

## **Determination of effective criteria in Iranian facial tissue industries with respect to customer's perspective**

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### **Abstract**

There are various facial tissues that are used in the country. The products are deferent together in quality and prices. Some of these products are made in local factories and almost of them are entered from another countries in mass form and then they are packaged in the internal firms and distributed among the sellers to final using. Of course all the products have to get acceptance stamp from the local organization before distributing. For determining effective criteria of the product with respect to customer's perspective, AHP method and Expert Choice software has been used to calculate weighing value of facial tissue criteria. The results showed softness, time of absorption, appearance quality, basis weight and price criteria have high priority respectively.

### **Introduction**

We did the current research to determine effective criteria in facial tissues which are used by the consumers. Acknowledgment of the criteria of tissues with respect to the consumers is very important and will affect on them market demand.

Annual per capita of facial tissue in the world is 3 kg and annual per capita in the United States, Africa, Northern Europe, is 20, 0.36 and 15 kg, respectively.

In Iran there are 90 factories that produce facial tissue and nominal capacity of facial tissue is 43076 Ton/year. There are some parameters which affect on final price of facial tissue are as follows: utilized raw material, location of the units, kind of technology, man force costs and production capacity. Because there are different kinds of the product in quality and prices it is necessary that customers get some information about specifications of the products which they use of them everyday. After this process they can suggest to improve the products to the factories.

There are 24 criteria for facial tissue which has been measured by Iranian industrial researches and standard organization.

For acknowledgment of effective criteria which affect on selecting facial tissue by using experts of the products, marketing experts and information in Iranian industrial researches and standard organization in number of 627, We selected 8 of them with regard to customer's interested. The attributes considered most relevant from the consumer's perspective are (1) softness, (2) humidity, (3) price, (4) appearance quality, (5) brightness, (6) basis weight, (7) stretch, (8) tensile. To select the best facial tissue, AHP method was applied. This method was first invented by Thomas L. Saaty in 1970s, and it is used in decision making processes which have qualitative and quantitative criteria (Saaty, 2000). There is a comprehensive example how to make the decision on national missile defense program. The US government faces the crucial decision whether or not to commit itself to the deployment of a National Missile Defense (NMD) system. By applying an AHP model, deploying NMD alternative is the best alternative (Saaty, 2001d). One of the main advantages of this method is its use in group decision making, in such a way that it will integrate the group members' decisions, so that the final and optimized decision contains the decisions of all members (Memariani and Azar, 1995). Azizi(2005) applied AHP method to determine effective criteria for selecting the best choice of raw material procurement in paper making factories in Iran. The decision has been done with base on benefits, costs, opportunities and risks. The results showed No harmful on environment has the highest priority in terms of benefits. Azizi et al. (2003) used AHP (Analytical Hierarchy Process) method to determine effective criteria for location selection of plywood and veneer units. They identified 25 criteria and sub-criteria in this research. Samari et al (2005) presented that how the analytical hierarchy process (AHP), as a multi-criteria decision-making techniques, can be effectively helpful in selecting on

appropriate model for forestry extension. The result showed AHP technique, as employed in the research, reveals that present situations fail to regard privatized extension model as an appropriate one for Zagros Area. Memariani et al (1992) applied AHP method to determine the rate of priority of the effective criteria for selection of the best variety for wheat seed, and believes that this method has provided significant facilities for analysis of decision making issues and determination of effective criteria in decision making process. Chen and Li (2001) state in their paper that AHP is useful in making business decisions, such as the evaluation of alternative marketing strategies, the choice of candidates for jobs. Comments and discussions regarding the AHP method are also provided. Towfigh (1993) believes that decision making should be performed in a multi-dimensional atmosphere. In this connection, after determination of evaluation criteria (accessibility to raw materials, transportation network, accessibility to sales market, ...slope, climate, application, capability, and etc) and formation of bi-comparison matrix, their rate of priority will be calculated and determined by AHP method.

## Materials and Methods

### Features of the criteria affecting in selection of the facial tissue

The criteria are described as follows.

**1. Softness:** softness is very important specification which there are not any normal measurement for it. Every factory has especial method to measure it. One method is Hand feel which the criteria is measured with 2-6 ranking. Another measurement is inverse of softness which is ruggedness. In Iranian standard, amount of acceptable measurement is 110 milli Newton. The range of ruggedness is 20-50 milli Newton.

**2. Humidity:** humidity divided in two sub criteria as follows: Moisture content and absorption time.

**2.1. Moisture content:** In Iranian standard available moisture in the tissue is 8% maximum and the range of moisture content is 2.5-5%.

**2.2. Absorption time:** maximum time of absorption is 0.02 millimeter of 20+2 or 20-2 centigrade degree distilled water in one sheet of facial tissue. In Iranian standard this time is maximum 10" and range of time is 2-3".

**3. Price:** price of one box of facial tissue with 100 sheet and 2 layer is 4000-4500 rails.

**4. Appearance quality:** appearance quality divided in two subsections which are as follows: Box and tissue.

**4.1. Box:** the box is some characters includes design, appearance and color, packaging and variety.

**4.2. Tissue:** tissue has three character includes design, color and legend.

**5. Brightness:** In Iranian standard minimum of brightness in white facial tissue is 80% and in color facial tissue is 78%. The range is 95-80%.

**6. Basis weight:** basis weight is unit weight of the paper surface and is measured in  $\text{g/m}^2$ . The range is 27-36  $\text{g/m}^2$ .

**7. Stretch:** pliature of the paper surface which is generated to increase of contact surface and give rise to increase of water absorption speed in the paper. The acceptable range is 8-18%.

**8. Tensile:** the tensile has three sub criteria which are as follows:

**8.1. Dry tensile MD:** the criteria is unit of resistance to tensile of one tissue sheet in dry position and in machine longitudinal side (MD) which is force gram on 15 millimeter of width. The acceptable range is 200-700gf.

**8.2. Dry tensile CD:** the criteria is unit of resistance to tensile of one tissue sheet in dry position and in machine latitudinal side (CD) which is force gram on 15 millimeter of width. The acceptable range is 70-350gf.

**8.3. Wet tensile MD:** the minimum of tensile resistance in machine longitudinal side (MD) and wet position is 15gf. With regard to the testing method we have only one range for this criteria and the maximum is 55gf.

## How Questionnaire Prepared

We did interviews with the marketing and product experts and were collected information in Iranian industrial researches and standard organization. Then with respect to customer's perspective 8 criteria were recognized which are effective on facial tissue. After the hierarchy of these criteria were drawn up, a questionnaire was distributed among 6 experts from university, producers, conservation organization of customers and producers rights, marketing expert and industrial researches and standard organization as a two-by-two comparison between criteria and sub-criteria to determine the rate these criteria (weighing value) influence on the facial tissues.

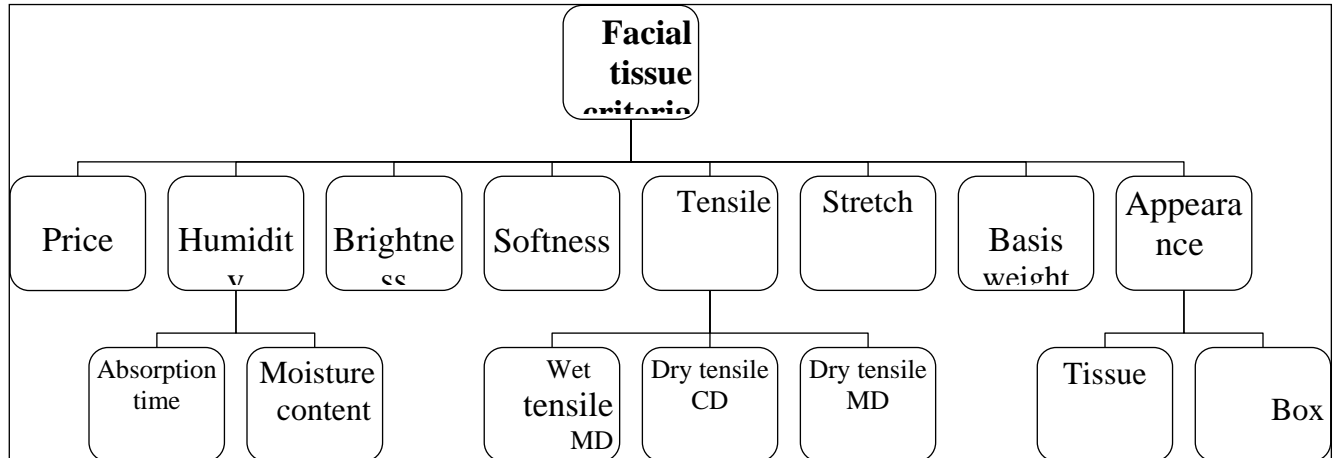
**Analytical Hierarchy Process method (AHP) for determining of priority rate (weighing value) of each one of the criteria**

AHP is a method for decision-making by which we can make some decisions which are dependant on several criteria or multi-criteria decisions. By AHP method, first the given structure and then the criteria relevant to decision making are compared to each other and then the priority rate of each one is determined. Numbers which are used in two-by-two comparison are from 1 ÷ 9 to 9 which is in the form of a standard scale (Saaty,2000).

Application of AHP is based on the following three principles (Asgharpoor, 1999):

- A) Establishment of a structure and a rank-based from for the problem
- B) Establishment of preferences by two-by-two comparison
- C) Establishment of logical consistency from measurement

The AHP is basically a simple, efficient technique for problem solving . The following step by step example demonstrates this simplicity; it can also serve as a model for using the process to solve other problem. A firm wants to determine consumer preferences for three different kinds of facial tissue. Given the consumer's "bounded rationality" that is, the fact that consumers do not act on perfect or complete information and are satisfied with less than the economically most rational choice we can design best distinguish among the attributes by dividing them into this small number of intensity categories. The resulting hierarchy is shown in Figure 1.



**Figure 1: Hierarchy of effective criteria for Facial tissue industry**

## Results

### Weighting value of the effective criteria and sub –criteria for the facial tissues

Weighting value of the effective criteria and sub-criteria for the facial tissues plus geometric mean of comparison matrices is put forward here as results of group decision making by a group of the experts with the aid of Expert Choice Software 2000 (Saaty, 1998), (Figures 2-10).

	basis weigl	stretch	tensile	softness	brightness	humidity	price	apearance
basis weight		1.88597	1.4678	4.54846	1.5184	1.5283	1.0327	1.18351
stretch			3.09268	4.23264	1.01772	2.01783	1.90637	4.73361
tensile				1.86239	2.72738	1.04101	1.2849	1.64392
softness					3.30193	1.80861	2.31995	1.47978
brightness						2.06759	1.55246	2.90204
humidity							1.51319	1.44225
price								3.76755
apearance quality	Incon: 0.02							

Figure2: Compare the relative importance with respect to goal

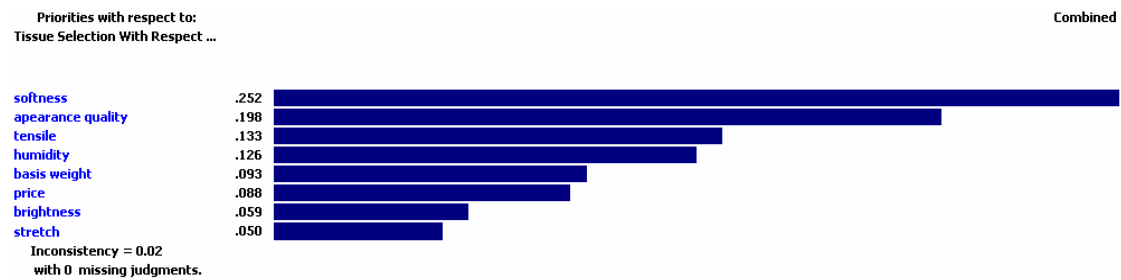


Figure 3: Result of comparison with respect to the goal

	dry-tensile	dry-tensile	wet-tensile
dry-tensile MD		3.75848	1.0801
dry-tensile CD			5.12278
wet-tensile MD	Incon: 0.01		

Figure 4: Compare the relative importance with respect to the tensile

Priorities with respect to:  
Tissue Selection With Respect To  
>tensile

Combined



Figure 5: Result of comparison with respect to the tensile



Figure 6: Compare the relative importance with respect to the humidity

Priorities with respect to:  
Tissue Selection With Respect To  
>humidity

Combined



Figure 7: Result of comparison with respect to the humidity



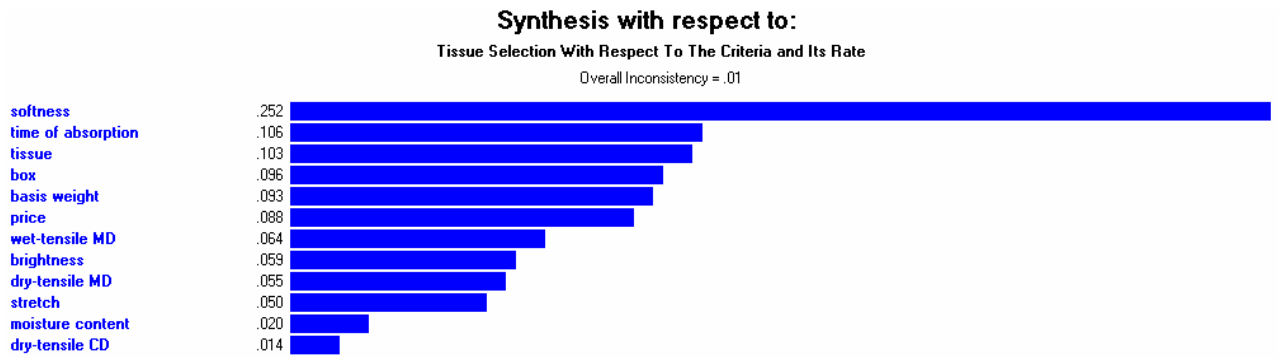
Figure 8: Compare the relative importance with respect to appearance quality

Priorities with respect to:  
Tissue Selection With Respect To  
>appearance quality

Combined



Figure 9: Result of comparison with respect to appearance quality



**Figure 10: Result of final synthesis**

### Discussion and conclusion

With respect to the result, softness criteria, has 0.252 weighing value which is the highest priority for the facial tissue and overall consistency ratio of the current research is 0.01. Of course to reach to proper softness with respect to customer' perspective and also holding of resistance level that is necessary for facial tissue performance we need high skillful in paper making process. There are several parameters which affect on facial tissue softness as follows: paper combination or furnish component, tensile resistance level of machine latitudinal side (CD), tensile ratio, tensile percent, kind of rumple, drying, volume of roller, accordingly to make of product which be acceptable, completely, have to be generate a balance among of the parameters with regard to customer's perspective. Time of water absorption has 0.106 weighing value with second priority. Capability of liquid absorption is a common and initial specification in all of the facial tissues. If the facial tissue has not enough capability of absorption it will has not desirability for final using. Some of the various pulps which are used for thin papers are very absorptive. For example in craft pulp's process many of hydrophobic materials are deleted and the pulp need to water and generates thin absorptive paper while sulfite pulps do not generate similar absorption capability sheet. To control of absorption capability of the thin papers and solve the problem usually is added moisturizer material in the pulp or with adjustment of the machine in the moisture final water system and the dryer part it will be possible.

The tissues which are used to drying and liquid absorption have to storage the liquid similar to the sponge. Tissue and box criteria which are related to appearance quality have third and fourth priorities with 0.103 and 0.096 weighing values respectively. A group of esthetic specifications are important in competition market. The demand for the tissues with ornament colors and designs which are compatible with kitchen, house and bathroom decoration is very high. Appearance fairness is very important for success of paper products in consumption market. Basis weight has fifth priority with 0.093 weighing value. Although there is minimum weight with regard to standard regulations for the tissues but fineness of the paper is not acceptable for the consumer, because of, with proportional increasing of the weight, capability of water absorption is increased, which is notable factor in Iran market. The price has sixth priority with 0.088 weighing value. The low price is important criteria to select of the final product but the price has not high priority in compare with what mentioned above criteria. Although the cheaper product is desirable to the consumer perspective but they do not agree with decreasing of the tissue quality. In past years there was not high pay attention to quality of the products in purchasing but at present the quality is very important factor and some of the firms has sale on a large scale in spite of high price of the product. The wet tensile MD has seventh priority with 0.064 weighing value. The softness is important factor for the tissue meanwhile the resistance and consumption capability is important factors too and during of consumption it does not have to cohere to the hands and face. If the tissue be very softness but it does not be usable it is unacceptable, of course, slight and tensely tissue which it has not softness is unacceptable too. The favorable softness is a combination of favorable surface delicacy and hardness which it procure rumple capability in consumption. On the other hand the weakness softness tissue has undesirable and hard surface delicacy

and the sheet is tensely which in consumption there is not rumple and deformation capability. Almost the criteria were preferred with high priority, there is exception about the price, which has been preferred low priority that is usual. Some of the criteria were preferred with medium priority which are dry tensile MD, brightness and moisture content. With regard to paper making, when the formation is recognized and the furnish is not favorable procurement of tensile resistance is difficult normally. The analysis indicated that high tensile CD give rise to weak softness and a reason for settling of resistance to dry tensile in CD direction.

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