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# Method to Property the Organizations Based on Their Agility (In 15 Industries in North Khorasan Province)

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## ABSTRACT

As the agile production have a significant place in today world, so it's been tried, proposing this issue in 15 industries of North Khorasan Province. In this study, in addition to introduce this theory, it's been specified the importance and efficiency of it and it's been given the necessary confidence to artisans about the industry development.

It's conducted to propose a method to property the organizations based on their agility (in 15 industries in North Khorasan Province). The population of the study includes all engineers, managers, and employed engineers in 15 industries in North Khorasan Province. We divided these industries to two small and big groups because the organizations area and the extent of their production are not the same. Seven first industries are big and seven second industries are small. The study samples in small industries (8 ones) are 160 people (in each industry) and in Macro Industries (8 ones) are 280 people (40 people in each industry). Total sample are 440 people that include all managers and accidently some engineers and technicians. The research measuring tools is the agility questionnaire, Josef model. The other similar researches have been applied. The content method is applied to measure the validity of questionnaire and Cronbach's alpha was calculated to determine the reliability of it that the amount of it was estimated 0.82%. Incompatibility rate is below 0.1%. To analyze the data, hierarchical method was applied- similar to the ideal option. The results of the study showed that in Macro Industries, the industrial A, F, D, have got the first and the third priorities in order, and the small industries, I , H, N, have got the first to third priorities in order. Also the analyses indicate that quality, changing, market; competence, technology and education indexes are among the effective factors in agility of the organizations.

KEY WORD: Agility Manufacturing, Multi Criteria Decision Making, AHP/TOPSIS Model, Joseph Model

## **INTRODUCTION**

In the last decades, the manufacturing industries have experienced the considerable changes which come from the business environment and threaten success and continuance of the organizations. Maybe the causes of these changes and uncertainly in the business world are the increasing access to technology, the serious competition in IT development, globalization of the markets and the global competition, changing the salaries and job skills, and the most important one, high expectations of the customers. (Jhon Kenan; Poyouder, 2001) the agility has been considered as the ability of the organization in understanding and prediction of the changes (Sharifi and Jang, 1999) and the effective response to these changes in order to access to competitive advantages of the opportunities and continuance against the threats. (Yousef, Sarhadi, Ganskaran, 1999) it can be generally said that the agile organizations are identified by the quick and appropriate response to unpredictable changes in the market to know the different demands of customers about the price, quality, quantity and delivery. (Boutani, 2009) since the agility directly effects on the ability of the organization to produce and deliver the product with the best price, to reduce the production costs, to increase the customer's satisfaction, to eliminate the actions with non-added values and to increase and improve the competitiveness. (Lin, Chi Yu, Chou, 2006) it's known as the competition and continuance basis in the changing market. (Agarwal and Chanker, Tiwari, 2007) access to it as a superior strategy to achieve a better performance for the organization is important for the administrators. Although the administrators and the organizations are faced with the challenge of achieving to the agility, but it should be noted that the agility and achieving to it is not important, it's an essential means to keep competition in the market and turbulent environment. The question which arises in this text is that "is the agility an inevitable necessity in the global economic activities and competition fields?" To answer to this question, the administrators should get the information about the extent of the required agility of their organizations. It requires evaluating the need of the organizations for agility. The purpose of this article is to help to the administrators to evaluate and prioritize the agility indicators and as a result to make the organizational agility decisions. The conceptual model of this study is based on Yousef, Sarhadi and Ganskaran with multi-criteria decision making approach. (Yousef, Sarhadi, Ganskaran, 1999). Literature review

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#### LITERATURE REVIEW

#### **Theoretical background**

In dictionary, the agile means the fast and active movement and the agility means the ability of the movement easily and the ability of thinking in an intelligently way. The root of agility is the agile manufacturing and the agile manufacturing is a concept that has become popular in the last years and is accepted as a successful strategy by the manufacturers who make them ready for increasing the significant performance. In such environment, every organization should be able to produce the different products at the same time, redesigning of the products, changing the production methods and the ability to respond effectively to the changes. In the case of having such capabilities, the manufacturing firm can be called "Agile Organization".

Many definitions have been proposed for agility, but they're not opposite with each other. Generally, these definitions indicate the speed idea and changing in the business environment. There is not a general definition approved by everyone for the agility, because it's a new conception.

To Jang and Sharifi (1999), the agility means the ability of each organization to perceive and predict the presenting changes in the work environment. Such organization can realize the environment changes and consider them as the development factors. They also define the agility as the ability to overcome on unexpected challenges to face with unprecedented threats of the business environment and taking the advantage of changes as the development opportunities.

Brayan Maskel (2001) defines the agility as the ability of developing in a changeable unexpectedly environment. In this regard, the organizations mustn't be afraid of the environmental changes run away from it, but should consider it as a competition advantage in market.

Wernadat (1999) believes that the agility means the close alignment of the organization with the required changing needs in order to take the business advantages. In such organization, the staff's goals are in the line with the organization goals and these two combined with each other attempt to give a right answer to the required changing needs.

According to the results, the agility means the dynamic and courageous changes that ensure the success in the market and attracting the clients. In the other words, the agility means the ability of a business to develop in a competitive environment that the changes are continuance and unpredictable and it needs to a rapid response to the changing markets.

Without a doubt, this issue is obtained by creating the value in the products and services required by the clients. (Goldman, Nagel, Peris, 1995) so, the agility can be defined as the ability of an organization to response rapidly to the market and clients' needs.

#### Experimental background

In 2006, Khosh Sima in an article entitled as "the Analysis of Agility Ordinary Correlation and Strategic Performance of the Production Organizations" analyzes agility of the organization, competitive advantage, the organizational performance in the organizations and the relationship between agility with competitive advantage and the organizational performance. To achieve to this goal, it's been studied the latent variables of the agility, competitive advantage and the organizational performance by factorial analysis. In the model of study, the latent variables of the agility include the clients' satiety; control the changes and uncertainty, cooperation in order to increasing the competitiveness. The competitive advantage includes the time to get to the market, price/cost, quality, product innovation and reliable delivery. The organizational performance includes the financial and market performance. Each latent variables and strategic performance variables.

In 2008, another article entitled as "Data Envelopment Analysis (DEA), a Modern Approach to Assess the Agility of the Organizations", was written to assess the agility of manufacturing enterprises, in order to assess the extent of agility and response power according to the assessment practices, technique of data envelopment analysis with definition of the inputs and outputs of agility. This measurement model has been used by twenty manufacturing enterprises with five different industries to assess the agility. The relative agility of enterprises and also the improvement of outputs have been determined in order to the efficiency border of different organizations in terms of agility. The results of the study for output models of different organizations indicate that only having a high level of ability cannot be a reason for agility of an organization, because it may not be adequate this level of ability in the regard of their changing environments. In 2009, another article entitled as "Measurement of the Manufacturing Organizations Agility in Fuzzy Environments" was published by Ibrahimnejad and Imami. This article is proposed by an applied model (the proposed model based on the separation of technological and managerial aspects of agile structure in the organization), in order to measure the agility in an active manufacturing organization in the field of vehicles in six main agility areas. The questionnaires are given to the administrators and experts of the industry to assess the different pars of the organization according to their knowledge and experience. The agility of the organization is 46.6 by the administrators' opinions and rating from the industry experts. This value indicates that the studied organization has 60% characteristics of an organization with the average ability and 10% characteristics of an organization with the high ability (Ibrahiminejad, 2009).

#### The Research Model: Yousef, Ganskaran & Sarhady's Model

Gansaskaran has offered a conceptual model to design the agile manufacturing systems based on four elements: strategy, technology, staff and systems. He believes that the main part of agility focuses on strategies and techniques. He says that his model is necessary to get the validity that is tested by field and experimental studies. Yousef and et al. (1999) state the following definition for agility. The successful applying of competitive principles (Speed, Flexibility, Innovation, Quality and Profitability), by integration of renewable resources and the best functions in an environment with the rich knowledge to provide the products and common services in a changing market environment is called "Agility". This definition for agility is different from the other ones because of the following reasons:

- 1- This definition introduces the agility based on the input, output and process. So it can be said that there is kind of systematic approach in this definition.
- 2- The competitive basis of the agility is clearly specified and they are the speed, flexibility, innovation, quality and profitability.
- 3- In this definition, there are three levels: individual, organizational and inter-organizational. However the individual and organizational levels are introduced before by Goldman and et al. (1995), but Yousef and his et al. add the inter-organizational level to these, in this definition.

This definition needs four main concepts of the agility that include the competition based on the key competency, organizing a virtual organization, ability of restructure, and the method of access to organizational agility proposed by Yousef and et al. according figure 1. According to this method, every organization needs to identify and training of its competency to access to the agility. These competencies specify what kinds of abilities the organization has. Then the barriers to response to the changes or the factors which prevent the organization to reach to its goals are identified and the solutions to fight with them are designed. These solutions must improve the competitive position of the organization besides the resolve the barriers.



Figure 1: General Method to Get the Agility

Also, Yousef and et al. (1999) introduced 32 index place them in four categories: the key competencies, virtual organization, ability of restructure, and knowledge-oriented organization. It's supposed that these indexes are the main dimensions of agility and show the general behavior of an organization.

#### Table 1: indexes of Agility in the Organization

	Simultaneously Execution Of The Activities			
	Enterprise Integration			
Integration	Employees' Easy Access To The Information			
	Ability Of The Economic Activity in the Different Fields Of Business			
Competence	Developed Business Activities With Rare Ability To Copy			
Team Creating	Decentralized Decision Making			
	Activity Of Powerful People In The Form Of Work Teams			
	Activity Teams			
	The Presence Of Teams In All Areas Of The Organization			
	Awareness OfNew Technologies			

	LeadershipAndExcellenceIn Applying TheNew Activities					
	Promoting Technology OfKnowledge,Skills					
Technology	Flexible ManufacturingTechnology					
	To ObserveThe QualityIn All Cycles Of The Product Life					
	HavingProducts WithHigh Value					
	The Appropriate InitialDesign					
Quality	Short Cycles OfProduct Development					
	CultureChanging					
Changing	Continuous Improvement					
	A Relationship Based On Trust With Customers And Suppliers					
	The Rapid Collaborative Partnerships					
	Close Relationship With Suppliers					
Cooperation	Strategic Relationship With Customers					
	<b>Response To Requirements Changing Of Market</b>					
	Introduction Of New Products					
Market	Customer-Based Innovation					
	TrainingAnd Continuous Development					
	Learner Organization					
Education	Multi-Skilled And Flexible Staff					
	Improving Of Staff Skills					
Welfare	Employee Satisfaction					

The main point is identifying the relationship among the indexes to combine and at last turning them into the strategic competitive competencies.

This study that has been set based on the above model, prioritizes the organizations based on the introduced criteria and gives a viewpoint to every organization to compare its grades of indexes with the other ones.

#### METHODOLOGY OF THE RESEARCH

If the set of acceptable responses are countable, the problem is called "Multi-Indexes", like choosing an appropriate technology among some existing technologies or choosing a house among some ones. In this problem, the criteria are qualitatively or qualitatively proposed and the decisions such as assessment, the prioritizing or choosing among the available alternatives is considered. The preferred method of this research is the combining of AHP/TOPSIS methods that are multi-indexes decision-making methods. In order to know better the preferred method, the research problem has been solved step by step with a little explanation.

**First Step**: defining, identifying and weighting of agility factors As it was mentioned before, the agility factors of proffered model is are as follows:

- 1- Integration
  - Simultaneously Execution Of The Activities
  - Enterprise Integration
  - Employees 'Easy Access To The Information
- 2- Competence
  - Ability Of The Economic Activity In The Different Fields Of Business
  - Developed Business Activities With Rare Ability To Copy
- 3- Team Creating
  - Decentralized Decision Making
  - Activity Of Powerful People In The Form Of Work Teams
  - Activity Teams
  - The Presence Of Teams In All Areas Of The Organization
- 4- Technology
  - Awareness Of New Technologies
  - Leadership And Excellence In Applying The New Activities
  - Promoting Technology Of Knowledge, Skills
  - Flexible Manufacturing Technology
- 5- Quality
  - To Observe The Quality In All Cycles Of The Product Life
  - Having Products With High Value
  - The Appropriate Initial Design
  - Short Cycles Of Product Development
- 6- Changing
  - Culture Changing

- Continuous Improvement
- 7- Cooperation
  - A Relationship Based On Trust With Customers And Suppliers
  - The Rapid Collaborative Partnerships
  - Close Relationship With Suppliers
  - Strategic Relationship With Customers
- 8- Market
  - Response To Requirements Changing Of Market
  - Introduction Of New Products
  - Customer-Based Innovation
- 9- Education
  - Training And Continuous Development
  - Learner Organization
  - Multi-Skilled And Flexible Staff
  - Improving Of Staff Skills
- 10- Welfare
  - Employee Satisfaction

Second Step: Paired Comparison Table

Here, it's been obtained a paired comparison table in order to compare them. Indexes Paired comparison table of this study has been obtained by 15 top administrators and 15 industries, as follows:

	Integrati on	Compe tence	Team Creating	Technolo gy	Qualit y	Changin g	Cooperatio n	Marke t	Educatio n	Welfare
Integration	1	1/4	1/3	1/4	1/6	1/5	1/3	1/6	1/4	1/3
Competence	4	1	3	1	1/5	1/4	3	1/5	1	1/3
Team Creating	3	1/3	1	1/4	1/2	1/5	1/2	1/4	4	1
Technology	4	1	4	1	1/2	1/2	5	1/2	2	4
Quality	6	5	2	2	1	1	2	1	2	3
Changing	5	4	5	2	1	1	4	1	3	5
Cooperation	3	1/3	2	1/5	1/2	1/4	1	1/6	1	2
Market	6	5	4	2	1	1	6	1	2	5
Education	4	1	1/4	1/2	1/2	1/3	1	1/2	1	3
Welfare	3	3	1	1/4	1/3	1/5	1/2	1/5	1/3	1

 Table 2: Paired Comparisons of Agility Index

**Third Step**: Calculate of the Weight of Elements in Analytical Hierarchy Process Method According to the received data and calculations (arithmetic average), it's been obtained the below table.

Table 3: the Final Weights of each Index

Index	Integration	Competence	Team creating	Technology	Quality	Changing	Cooperation	Market	Education	Welfare
Priority	0.078	0.090	0.089	0.111	0/111	0.137	0.081	0.142	0.078	0.083



Figure 2: Diagram of Indexes Rating

As it's observed in figure 2, prioritizing of the indexes with respect to the weights and the importance of each index to the other indexes is obtained by the top administrators and experts with over 20 years of experience in work.

So the order of indexes prioritizing is as follows:

Market>Changing>Quality · Technology>Competence>Team creating> Welfare>

Cooperation>Education>Integration

Forth Step: Non-Scaling of Decision Matrix:

According to the responses of each questionnaire and turning them to the quantitative data, it's been obtained an average from each component that the obtained data is multiplied by the weight of the component. The result is as follows:

	Integration	Competence	Team creating	Technology	Quality	Changing	Cooperation	Market	Education	Welfare
Α	0.83	0.91	0.66	0.87	0.97	0.93	0.47	0.94	0.87	0.62
В	0.87	0.81	0.54	0.82	0.95	0.91	0.44	0.86	0.81	0.54
С	0.70	0.80	0.56	0.70	0.89	0.78	0.36	0.72	0.77	0.57
D	0.82	0.89	0.66	0.86	0.95	0.99	0.43	0.89	0.82	0.62
Е	0.75	0.84	0.63	0.83	0.95	0.98	0.45	0.94	0.81	0.67
F	0.81	0.85	0.65	0.87	0.95	0.97	0.48	0.95	0.85	0.62
G	0.78	0.83	0.60	0.81	0.95	0.96	0.48	0.89	0.79	0.58

**Table 4: Non Scaled Matrix in Macro Industries** 

#### Table 5: Non Scaled Matrix in small industries

	Integration	Competence	Team creating	Technology	Quality	Changing	Cooperation	Market	Education	Welfare
Н	0.71	0.80	0.53	0.70	0.94	0.92	0.45	0.91	0.67	0.54
Ι	0.75	0.81	0.53	0.73	0.94	0.91	0.40	0.90	0.67	0.52
J	0.74	0.70	0.45	0.80	0.88	0.94	0.44	0.87	0.67	0.50
K	0.71	0.72	0.53	0.76	0.86	0.99	0.44	0.82	0.66	0.52
L	0.62	0.70	0.52	0.60	0.93	0.78	0.42	0.90	0.67	0.45
Μ	0.62	0.77	0.53	0.76	0.91	0.91	0.39	0.85	0.72	0.46
Ν	0.66	0.78	0.54	0.76	0.90	0.99	0.40	0.88	0.75	0.47
0	0.68	0.73	0.54	0.72	0.96	0.91	0.41	0.88	0.71	0.39

Fifth Step: ideal and anti-ideal solutions

If the ideal solution is indicated with  $A^*$  and non-ideal solution with  $A^-$ , for each index at every level of industries they are as follows:

#### **Macro Industries**

 $A^* = \{0.83, 0.91, 0.66, 0.87, 0.97, 0.99, 0.48, 0.95, 0.87, 0.67\}$ 

 $A^{-} = \{0.75, 0.81, 0.54, 0.80, 0.96, 0.99, 0.45, 0.91, 0.75, 0.54\}$ 

## **Small industries**

 $A^* = \{0.75, 0.81, 0.54, 0.80, 0.96, 0.99, 0.45, 0.91, 0.75, 0.54\}$ 

 $A^{-} = \{0.92, 0.70, 0.45, 0.60, 0.86, 0.78, 0.39, 0.82, 0.66, 0.39\}$ 

Sixth Step: Calculate of Similarity Index

The value of similarity index must change from zero to one. Whatever the option is more similar to the ideal, the value of similarity index will be closer to one.

To rate the alternatives based on the value of similarity index, the alternative with the highest similarity index is placed in the first rate and the alternative with the lowest similarity index is placed in the last rate. **Macro Industries**:

	Far From Ideal	Far From Anti- Idea	Similarity Index
Α	0.0024	0.1280	0.9814
В	0.0375	0.0421	0.5286
С	0.1509	0.0004	0.0029
D	0.0053	0.1012	0.9503
Е	0.0081	0.1035	0.9275
F	0.0034	0.1206	0.9728
G	0.0187	0.683	0.7854

## Table 6: Calculate of Similarity Index in Macro Industries

#### Small industries:

 Table 7: Calculate of Similarity Index in small industries

	Far From Ideal	Far From Anti- Ideal	Similarity Index
н	0.0109	0.0603	0.8467
I	0.0094	0.0622	0.8683
J	0.0209	0.0601	0.7418
К	0.0194	0.0645	0.7684
L	0.0866	0.0099	0.1022
М	0.0234	0.0364	0.6093
N	0.0129	0.0655	0.8393
0	0.0282	0.0358	0.5595

Seventh Step: methods prioritizing

## Macro Industries:

A > F > D > E > G > B > C

### Small industries:

I > H > N > K > J > M > O > L

## CONCLUSION:

The results indicate that the indexes such as market, changing, technology, and quality that is directly associated with the production, are more effective than the other indexes, and the organizations should consider the following criteria more than past.

- Customer-Based Innovation
- Strategic Relationship With Customers
- Response To Requirements Changing Of Market
- Introduction Of New Products
- Culture Changing
- Continuous Improvement
- Leadership And Excellence In Applying The New Activities
- Promoting Technology Of Knowledge, Skills
- Flexible Manufacturing Technology
- To Observe The Quality In All Cycles Of The Product Life

- Having Products With High Value
- The Appropriate Initial Design
- Short Cycles Of Product Development

According to the results, the industries are prioritized based on the rates of agility. These results are obtained by comparison of the agile organizations and also the indexes that are placed in first priority:

The agile organizations have almost obtained the high rate in all criteria. It means that the organizations doesn't have single-dimensional look and it's been considered all dimensions of the organization. This consideration indicates a considerable planning and management.

The statement of Souba and Goldman related to the agility mentioned in chapter two is repeated in this part: the agility is ability to respond effectively to a customer. The agility is manufacturer's abilities to quick respond to unpredictable changes.

It's been suggested that the researchers who are interested in doing this research in the other provinces, use the similar industries in order to use easily from the results and creating the effective competition.

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