ANALYTIC NETWORK PROCESS (ANP): AN APPROACH TO ESTIMATE THE COLOMBIAN BABY DIAPERS MARKET SHARE

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ABSTRACT

Colombian baby diapers market is aggressive, competitive and dynamic. For this reason, Kimberly-Clark Corporation in Colombia is interested on knowing how the relevant components of the diapers market affect their brands' market share. Considering that the conditions of the problem are adjusted perfectly to the ANP structure, we developed a model based on this tool to estimate the market share for the Corporation diapers' brands. The relevant components on the model are: principal brands, consumer preferences, distribution channels, segments, and Colombian regions. The results were validated by comparing the ANP model's estimations with market share's ones done by Nielsen. These results show that there is no significant difference between the ANP results and the Nielsen statistics. Results also indicate that the model is a good approach to represent this market's behavior, and, therefore, Kimberly Clark Corporation in Colombia is willing to implement the model.

Keywords: Analytic Network Process, market share, diapers

1. Introduction

Colombian Baby Diapers Market is an aggressive, competitive and dynamic market because of its historical stable size, low growth rate and a variety of competitors that offer high quality products at lower prices. Based on this, Colombiana Kimberly Colpapel S.A. (CKC), the Kimberly-Clark Corporation in Colombia, is interested on knowing how relevant components of diapers market affect the three principal brands' market share, with which a competitive analysis of Colombian Market comes into sight. For this issue, a project based on a Decision Theory approach was developed. It considers relevant components' identification, and their influences and importance in the market, as the inputs to estimate the brand's market share.

Based on a diapers market's literature revision, the Colombian Diapers Market could be described as directed by three important brands: Winny, Pequeñín and Huggies. They compete by increasing their

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product's quality (Millward Brown Región Andina, 2008). That is, offering products to the consumers with better quality at the same price. Although their prices are stable, each brand has a sub-brand for each socioeconomic level with a different pricing strategy. To distinguish from the others, each company launches benefit plans as additional services for brand loyalty. Commerce competition in the distribution channel plays as well an important role in this market. Each actor in the channel plays a double roll: as a direct client of the brands and as a direct seller for the consumer. Actually, the most important channels are hypermarkets, supermarkets, drugstores, retail stores, and specialized babies' stores. In Colombia, each region has its own buyer behavior, as commerce behavior does, according to Nielsen. The movements of the market that influence market share could be modeled by a Decision Making Tool: the Analytic Network Process because this method allows us to view the market as a system of interactions among the market's relevant components previously identified (Saaty, 2001).

The first step to model this situation is to obtain the necessary information. In this process are included employees' judges, marketing research studies, and quantitative information. With this information, we identified the market's relevant components: 1) principal brands; 2) consumer preferences; 3) actors in the distribution channel; 4) Socioeconomic Product Segments; and 5) Colombian regions.

2. ANP model for Colombian diapers market

Based on the preceding information, the network that represents this situation was designed. The components are C= $\{C_1, C_2, C_3, C_4, C_5\}$. Each component is defined by its own elements. These definitions are presented on *Table 1* below:

Table 1. Diapers' component definitions

Components	Elements
C_1: Alternatives – Colombian principal diapers' brands	• E_{11}: Winny • E_{12}: Pequeñín • E_{13}: Huggies • E_{14}: Other Brands
C_2: Brands' consumer preferences	• E_{21}: Price • E_{22}: Quality • E_{23}: Advertising • E_{24}: Brand Loyalty
C_3: Actors in the distribution channel	• E_{31}: Hypermarkets • E_{32}: Retail Stores • E_{33}: Drugstores • E_{34}: Specialized Babies' Stores • E_{35}: Supermarkets
C_4: Socioeconomic segments	• E_{41}: Premium • E_{42}: Value • E_{43}: Economy
C_5: Colombian regions	• E_{51}: Atlántico • E_{52}: Antioquia • E_{53}: Centro • E_{54}: Pacífico • E_{55}: Oriente • E_{56}: Cundinamarca

As you can see on *Table 1,* the evaluated alternatives are Winny, Pequeñín, Huggies and other brands. Consumer preferences are determined by price, quality, advertising and brand loyalty. On the other hand, the structure of the distribution channel is based on hypermarkets, retail stores, drugstores, specialized babies' stores and supermarkets. Diapers are classified in three segments: 1) Premium, in which mothers seek well-nice and luxury products for her baby; 2) Value, in which mothers' buyer behavior is based on the degree of the baby's satisfaction; 3) and Economy, in which mothers seek good products at lower prices. Finally, the table defines Colombian regions as Nielsen does, dividing Colombia in 6 regions: Atlántico, Antioquia, Centro, Pacífico, Oriente and Cundinamarca.

The resulting market's network showed below represents the influences among the diapers market's components, modeled in Super Decisions software. These are the influences between the components: $\{(C_1,C_1), (C_1,C_3), (C_1,C_4), (C_2,C_1), (C_2,C_2), (C_3,C_1), (C_3,C_3), (C_4,C_1), (C_4,C_4), (C_5,C_1), (C_5,C_5)\}$. These relationships demonstrate that all the components directly affect the alternatives.
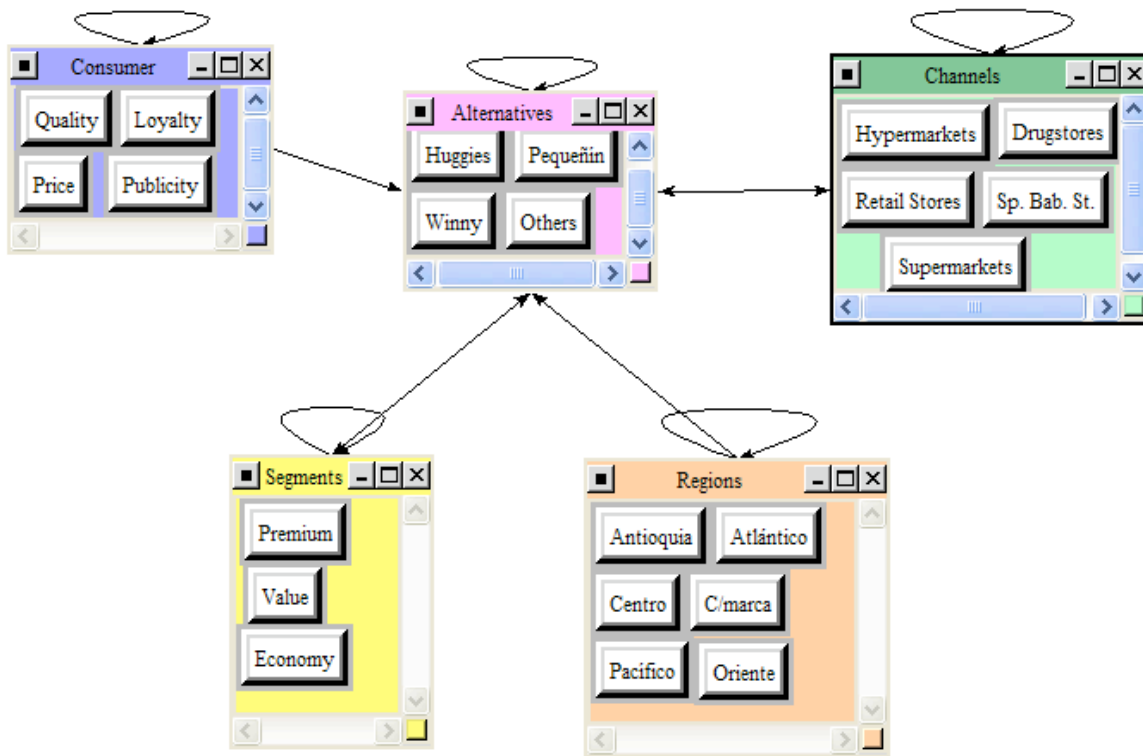

Figure 1. Diapers market's network

Once we have the network, we proceed to construct the component matrix based on the priorities obtained from the pairwise comparison matrices (Saaty, 2001), as the matrix illustrates below.

Table 2. Components' pairwise comparison matrix with respect to the alternatives

	Alternatives	Channels	Segments	Priorities
Alternatives	1	3	4	0.625
Channels	1/3	1	2	0.238
Segments	¼	½	1	0.137

Inconsistency Ratio = 0.0176

This matrix represents the influences of the components on the alternatives. *Table 2* shows that the alternatives influence on the channels and segments. The priorities of each component, with respect to the alternatives, are on the right column of the matrix. This type of matrix has to be filled for each component of the network.

With the priorities previously obtained, the component matrix could be constructed. Each cell of this matrix is filled with its respective priority, which represents the relative importance of the component in the row with respect to the component in the column (Saaty, 2006), bearing in mind the market share estimation. The resulting component matrix is presented as follows:

Table 3. Component matrix

Cluster Node Labels	Alternatives	Channels	Consumer	Regions	Segments
Alternatives	0.625013	0.750000	0.666667	0.750000	0.800000
Channels	0.238487	0.250000	0.000000	0.000000	0.000000
Consumer	0.000000	0.000000	0.333333	0.000000	0.000000
Regions	0.000000	0.000000	0.000000	0.250000	0.000000
Segments	0.136500	0.000000	0.000000	0.000000	0.200000

For all the components, the most important one is the alternatives. With respect to the brands, the channels have an importance of 23.8%, and the segments' component one of 13.6%.

Next, we proceed to analyze the element's pairwise comparison matrices. An example of this type of matrix is shown below on *Table 4*. This matrix represents pairwise comparison of the actors in the distribution channel's components with respect to Huggies.

Table 4. Pairwise comparison matrix of the distribution channel elements with respect to Huggies
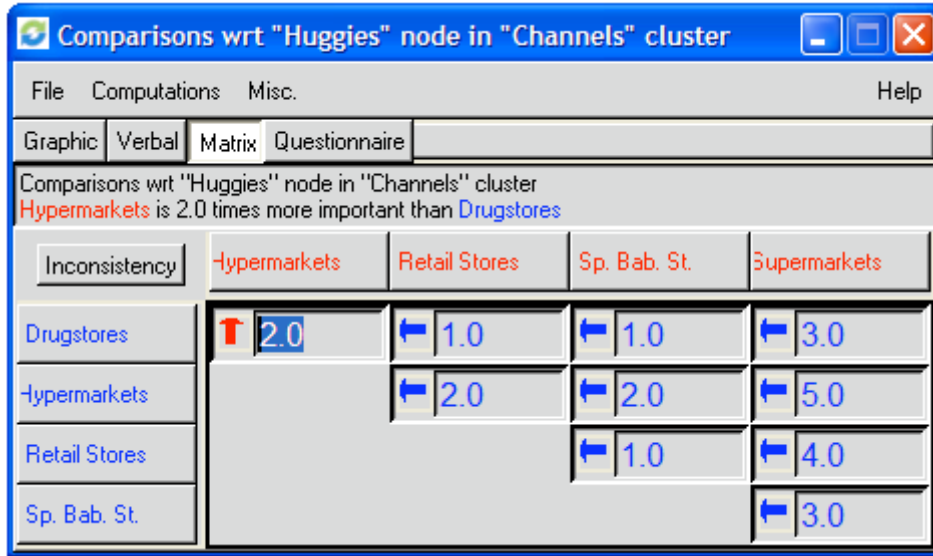

Table 4 gives information concerning to the importance that drugstores, supermarkets, specialized babies' stores and retail store represent to Huggies. For example, the second cell in the first row, moving from the left to the right, indicates that drugstores and retail store are equally important to Huggies. The same comparisons have to be done for all the distribution channels on the matrix to obtain the matrix's priorities shown below.
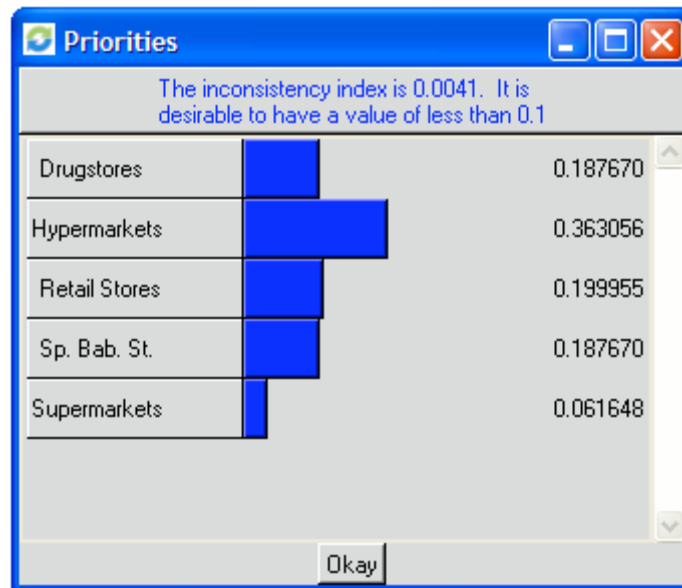

Figure 2. Channel's priorities relative to Huggies

As the reader can see on *Figure 2,* the most important actors in the distribution channel for Huggies are hypermarkets with 36.3% of importance, followed by retail stores with 19.9%, drugstores and specialized babies' stores with 18.8% each one, and ending with supermarkets.

Once we have completed all the pairwise comparison matrix's priorities, we proceed to construct 21x21 elements supermatrix. First, the un-weighted supermatrix is constructed after weighting that matrix with the component matrix, and finally, we obtain the limit supermatrix (Saaty, 2006), represented as follows:

Table 5. Weighted Limit Supermatrix

| | | Alternatives | | | | Channels | | | | | | Seg |
		Huggies	Others	Pequeñín	Winny	Hypermarkets	Drugstores	Supermarkets	Sp. Bab. St.	Retail Store		Value
Alt.	Huggies	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	...	0.171
	Others	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	...	0.031
	Pequeñín	0.198	0.198	0.198	0.198	0.198	0.198	0.198	0.198	0.198	...	0.198
	Winny	0.281	0.281	0.281	0.281	0.281	0.281	0.281	0.281	0.281	...	0.281
Channels	Hypermarkets	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	...	0.047
	Drugstore	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	...	0.043
	Supermarkets	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	...	0.014
	Sp. Bab. St.	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	...	0.041
	Retail Store	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	...	0.062
Q.	Quality	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	...	0.000
Reg.	Oriente	...	...	...	...	...	...	...	...	...	...	...
	Pacífico	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	...	0.000
Seg.	Economy	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	...	0.009
	Premium	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	...	0.025
	Value	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	...	0.077

The results are highlighted by the red rectangle on *Table 5*. Each cell's value is normalized, and represents the estimated value of the market share, as we observe on the next figure.

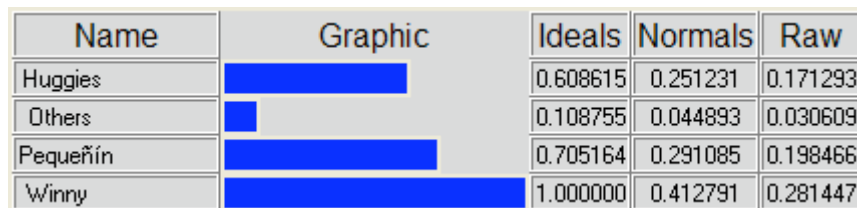| Name	Graphic	Ideals	Normals	Raw
Huggies		0.608615	0.251231	0.171293
Others		0.108755	0.044893	0.030609
Pequeñín		0.705164	0.291085	0.198466
Winny		1.000000	0.412791	0.281447

Figure 3. Diapers market share estimation

Based on the estimations above, the most important brand on Colombian diapers market is Winny with 41.3% of importance, followed by Pequeñín with 29.1% and Huggies with 25.1%, and ending with other brands with the rest of importance.

3. Validation of results vs. actual situation

To understand the significance of these results, we have to compare them with real statistics. The verification of these results is detailed on *Table 6*. The statistics were obtained from Nielsen Colombian Diapers' Market Database. We found out that there is no significant difference between de ANP results and Nielsen statistics.

Table 6. ANP Results vs. Nielsen statistics

	ANP	Nielsen	Difference
Winny	41.28%	40.30%	0.98%
Pequeñín	29.11%	29.90%	0.79%
Huggies	25.12%	25.60%	0.48%
Other Brands	4.49%	5.00%	0.51%

At the same time, this model gives information about the distribution channels' participation in the diapers market and participation in the diapers market by segments. The comparison between these results and their differences is shown below.

Table 7. Channel's ANP results vs. Nielsen statistics

	ANP	Nielsen	Difference
Hypermarkets	22.61%	21.00%	1.61%
Drugstores	20.88%	19.00%	1.88%
Supermarkets	6.77%	7.00%	0.23%
Specialized channel	19.87%	20.00%	0.13%
Retail stores	29.87%	33.00%	3.13%

Table 8. Segment's ANP results vs. Nielsen statistics

	ANP	Nielsen	Error
Economy	8.23%	6.29%	1.94%
Premium	22.61%	14.00%	8.61%
Value	69.16%	78.86%	9.69%

Based on the ANP results, we conclude that the most important channels in the Colombian diapers market are the retail stores with 29.87%, followed by hypermarkets with 22.61%, drugstores with 20.88%, specialized babies' stores with 19.87%, ending with supermarkets. These estimations are similar, if compared to Nielsen Statistics.

Additionally, based on ANP, we conclude that the most important segment in this market is Value with 69.16% of share, followed by Premium with 22.61%, and ending with Economy with 8.23%. The same ranking and similar values are presented in Nielsen statistics, although the comparisons have more differences than the other results mentioned before.

In general, the model's results are good estimations for measuring the brands' participation in the Colombian diapers market, with respect to the Nielsen statistics. Therefore, this ANP model is a good representation of the diapers market's reality.

4. Conclusions

The final results of this project are the identification of the Colombian diapers markets' relevant components and its importance and relationships, with which we obtained a tool to make a brand's competitive analysis, made by Kimberly Clark Corporation in Colombia. The model was created through ANP, which brought on a feasible model for representing this market.

The ANP approach allows us to use quantitative and qualitative information making this methodology flexible. Additionally, the methodology allows us to obtain the estimations faster than the traditional estimation's models, as linear regression or logistic models (Lilien, Gary L., 1946). This, because we count on the experts' perception for making estimations, and therefore, the latest data of diapers' consumption is not needed.

As a final point, it is important to remark that this project is the first example of application the ANP method to estimate market's participation in Colombia. The researching process of papers, monographs, thesis made in Colombia concerning to ANP was made in the most prestigious Colombian universities' websites.

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