process that better reflect human thought and opinion, it seems to Resulted in a more scientific, more realistic and be more reliable.

2. LITERATURE REVIEW

The project is a temporary endeavor To produce a unique product, service or result. (Project Management Body of Knowledge, USA, 2008) projects are said to be the industrial and manufacturing Which entails spending a lot of time and resources to set up and run.

Investment is one of Factors affecting growth and Economic development, therefore, due to the growth And the expansion of investment in private sector It depends on factors such as inflation. (Pajooyan and Khosravi, 2012). Many countries Have designed mechanisms To encourage investment and control the manufacturing sector (Vlynzhad and Barforoosh, 2016; Doorman & Botterud, 2008).

Glygyr and Holcomb (2012) Today fierce competition, that all businesses And manufacturing services are facing, is arised from the Technological changes and innovations to come And changes in demand in the market Customers. This situation causes a change in Business priorities, strategic vision and questioned traditional and in some cases Even new business models and The way companies has been managed. (Shariati Rad, 2016(

The index shows What a volume is done in industrial activities Through export (Nili, 2003, 47(. Market breadth indicators of sales per industry is The output value of the same industry which in any activity Represents the sold productions. (Negahdari and Ibrahimi, 2010 (In the turbulent and changing of today world, The only thing that does not change is change itself. In a increasingly business world which overshadowed by three words, Competition, Customer and change, companies are In search of a solution to Their business problems (Zndhsamy et. al., 2009(. In recent years, As Iran's economy has been raised,

high inflation rate is became an important problem. (Soheili et. al., 2012 (Several measures been taken In taxation to steer And motivate the economy including the Measures include exemptions Agriculture tax exemption for ten years Companies and factories located in Disadvantaged areas and so on. (Amini, 2008 (There are many state laws and will not run In different regions of the same state. For example, in areas where accumulation There may be various industries Due to pollution, limiting rules But in other areas due to unemployment and Other problems exemption The tax. (Majidian, 2014, p. 101(One way of funding Is allocating funds and bank facilities (Barzan et. al., 2011). Moghimi and colleagues (2013) Chemical industry companies listed on the Tehran Stock Exchange Securities ranked based on financial ratios. Tansl and colleagues (2010) By Macroeconomic variables and the proportion of industry and economy, Financial and industry rankings is discussed In Turkey. Gharib et. al (2014), are Rankings companies based on financial indicators. Mehran and colleagues (2004) variables sale, Net profit, return on equity Raised as financial variables. No matter how much of an industrial activity, Allocating more output data To be carried out efficiently and they produce the minimum output of The raw materials. (Hashemian, 1999, 132; Indigo, 2003, 42(Review changes in technology, Represents a growing share of companies with advanced IT in the global economy. (Mortaza Nia et. al., 2012 (.

Changes in the value-added Industrial activities. industrial-economic policies are Important indicators for understanding The structure of industries. (Dronprvr et. al., 2012) Due to the high cost of capital and The low cost of labor, this index is Reverse used. Low rates The figure represents less capital intensive Industrial activities and having a higher priority for New investments (Hashemian, 2000: 236(The use of Profitability ratios determine the Success of business in profitabl organizations (exchange, 1390; Strange et. al., 2014 (.

Harmful Wastewater disposal substances and hazardous effluent from factories And manufacturing industries, are an important issues in today's world. (Eloquent, 2014; Nasrollahi and ready to forgive Gulcan, 2010). Social Development Can in turn have a huge impact In furtherance of the objectives of development projects and development Stable or even increase profitability of The economic plans. (Muslim, et. al., 2006, p. 1; Kazemi and Adib, 2014(Social effects of the projects are More important than environmental impacts And are much more difficult(Goldwyn & Switzer, 2004). Projects In addition to the Technical and environmental risks, also face with The social risks that sometimes the fate of the project And achieve the desired goal (Talebian and Omrani Majd, 2008). In fact, the same management and Engineering and economic factors should be done with Environmental and industry sector, Social factors associated with the Development project to be managed So that the economic and industrial development and The realization of social development Achieved in the local community. (Talebian and Omrani Majd, 2008.(Technology must be compatible with society And the local culture (Majidian, 2014, p. 101. (

At present, human resources Knowledge is the most important Ability of the organization to gain competitive advantage, And is considered the most important intangible assets. (Ellinger & Yang, 2005; 2009, Michie; and Haji Karim Rahimi, 2011; Guest, 2011 Darby and Mark (2012) Due to determine the location for making sugar factory based on Cellulosic ethanol plant's location. In this study, plants according to Economic performance and the cost of transportation Were compared with each other. (Abazari and Hosseini ones, 2014) Developing countries like Iran are Need to invest in infrastructure Sectors to development (Kumaraswamy, et. al, 2001; Ebrahimnejad, 2010; attuned et. al., 2010) Industrial agglomeration and regional distribution are balanced employment And production. (Abasinejad and Abdel, 2007).

Javier et. al. (2009) analysis and prioritization The factors affecting Industrial investments in Spain with a special focus on state policy. Ang (2009), on research, Has examined investment priorities in The private sector due to policy Financial sector in India and Malaysia. Kumar et. al. (2007) In a study to identify inputs and outputs Has used Six Sigma projects, from analysis DEA to choose the best Six Sigma project. Pvtamvnt and Rakvngam: In 2007, To select strategic research projects In the public sector, the study projects was done in Thailand Ministry Building of Defence. The ultimate goal of this research is to identify Effective measures in the proposed framework for Thailand. (Modest, et. al., 2014)

3. METHODOLOGY RESEARCH

The aim of the present study is Applied and in the nature and Data collection method is descriptive-analytic. In this study quantity Methodology is used. History and literature of the study were developed through Library resources and archives, Internet, Articles and interviews with a number of experts. The questionnaire Built as a method of collecting data Been used. In this scheme after study of This literature important indicators were identified with statistical Spss tools And Then on the next steps for analyzing relationships using mathematical algorithms Model to decide MADM Fuzzy attribute called indicators, Were evaluated. According to the study, The study population includ All experts in the industry. In this study, Because of the complexity of Theoretical matrix designed models Eight person were selected for comment. Samples examined in this study formed the sample sufficiently.

Research Questions

According to the research questions aer as follows:

1. Which prioritize criteria is more important?
2. Which prioritize criteria is more effective?
3. Which prioritize criteria has more interaction?

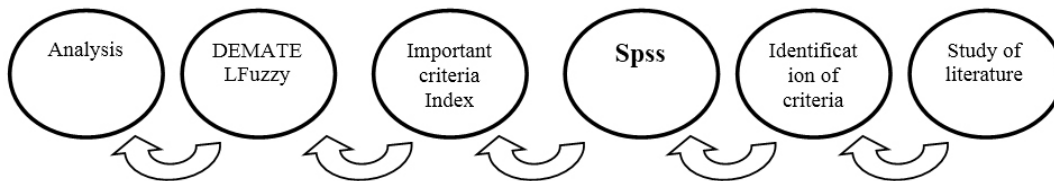


Figure 1: The process of study DEMATEL

In analysis of complex systems, sub- systems take Their identity in interaction with components of other subsystems, Not in a single form (Danyeefard, 2006).

Multiple Attribute Decision Making

Statistical Analysis techniques are proper tools for Explore the latent indicators and factors As well as the relationships, But they have not tools and quizzes to check and ratings Indicators and options. The combined use of Multiple Attribute Decision Making techniques and The aforementioned statistical mathematical approach, can compensate The above shortcomings. DEMATEL techniques of Multi-Attribute Decision Making Tools Presented In order to evaluate the effectiveness of measures.

Soft approach in decision-making modeling Is a branch of research operations that The issue should be properly defined and structured first. In soft approach, Researchers with a comprehensive view Identify and consider all of the Fixed and influencing variable factors. But the tough approach of Research Operations, The issue is assumed to be clear from the beginning.

Fuzzy DEMATEL

DEMATEL technique is a Multiple Attribute Decision Making technique to solve complex problems Was presented By American scientists first in 1972. This technique was Built based on graph theory is able to solve problems by a simple method. Decision Making in uncertain condition was caused to offer Fuzzy DEMATEL. Fuzzy DEMATEL method by using linguistic variables, making Decision under uncertainty Environmental is easy. This technique In the fields of production, management, social sciences And information system is used. (Quan Z., HuangWeila i., Zhang Y. 2011-). In addition, This technique by The use of group decision-making can resolve All problems facing with organizations in the Fuzzy condition. (Reyes F., Reyes N., Candia-Véjar A. 2011).

The steps of this technique are as follows. (Vhashmy Jamali, 2011) Wu and Lee (2007), first in an article called competence development for managers, have used a DEMATEL technique with Fuzzy approach. In fact, Fuzzy approach used to deal with Uncertainty and ambiguity of the verbal phrases of Respondents (Habibi et. al., 2014). This technique Besides converting Cause and effect relationships in a visual structure model, It can also identifies Internal dependencies between agents and make them understandable. (Shariati Rad, 2016)

DEMATEL Table 1
The studies in the technical scope of Yty Rad, 2016

<i>Use of area DEMATEL</i>	<i>Year</i>	<i>Writer</i>	<i>Row</i>
Analyzing the relationship between social capital indicators using fuzzy DEMATEL	2015	Soltani, Ebrahim; Fathi	1.
Hybrid approach based on DEMATEL fuzzy, AHP Fuzzy and Fuzzy TOPSIS for green supplier evaluation	2012	Buyukozkan, G., & Çifçi, G	2.
The analysis of portfolio selection criteria using DEMATEL	2012	Karthika& Sunil	3.
Identify factors influencing investment decisions in buying stock with Dymtl	2012	Mohsen Moradi	4.
Social influence in the use of clinical decision support systems: Overview Unified Theory of Acceptance and Use of Technology with Fuzzy DEMATEL	2012	Jeng, D.-F., & Tzeng, G.-H.	5.
Analysis of social capital indicators using DEMATEL	2014	Kiakojuri, D., Shamshirband, S., Anuar, N., & Abdullah, J.	6.
Identify and assess strategic decisions in the gas industry using DEMATEL	2012	Mehregan MR, Razavi SM; Anvari Akhavan,, MR	7.
Assessment of the relationship between risk factors affecting the bank's information technology projects in Bushehr province, using fuzzy Dymtl	2011	Jamali; Hashem	8.
The optimal portfolio selection project using an integrated approach DEA / DEMATEL	2013	Ali Nejad and Samyari	9.

<i>Use of area DEMATEL</i>	<i>Year</i>	<i>Writer</i>	<i>Row</i>
Feasibility of DEMATEL as applied mathematical modeling	2013	Lee, H. S., Tzeng, G. H., Yeih, W., Wang, Y. J. and Yang, S. C.	10.
Selection criteria for portfolio analysis techniques using Dymtl	2015	Mohammadpur and Mirzapur Babajan	11.
MCDM-based hybrid approach DEMATEL fuzzy, fuzzy AHP and fuzzy TOPSIS suppliers to evaluate green	2012	Kozkan, G., Cifci, G	12.
Use Chndmyarh decision based on the incorporation of DEMATEL and ANP	2014	Taheri et. al.	13.
Choose the optimal location in the cemetery of (Case study: Isfahan)			
Selecting management systems for sustainable development in SMEs: A novel hybrid model based on DEMATEL, ANP, and ZOGP	2009	Tsai, Chou and Chin	14.
Information security assessment for risk control, based on VIKOR, DEMATEL و ANP	2013	Ou Yang, Y. P., Shieh, H. M. and Tzeng, G. H..	15.

Fuzzy Logic

Fuzzy approach is an excellent tool In order to deal with uncertainty and language Variables modeling. Fuzzy logic effort to stem a base to argue And modeling inaccurate statements Using ideas provided from fuzzy sets. (Minhaj, 2007) Mahdirji Amuzade (2008) It is assumed that about Many sciences such as mathematics and logic, There are exactly defined borders and boundaries, as a subject Fits or does not fit within its specific boundaries This belief in black and white, and ones and zeros goes past the divalent Reaches at least to ancient Greece and Aristotle. Before Aristotle there was a philosophical mindset That viewed Binary faith with skepticism. (Shariati Rad, 2016)absolute numbers are generalized fuzzy numbers. With the rule of expansion, Operations can be used For the generalized algebraic numbers. A Fuzzy collection (N) from the set of real numbers (R) can be called a real fuzzy number, If we truly have the following three features:

1. N is a convex fuzzy set, i.e., $\mu_N[\lambda x_1 + (1 - \lambda)x_2] \geq \min\{\mu_N(x_1), \mu_N(x_2)\}$
2. Normal and single shot (i.e., there would be only one $\mu_0 \in X$, in which $\mu_N(x_0) = 1$
3. $\mu_N(x)$ part to be continuous.

Fuzzy numbers are one of the fuzzy theory tools to show uncertainty, in this article fuzzy number has been shown with a triangular membership function in order to phase out the use to be (Ramezani farmers and Doodaj, 2012).

Language Words become Fuzzy Numbers

Wu and Li (2007) first In an article titled Development Suitability of Managers of Engineering have used a DEMATEL fuzzy approach. In fact, fuzzy approach for Deal with uncertainty and ambiguity Used In respondents verbal expressions, so to perform First-phase technique for computing DEMATEL Of a suitable whole language for collecting data in the field Spectra of various types of scale DEMATEL conventional scoring suggested. Two main Spectra of fuzzy are in the table below. (Habibi et. al., 2014)

EXCEL Software Was used in this study to integrate The experts words, and SPSS software was used for parts of calculations. In the next step of computing DEMATEL Fuzzy of MATLAB software can be utilized.

Data Analysis

In this section the data matrix Obtained from a population that Contains data plans According to various indicators To evaluate the preparation and Then the mathematical algorithm Topsis analysis in the form of Matrixes and tables are provided In general data analysis, There have been two main stages as follows: The first step is defining important parameters and Second step: analysis of the importance of DEMATEL Fuzzy.

Evaluation Indicators Discussed the Importance of Investment in Priority Industrial Projects with Software SPSS

To assess the importance of priority indicators As well as the relevance of the sub extracted The priorities of industrial projects A localize questionnaire was used. The questionnaire used in this section are Important indicators and sub-indicators to suit The degree of importance from a very low degree of importance to five which means too much importance. To integrate Experts Comments, arithmetic mean is used. After the merging of experts Comments by Using the software spss ratio test, sub-indicators that are less important will be deleted. The main criteria derived from meta-synthesis theory was 8 criteria and 59 sub-criteria that in The next step to identify the important criteria and eliminating of insignificant sub criteria, The localization questionnaire was designed. The following important criteria from the perspective of 16 Certified Experts in the questionnaire were evaluated. After the merger experts Comments using Software spss ratio test, sub criteria with an average less than 2.99 was removed. So from the total 59 sub-criteria, 49 sub-criteria was recognized as the important.

Table 2
Analysis of experts opinions on the importance of following technical criteria

	<i>Binomial Test</i>	<i>Category</i>	<i>N</i>	<i>Observed Prop.</i>	<i>Est Prop.</i>	<i>Exact Sig. (2-tailed)</i>
Raw material	Group 1	<= 2.99	0	.00	.50	.000
	Group 2	> 2.99	16	1.00		
	Total		16	1.00		
production capacity	Group 1	<= 2.9		.00	.50	.000
	Group 2	> 2.99	16	1.00		
	Total		16	1.00		
Building land	Group 1	<= 2.99	2	.13	.50	.004
	Group 2	2.99	14	.88		
	Total		16	1.00		
Maintenance and support	Group 1	<= 2.99	1	.06	.50	.001
	Group 2	> 2.99	15	.94		
	Total		16	1.00		
Technology	Group 1	<= 2.99	0	.00	.50	.000
	Group 2	> 2.99	16	1.00		
	Total		6	1.00		

Binomial Test		Category	N	Observed Prop.	Est Prop.	Exact Sig. (2-tailed)
Human skills	Group 1	<= 2.99	1	.06	.50	.001
	Group 2	> 2.99	15	.94		
	Total		16	1.00		
Technical risk	Group 1	<= 2.99	1	.06	.50	.001
	Group 2	> 2.99	15	.94		
	Total		16	1.00		

NPARTESTS/BINOMIAL (0.50) = A1 A2 A3 A4 A5 A6 A7 (3)
/MISSING ANALYSIS

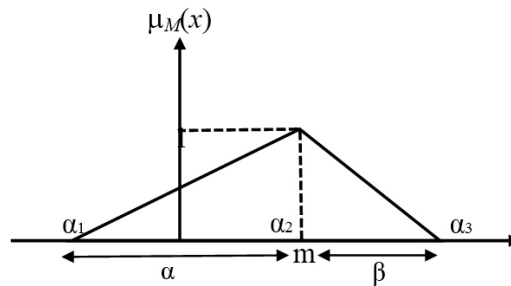
Based on Output software, all of the technical criteria; All below market standards; all of the following economic criteria except tax criteria; all The following financial measures except the standard cost Disposal of industrial waste water, all the environmental standards except standard geographical risk; all of the following criteria except socio-cultural criteria Customs, social status, Academic and research community universities And social risk; all of the following criteria except the standard of health infrastructure All the legal and political criteria except the standards of international communication and Rules and regulations International has a 5%> Sig and Observed Prop> 80% so, are considered as important.

Descriptive Analysis

According to statistical samples More than 60% of respondents have more than 5 years experience in service Units. This shows the experience of the respondents is relatively high. So The results of the self-assessment of their considerations are important. Nearly 76% of the population are male professionals. Thus it can be stated Due to the demands of the workplace, more men have worked on the study. More than 50 percent of respondents were educated PhD and PhD student. This shows the number of people are highly educated.

DEMATEL Fuzzy Technique

First step (design decision matrix): This technique reviews Interrelationships between the criteria, The impact and importance of the numerical rating. Fuzzy logic is based on the So fundamental efforts to approximate reasoning And modeling inaccurate statements Using ideas from fuzzy sets provided. (Minhaj, 2007) DEMATEL method One evaluation method is applicable In order to improve decision-Group In the form of a structural model. (Mashtani et. al, 2012) One of the most useful fuzzy numbers, Triangular fuzzy number (TFN) is And for $M = (m, \alpha, \beta)$ Is shown in Figure M facades, α and β are views down to coast to coast are facing high.



(Note: Sometimes fuzzy number triangle as $M = (the\ show)$. The mathematical form of the membership function is as follows:

$$\mu_M(x) \begin{cases} 1 - \frac{m-x}{\alpha} & m - \alpha \leq x \leq m \\ 1 - \frac{m-x}{\beta} & m \leq x \leq m + \beta \\ 0 & \text{Other wise} \end{cases}$$

To calculate the relevance and impact on each of the criteria and sub-criteria DEMATEL Fuzzy matrix designed Which makes the relationship between them. To this end, a five-level scale fuzzy Table (3-2) was shown.

Table 3
DEMATEL Fuzzy the whole

<i>Fuzzy equivalent</i>	<i>Certain of</i>	<i>The linguistic variable</i>
(0.0 · 0.1 · 0.3)	0	Ineffective
(0.1 · 0.3 · 0.5)	1	Very little effect
(0.3 · 0.5 · 0.7)	2	Niminy-piminy
(0.5 · 0.7 · 0.9)	3	High impact
(0.7 · 0.9 · 1.0)	4	A huge effect

Second Step (Fuzzy Matrix Calculation Direct Connection)

After collection of Experts Regarding the impact on each criterion and sub criterion Considering the fact that all the experts are of equal weight matrix direct connection is formed. The mean matrix for the aggregation of expert opinion using equation (1) and (2) is calculated.

L: number of first phase, m: number of second phase, u: Third fuzzy number

$$\tilde{x} = \frac{1}{p} (\tilde{x}^1 \oplus \tilde{x}^2 \oplus \dots \oplus \tilde{x}^p) \tag{1}$$

$$N_1 \oplus N_2 = (l_1 + l_2, m_1 + m_2, u_1 + u_2) \tag{2}$$

Third Step (Normalized Correlation Matrix of Fuzzy Place)

At this point a direct connection phase can be normalized matrix is based on the relationship of (3) and (4) to be achieved.

$$X = \begin{bmatrix} x_{11} & x_{12} & x_{13} \\ x_{21} & x_{22} & x_{23} \\ x_{31} & x_{32} & x_{33} \end{bmatrix}$$

$$r = \max \sum_{j=1}^6 u_{ij} \tag{3}$$

$$r_{ij} = \frac{Z_{ij}}{r} = \left(\frac{l_{ij}}{r}, \frac{m_{ij}}{r}, \frac{u_{ij}}{r} \right) \quad (4)$$

where, r is equal to the maximum value of the sum of each row. After identifying the division we r all Drayhhay matrix.

Fourth Step (Fuzzy Overall Communication Matrix Calculation)

The matrix T is displayed and its elements are in phase. In order to calculate the matrix of relations (5), (6) and (7) the aid is taken. In this matrix I is the identity matrix.

$$[l_{ij}'''] = X_l \times (I - X_l)^{-1} \quad (5)$$

$$[m_{ij}'''] = X_m \times (I - X_m)^{-1} \quad (6)$$

$$[u_{ij}'''] = X_u \times (I - X_u)^{-1} \quad (7)$$

Fifth Step (Charting Causal)

At this stage, all the rows and columns of the matrix is calculated. If the sum of rows and columns, called D and R matrices respectively, Total row D represents the highest standards Other elements that strongly influence And R represents the highest total column criteria Which are located under the influence. The sum of these two matrix ($D + R$) the matrix excellence And the difference of the matrix ($R - D$) is called the communication matrix, it will be obtained. Graph effectiveness of using coordinates ($R - D$, $D + R$) is obtained The $D + R$ on the horizontal axis and the vertical axis is $D - R$. (Azar et. al., 1394)

Step Six (Defuzzification of the overall communications matrix) The algorithm then calculates the DEMATEL Fuzzy Full correlation matrix Defuzzification can be attempted. The resulting matrix, the matrix of a perfect relationship is confirmed And to calculate the pattern of causal relations It can be used. There are several ways to Defuzzification As the center of gravity known as COA and BNP and. In this study To Dyfazy BNP's method of equation (8) is used.

$$BNP = l + \frac{(u - l) + (m - l)}{3} \quad (8)$$

Step Seven (calculated Matrix Intercom): Based on the results matrix of communication And Figure causal, Taking into account the correlation matrix. Normalized overall communication with the column of the matrix By soft linearity, Internal communication matrix is obtained. Experts used The weight of these tables directly in the model.

Defuzzification and fuzzy data of sub-criteria

The results of the sub-criteria given in the following tables.

According to the data analysis and charting, The results of the technical sub-criteria are as follows: According to the ($R + D$) land and buildings in The technical Sub criteria Compared to other sub-criteria Is more important. This confirms that the role of land and buildings in line with the priorities of industrial projects is very important. Given that the land and buildings has the So more measure ($R + D$) the interaction

Table 4
Technical sub Data is fuzzy and defuzzy

<i>Technical</i>	$(\tilde{R} - \tilde{D})$	$(\tilde{R} + \tilde{D})$	$def(\tilde{R} - \tilde{D})$	$def(\tilde{R} + \tilde{D})$
Raw material	$-(0.109 \cdot 0.156 \cdot 0.312)$	$(1.053 \cdot 2.611 \cdot 7.523)$	-0.192565234	3.729413123
Nominal capacity of	$(0.141 \cdot 0.240 \cdot 0.480)$	$(1.050 \cdot 2.576 \cdot 7.451)$	0.2874682	3.692653443
Land and buildings	$(0.152 \cdot 0.221 \cdot 0.443)$	$(1.421 \cdot 3.145 \cdot 8.591)$	0.272646475	4.386180634
Maintenance and support	$-(0.041 \cdot 0.059 \cdot 0.119)$	$(1.018 \cdot 2.561 \cdot 7.423)$	-0.073708388	3.668083105
Technology, machinery and equipment	$-(0.090 \cdot 0.173 \cdot 0.346)$	$(0.455 \cdot 1.628 \cdot 5.563)$	-0.203492102	2.54897401
Human resource skills	$(0.005 \cdot 0.007 \cdot 0.015)$	$(1.154 \cdot 2.756 \cdot 7.815)$	0.009455361	3.908797824
Technical risk	$(0.058 \cdot 0.080 \cdot 0.160)$	$(0.735 \cdot 2.087 \cdot 6.475)$	-0.099804311	3.099247266

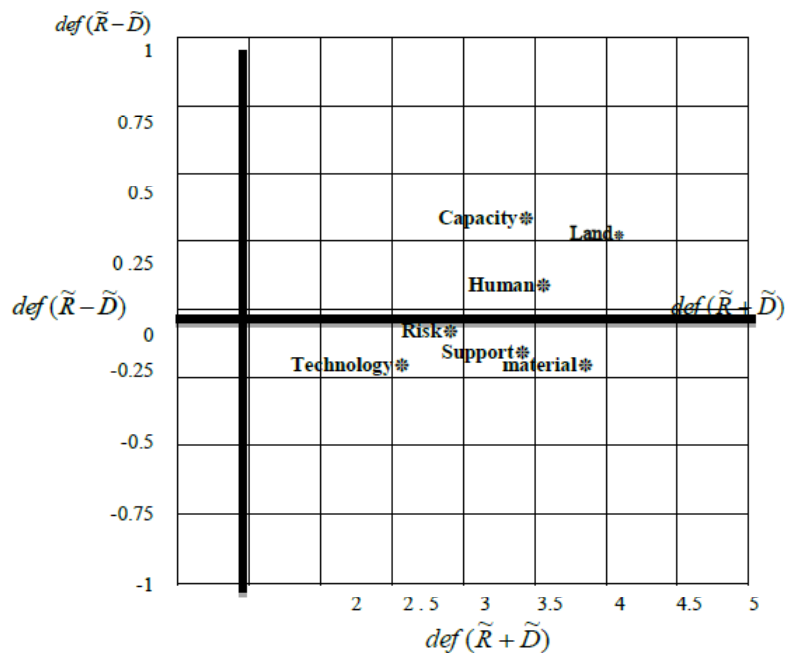


Figure 2: Relationship Chart - due to technical criteria

is more. Criteria for raw materials, production capacity, skilled manpower are cause and technical risk criteria and maintenance and support and technology, machinery and equipment In the group are effect. According to the $(R - D)$ and its negative impact In terms of influence metrics, maintenance, support and technology, machinery and equipment impact Among these criteria is the technology standard impact And given the amount of $(R - D)$ and its positivity criteria for raw materials, production capacity, skilled manpower and technical risks as well as corporately The production capacity of measure has the greater impact. Criteria for raw materials, production capacity, skilled manpower and technical risk Should be regarded as core criteria Industrial projects as a priority in the planning and selection And criteria Maintenance and support and technology, machinery and equipment Known as the main criteria And planning and selection should be based on them.

According to data analysis, Results related to The market sub-criteria are as follows: According to the $(R + D)$, The importance of sub-criteria Values and market entry To international markets, Is more

Table 5
Dyfazy fuzzy data and a sub market

<i>Market</i>	$(\tilde{R} - \tilde{D})$	$(\tilde{R} + \tilde{D})$	$def(\tilde{R} - \tilde{D})$	$def(\tilde{R} + \tilde{D})$
Location Exports	(0/47 · 0/038 · -0/243)	(2/049 · 4/147 · 26/878)	0.088326202	11.02500687
Location Imports	-(0/428 · 0/0719 · 0/308)	(2/406 · 3/570 · 23/789)	-0.269105763	9.922062551
Demand and Consumption	(0/29 · 0/414 · 1/902)	(1/857 · 4/568 · 29/250)	0.86792005	11.89234117
Competition and competing firms (supply)	(0/04 · -0/4116 · -0/185)	(2/844 · 5/063 · 31/233)	-0.732894523	13.04698252
Market share	(-0/128 · 0/436 · 2/321)	(2/273 · 4/546 · 28/832)	-0.876371345	11.88388988
Market values	(0/105 · 0/1695 · 0/776)	(2/252 · 5/156 · 31/948)	-0.350136976	13.11912068
Login to international markets	(0/105 · 0/1695 · 0/776)	(2/252 · 5/156 · 31/948)	-0.350136976	13.11912068
Market regulations	(0/194 · -0/251 · -1/521)	(2/445 · 4/905 · 30/441)	-0.526118664	12.59729636
Relationship with Other Industries	-(1/13 · 2/579 · 15/98)	(1/125 · 2/578 · 15/980)	-6.56170751	6.56170751
Market risk	-(1/13 · 2/579 · 15/98)	(1/125 · 2/578 · 15/980)	-6.56170751	6.56170751

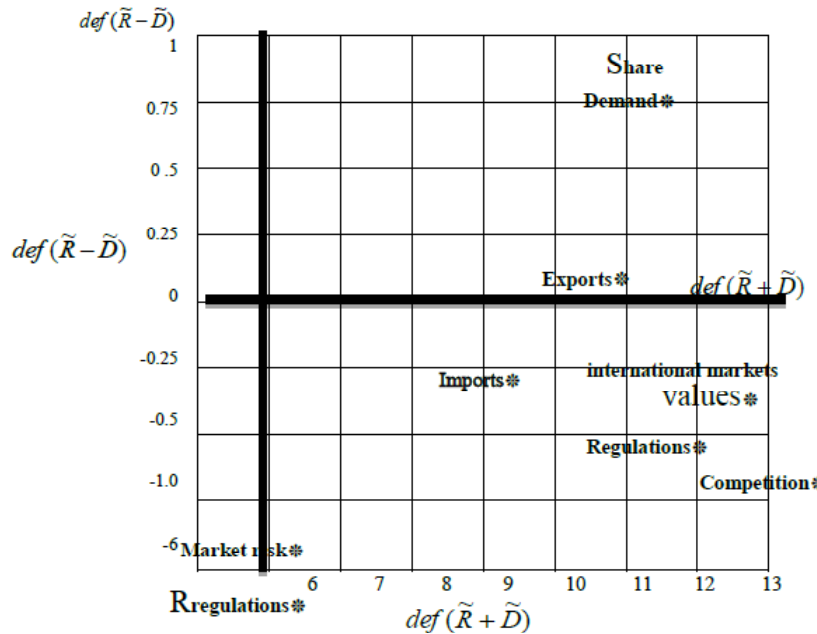


Figure 3: Relationship diagrams - the effect of market criteria

important than the other sub-criteria. This confirms that the role of the market and International market values in terms of priority investment Industrial projects is important. Benchmark values. Market and entry into international markets with the more (R + D) So the interaction is more. Criteria for market share Demand and consumption Location exports are cause and criteria Import position, competitors and competing companies, Market values, entry into international markets Market regulations, relationship with other industries and Market risk in the group are effect. According to the (R – D) and negative tests, import position Criteria, competitors and Competing companies, market values, entry to international markets, Market regulations, relationship with other industries and market risk are effected Among these

criteria and risk associated with other industries are effected from market and according to the criteria (R – D) And its positivity criteria of market share, the Demand and consumption and exports also influential position Which measure the market share of the impact is greater. Criteria for market share, demand and consumption And nuclear export position should be used as a criteria In industrial planning and project selection. The priorities and criteria for the import situation, Competition and competing companies, market values, Entry into international markets, market regulation, Communication with other industries and market risk as The main criteria considered and planned And the choice should be based on them.

Table 6
Dyfazy was fuzzy data and economic criteria

<i>Economic</i>	$(\tilde{R} - \tilde{D})$	$(\tilde{R} + \tilde{D})$	$def(\tilde{R} - \tilde{D})$	$def(\tilde{R} + \tilde{D})$
Economic conditions	(1/865 · 4/600 · 15/970)	–(0/078 · 0/129 · 0/164)	–0.123761045	7.477308999
Inflation	(1/853 · 4/58 · 15/93)	–(0/229 · 0/337 · 0/816)	–0.473864163	7.453326552
Income People	(1/769 · 4/443 · 15/75)	–(0/16 · 0/26 · 0/66)	0.358961071	7.321335917
Government facilities	(2/161 · 5/086 · 17/05)	–(0/068 · 0/112 · 0/312)	–0.163813575	8.100568103
The Employment	(2/158 · 5/081 · 17/05)	(0/08 · 0/13 · 0/33)	0.180459367	8.096192183
Economic risk	(2/512 · 5/664 · 17/99)	(0/14 · 0/23 · 0/30)	0.222018346	8.720581026

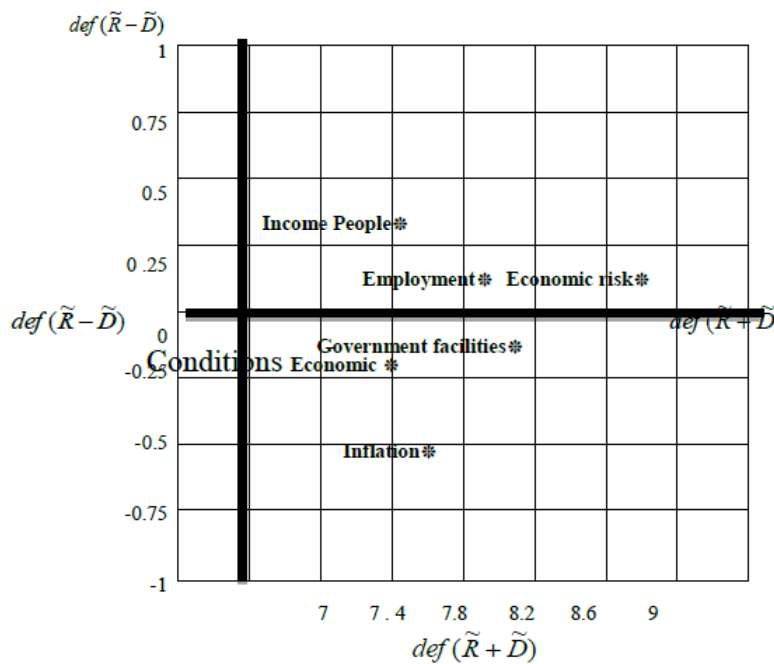


Figure 4: Chart relationship - the impact of the economic measures

According to the data analysis and charting The results of the economic criteria are as follows: According to the (R + D), in terms of importance, economic risk sub- criteria Is more important than the other sub-criteria. This confirms that the Industrial economy risk in terms of investment projects priority is very important. Given that the economic risk criteria The (R + D) is greater interaction. Criteria of income, economic risk are cause and economic conditions of employment standards, Inflation and government facilities in the group are effects. According to the (R – D) and its negativity In terms of impact and

influence metrics, economic Inflation conditions and government facilities that are under effect, is the benchmark inflation measure effect According to the (R – D) and positive criteria income, economic risk also influence employment rates. The impact of the income criterion More, So we can say that Criteria of income, economic risk and the Employment should be seen as core Industrial projects criteria and a priority in the planning and selection. And criteria of economic conditions, inflation and government facilities known as the main criteria And planning and selection should be based on them.

Table 7
Dyfazy fuzzy data and the financial sub

<i>Financial</i>	$(\tilde{R} - \tilde{D})$	$(\tilde{R} + \tilde{D})$	$def(\tilde{R} - \tilde{D})$	$def(\tilde{R} + \tilde{D})$
Utilization Rate	(1/851 · 4/684 · 21/28)	-(0/008 · 0/014 · 0/037)	-0. 019922	9. 272372
Facility investment	(1/766 · 4/54 · 20/79)	-(0/184 · 0/312 · 1/051)	-0. 515862	9. 032706
Economic efficiency	(1/766 · 4/54 · 20/66)	-(0/218 · 0/37 · 0/866)	-0. 484304	10. 00898
Investment cost	(2/074 · 5/063 · 22/31)	-(0/042 · 0/072 · 0/25)	-0. 121353	9. 814603
Current costs	(1/849 · 4/681 · 21/15)	-(0/179 · 0/304 · 0/898)	-0. 460612	9. 226537
Circulating assets	(1/519 · 4/123 · 19/39)	(0/048 · 0/08 · 0/274)	0. 13425	8. 344696
Annual income	(1/434 · 3/978 · 18/9)	(0/145 · 0/25 · 0/821)	0. 404	8. 10276
Profitability	(1/931 · 4/82 · 21/49)	(0/002 · 0/0 · 0/006)	0. 00417	9. 413124
Financial risk	(1/095 · 2/63 · 11/5)	(1/095 · 2/63 · 11/5)	5. 07387	5. 073871
The Investment attractiveness	(1/148 · 2/721 · 11/53)	(1/148 · 2/72 · 11/53)	5. 13224	5. 132239

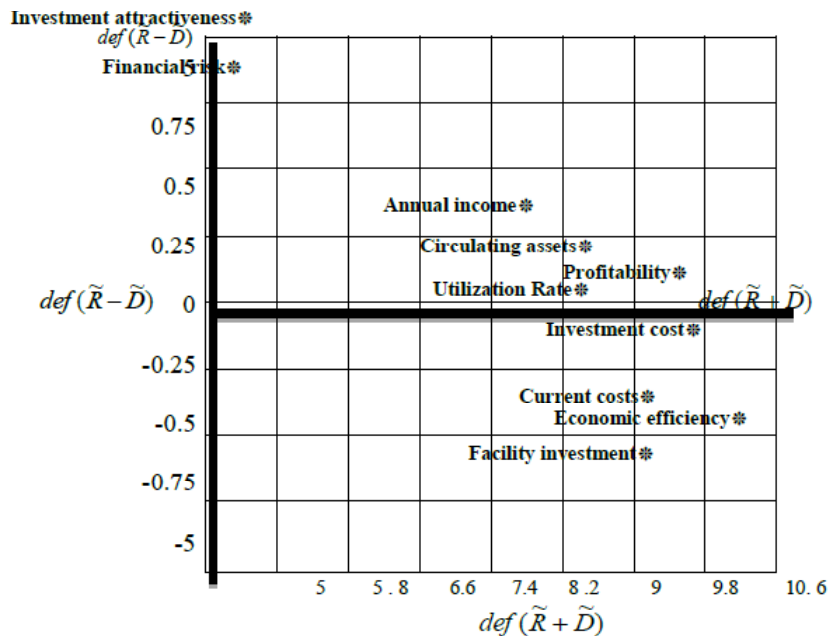


Figure 5: Relationship Chart - effect following financial measures

According to the data and charting analysis, for the Financial sub-criteria results are as follows: According to the (R + D), in terms of importance, Cost-effective sub criteria compared to other sub-criteria on financial criteria Is more important. This confirms The important role of the economy in line

with Industrial project priorities. Given that economic criterion has the more (R + D) So the interaction is more. Investment attractiveness criteria, Financial risk, annual income, assets In turnover and profitability plans and measures are causal and Utilization rates, facilities investment, Economic, investment, Operating costs and financial risks in the group are effects. According to the (R – D) and its negative impact in terms of Utilization rate and effectiveness in Facility investment, economy, investment, Operating costs and financial risks criteria, Among these criteria effectiveness facility investment criteria, And given the amount of (R – D) and positive criteria The attractiveness of the investment, financial risk, Annual income, asset turnover and profitability of the project as well as corporately Which measures the investment attractiveness of the impact is greater. So we can say that the standards of attractiveness In investing, financial risk, annual income, Asset turnover and profitability criteria should be used as nuclear plan In industrial planning and project selection. The priorities and criteria for utilization rates, Facility investment, economy, investment, Operating costs and financial risks known as The main criteria and planning and selection should be based on them.

Table 8
Fuzzy data and sub-criteria environmental Dyfazy

<i>Environmental</i>	$(\tilde{R} - \tilde{D})$	$(\tilde{R} + \tilde{D})$	$def(\tilde{R} - \tilde{D})$	$def(\tilde{R} + \tilde{D})$
Government restrictions	(2/218 · 5/37 · 25/33)	(0/094 · 0/156 · 0/28)	0.177098627	10.97427538
Air pollution	(1/928 · 4/886 · 23/58)	(0/0 · 0/0 · 0/29)	0.09801889	10.13231371
Environmental degradation	(1/933 · 4/893 · 23/90)	-(0/192 · 0/32 · 0/151)	-0.554277902	10.24289885
Adaptability The environment	(1/933 · 4/893 · 23/90)	-(0/192 · 0/32 · 0/151)	-0.554277902	10.24289885
Industrial Effluent Treatment	(1/835 · 4/729 · 23/33)	(0/29 · 0/484 · 1/73)	0.833438288	9.963738461

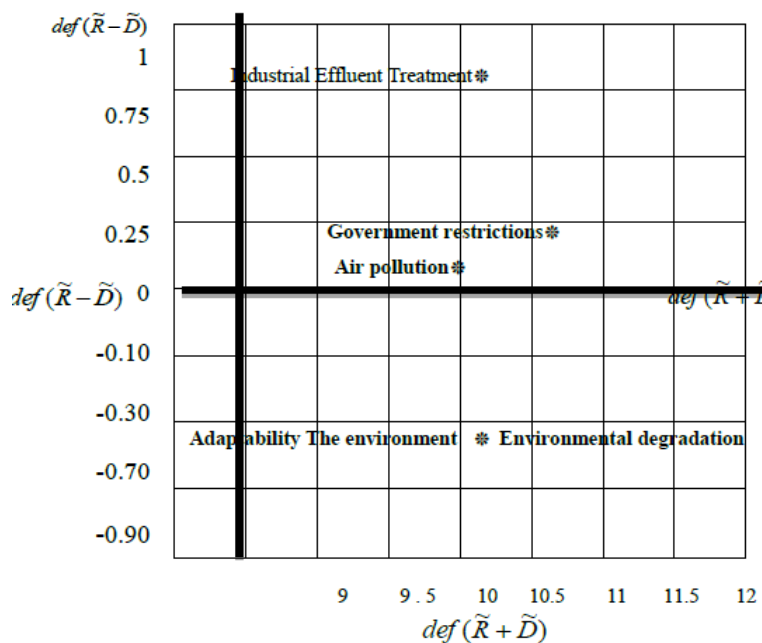


Figure 6: Relationship Chart - under the effect of environmental measures

According to the (R + D), The importance of Government environmental restrictions sub-criteria is Higher than The other sub-criteria. This confirms the important priorities role of government restrictions

in Industrial projects. Due to government restrictions, the standard has the more (R + D) So the interaction is more. Industrial wastewater treatment standards, are causal and government restrictions and measures of air pollution and environmental degradation And environmentally friendly are In the effect group. According to the (R – D) (And its negative impact in terms of impact and destruction measures Environment and sustainability, and given The amount of (R – D) and its positivity criteria of industrial waste water disposal, Government restrictions also affect air pollution Industrial Effluent Treatment is more effective than the criteria. So we can say that metrics Disposal of industrial waste water, air pollution and government restrictions Should be regarded as core criteria in planning And selection of industrial projects in priority and criteria for environmental degradation And compatibility with the environment as The main known criteria and planning and selection should be based on them.

Table 9
Dyfazy was fuzzy data and socio-cultural sub

<i>Sociocultural</i>	$(\tilde{R} - \tilde{D})$	$(\tilde{R} + \tilde{D})$	$def(\tilde{R} - \tilde{D})$	$def(\tilde{R} + \tilde{D})$
Security	(1.869 · 5.778 · 390.35)	(0.30 · 0.56 · -26.57)	-8.571121774	-127.5689289
Society culture	(2.30 · 6.594 · -426.95)	(-0.139 · -0.26 · 13.26)	4.287683953	-139.3504216
Attitudes	(2.30 · 6.594 · -428.47)	(-0.139 · -0.26 · 11.74)	3.780713104	-139.8573924
Access to skilled workers	(2.18 · 6.36 · -415.25)	(-0/02 · -0/035 · 1/563)	0.502724717	-135.5654624

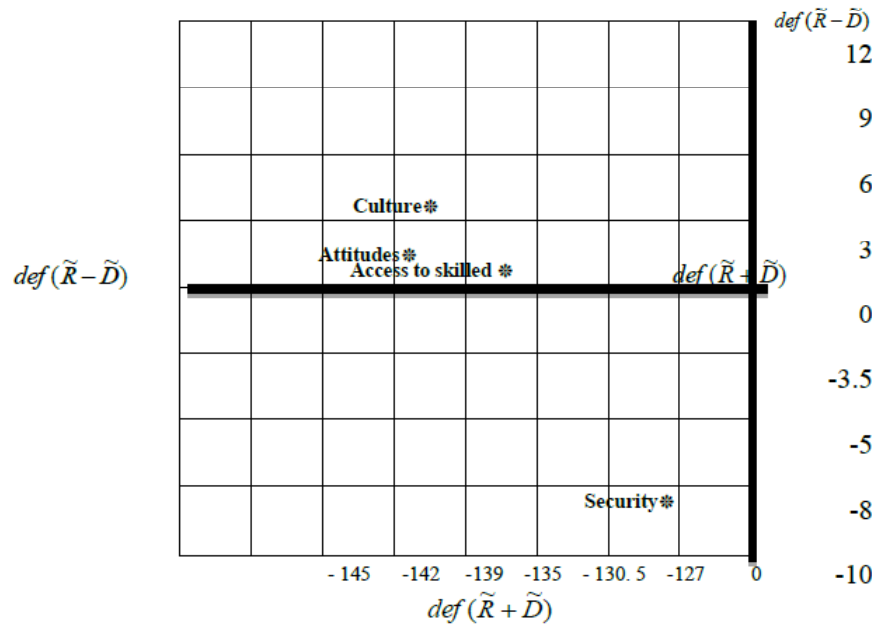


Figure 7: Relationship Chart - under the influence of sociocultural factors

According to the (R + D), The importance of attitudes In social and cultural sub criteria than other Sub-criteria is more. This confirms that the attitude of the people In line with the priorities of industrial projects is very important. Given that measure people’s attitudes have The more (R + D), so interaction Is more. Access to experts, culture and attitude of people criteria are causal, and security measures are in effect. According to the (R – D) and its negative In terms of the impact and effectiveness of security measures Based on the amount withdrawn (R – D) and positive Access to expert, Culture, society and

people’s attitudes criteria also influence the impact Measure of community culture more. So we can say that Criteria for access to the expertise, culture And the attitude people as a core criteria must have a top priority in Planning and selection of industrial projects, so planning and selection should be based on the safety criterion which is known as the main criteria.

Table 10
Dyfazy data and the underlying sub

<i>Infrastructure</i>	$(\tilde{R} - \tilde{D})$	$(\tilde{R} + \tilde{D})$	$def(\tilde{R} - \tilde{D})$	$def(\tilde{R} + \tilde{D})$
Roads and transit in Transportation	(1.313 · 3.82 · 21.17)	(0.0 · 0.0 · 0.0)	0	8.770331875
Transportation equipment	(1.524 · 4.169 · 22.49)	(0.0 · 0.0 · 0.0)	0	9.394154249
Infrastructure	(1.906 · 4.804 · 24.88)	(0.0 · 0.0 · 0.0)	0	10.53128576
Information and communications technology ICT	(1.726 · 4.503 · 23.74)	(0.0 · 0.0 · 0.0)	0	9.991055277
Industrial history	(1.726 · 4.503 · 23.74)	(0.0 · 0.0 · 0.0)	0	9.991055277

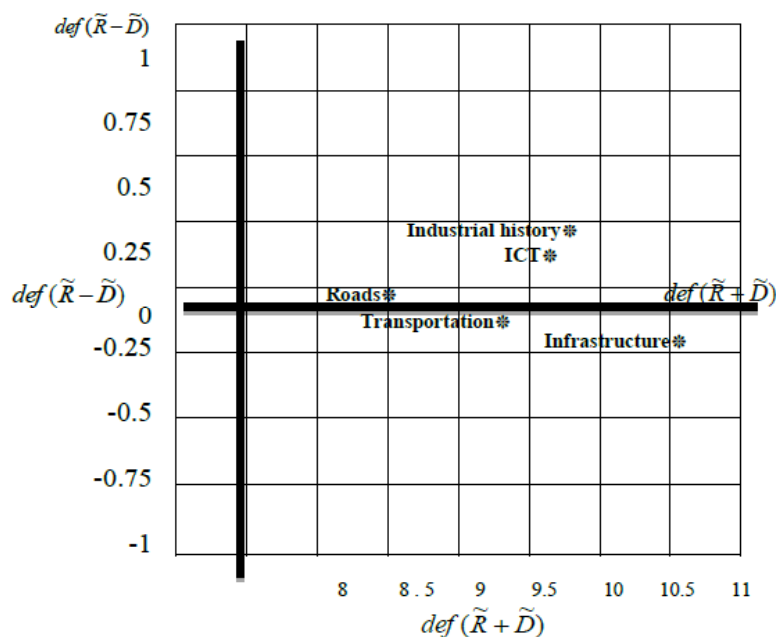


Figure 8: Relationship Chart - substandard infrastructure work

According to the $(R + D)$, The importance of infrastructure sub criteria In comparison with other underlying sub-criteria Is more. This confirms The important role of infrastructure in line with Industrial project priorities. Because $(R + D)$ in the Infrastructure facilities criteria is more, So the interaction is more too.

Political risk criteria is causal and standard legal rules and government regulations are In the effect group. According to the $(R - D)$ and its negative impact in terms of effectiveness And measure the of laws and government regulations affected And given the amount of $(R - D)$ and its positivity criteria Legal and political risks involved. So we can say that political risk criteria As nuclear regulatory criteria In industrial

planning and project selection has priorities and, rules and state regulations criteria Known as the main criteria And planning and selection should be based on them.

Table 11
Legal and political sub-phase data were Dyfazy

<i>Legal political</i>	$(\tilde{R} - \tilde{D})$	$(\tilde{R} + \tilde{D})$	$def(\tilde{R} - \tilde{D})$	$def(\tilde{R} + \tilde{D})$
Laws and regulations government	$(0.150 \cdot 235 \cdot 0.326)$	$(0.035 \cdot 035 \cdot 0.036)$	-0.035500609	0.236892434
Political risk lawful	$(0.150 \cdot 235 \cdot 0.326)$	$(0.035 \cdot 035 \cdot 0.04)$	0.035500609	0.236892434

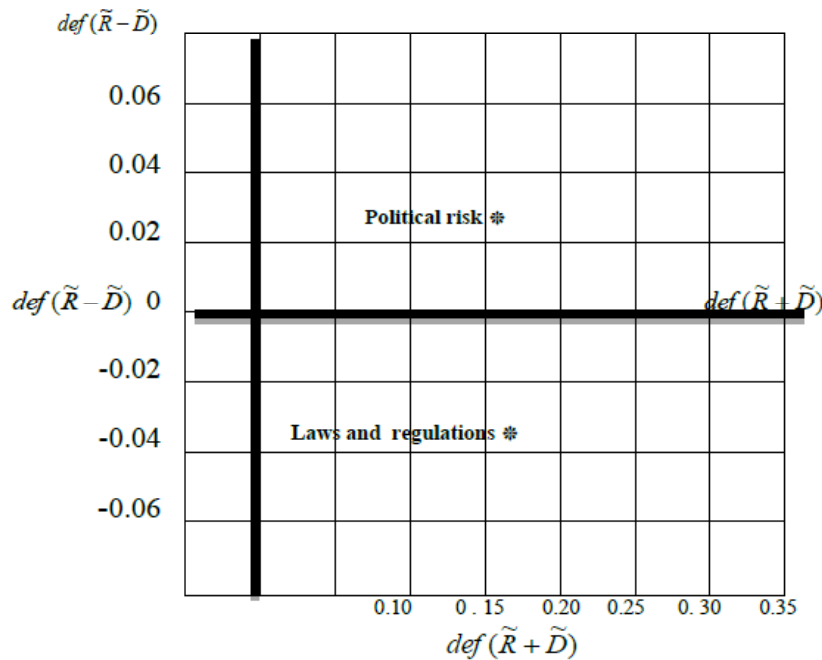


Figure 9: Relationship Chart - work under the political criteria for legal

4. CONCLUSION

According to the findings and outputs of Spass software, all the technical subcriteria ; all market subcriteria, all economic subcriteria except the tax measure, all Financial subcriteria except cost of disposal of industrial waste; All the environmental subcriteria except geographical risk subcriteria, All the social and cultural subcriteria except the Customs, social status, academic status and Research community (universities) and social risk subcriteria; All the health And treatment and all the legal political subcriteria except the rules of international communication And international regulation subcriteria has, 5%> Sig and Observed Prop> 80%, so Are important.

According to the data analysis and output DEMATEL fuzzy software, The results of the sub priorities are as follows:

- According to the results of this study we suggest:
- In order to complete this study, In future studies, consider more indicators.

Table 12
Analysis output DEMATEL fuzzy

The main criterion	The most important sub criteria	The most interactive sub criteria	The most the Effective sub criteria	The most the effect sub criteria
Technical	Land and buildings	Land and buildings	Production capacity	Technology
Market	Market values and entry into international markets	Market values and entry into international markets	Market share	Communication with other industries and market risk
Economic	Economic risk	Economic risk	Income people	Inflation
Financial	Economic efficiency	Economic efficiency	The investment attractiveness	Facility investment
Environmental	Government restrictions	Government restrictions	Industrial Effluent Treatment	Environmental degradation and environmental sustainability
Sociocultural	Attitudes	Attitudes	Society culture	Security
Infrastructure	Infrastructure	Infrastructure	Infrastructure	Infrastructure
Law political	Political risks, legal laws and government regulations	Political risks, legal laws and government regulations	Political risk lawful	Laws and government regulations

- Since this study only is done In DEMATEL fuzzy algorithm environment, it is suggested Such that research with other models (such as ISM, linier equations and statistical simulation) And the results of the study will also be adjusted.
- Managers, for the priority and selection of projects Pay more attention to the important criteria.
- In this study, we identify and analyze the components In the field of industrial countries, and the indexes are evaluated. In addition to evaluating, the causal relationship between indices Mentioned is evaluated. Also important indicators logic techniques DEMATEL fuzzy can be considered as a part of the innovation of this research. The present study used a complex framework for modeling, and Shortcomings in previous studies In terms of priority and the selection of projects and allocation Their resources, restrictions and terms of the Subject uncertainty in the calculations, was obviated. Each of the studies and researches about priorities was According to the industry at home and abroad. and Certain indicators such as financial indicators, Economic, operational, technical and managerial rankings Industry and options are applied. In this study, With a comprehensive and multi-dimensional view of the weaknesses and defects of Previous research has overcome and quantitative and qualitative Credible indicators has used.

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