

Development of a Decision Model for the Budget Allocation of the Advertisement Investment Portfolio at GM Colmotores

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ABSTRACT: Rational decision making inside organizations is, in great part, warranty for their success. However, and in spite of the existence of analytical tools that ease decision making processes, the own criteria and experience of decision makers keep on being the fundamental variables in structuring the mentioned processes.

In this way, the problem of budget allocation in advertisement is identified as a process of huge impact and is chosen to be studied in order to make it more effective. The project is based on the concepts of the Decision Theory and explores different available analytical tools. Using the Analytic Hierarchy Process (AHP) and integer linear programming, a methodology and a model are developed not only to facilitate the evaluation of the current allocation processes but to recommend a complete strategy based on the outcome of the analysis.

KEY WORDS: Decision Theory, advertisement investment, media planning, budget allocation, Analytic Hierarchy Process (AHP), pair comparison, Expert Choice, integer linear programming, General Motors Colmotores, Chevrolet Alto, Chevrolet Astra, Chevrolet Taxi Diesel.

1. INTRODUCTION

The decision making process is critical for organizations to be successful. However it is evident that the use of formal methodologies that ease the tasks of decision makers and offer them a greater chance of making better decisions, is not yet generalized. During the last years, and as a response to this situation, the study and usage of tools proposed by the Decision Theory have been increasing. This discipline offers great advantages still unknown for enterprises, and it is intended to show them through a concrete application in a budget allocation problem.

This case study involves one of the most important matters for organizations: The budget administration of the advertisement investment. With this in mind, and taking into account the strategic marketing plans of General Motors Colmotores, 3 different, but highly representative, vehicle families are selected to create a strategic proposal of investment analysis. Each one of them is studied separately using the chosen decision theory tools and at the end, a methodological proposal for advertisement investment is consolidated.

2. GENERAL OBJECTIVES OF THE PROJECT

1. To describe the way in which advertisement investment decisions are currently made.
2. To make a diagnosis to conduct an evaluation of the way in which this decisions are currently made.
3. To develop a methodology that represents the problem and a model that allows the company to evaluate its advertisement investment allocation strategies in a structured way.
4. To recommend a strategy based on the outcome of the analysis.

3. DOCUMENT STRUCTURE

The document is divided in three chapters, whose characteristics and main results are analyzed as follows:

4. THEORETICAL FRAMEWORK

The objective of this chapter is to describe the theoretical tools used to build up the model. It starts with the definition of the general scope of the decision theory concepts and continues with the analysis of the problem. The different budget allocation processes are described and the theoretical alternatives explored. Finally, the tools to be used are identified and described as well. The AHP is analyzed along with the steps needed to apply it adequately. In the same way, the concepts of optimization (integer linear programming) needed to solve the allocation problem are introduced.

4.1. DESCRIPTION OF PROBLEM

Strategic decision making in advertisement investment in the majority of Colombian enterprises, is a process that involves judgments and actions principally associated to the criteria and experience of the main actors, instead of, to the result of a rigorous study of the intrinsic characteristics of the different media alternatives (radio, television, newspapers, Internet) and the multiple possibilities that each one of them offer.

There is then, a great opportunity to improve the decision making process of media investment inside GM Colmotores, by developing a study that helps building a link with the current procedures. In this way, it is intended not only to optimize the assigned budget but to guarantee the effectiveness of the investments.

CURRENT PROCESSES OF BUDGET ALLOCATION AT GM COLMOTORES

Determination of the annual budget: Expenses in advertisement at GM Colmotores are directly related to the vehicle sales volume. The current process of budget allocation starts with the monthly vehicles and parts and accessories sales forecast for the whole year. In order to get the annual budget estimated amount, 1% of the calculated revenues is taken for that purpose. The forecast adjustment is done on a monthly basis affecting the budget calculus accordingly.

Definition of priorities: The establishment of priorities is mainly achieved in a subjective way taking into account the former year results and the stage in the product life cycle of each model. The models (or vehicle families) of high priority are then chosen, and the time in which, according to the decision makers, the advertisement campaigns will take place is planned. The following table shows an example of the summarized information:

Advertisement Investment Scheduling

Model	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alto												
Sprint												
Swift												
Corsa												
Esteem												
Astra												
Zafira												
Vitara												
Grand Vitara												
Chevy Taxi												
Taxi Diesel												

Positioning Campaign	
Launch	
Low Priority	

Initial Media Planning: The preliminary list, outcome of the planning meeting, is discussed with the advertisement agencies, which use the available tools to them (knowledge, experience and even mathematical models) to formulate an initial media plan for the whole year.

4.2. DESCRIPTION OF THE THEORETICAL ALTERNATIVES

The problematic situation described fits in the framework of Multiple Criteria Decision Methods (MCDM) in which the best alternative is chosen among possible candidates, restrained to the use of attributes or criteria.

A particular case study developed by the London School of Economics¹ that focuses on decision making analysis, is used to analyze three different methodologies and to guide the choice of the one to be used in the proposed strategy. These three methodologies and their basic concepts are described as follows:

Bayesian Analysis: It is a statistical decision making process in which information is updated in terms of probabilities. In order to do so, the Bayes Theorem is used: Relative causes and possible consequences are expressed in terms of conditional probabilities. The Bayesian theory takes initial probabilities from known causes of a sample and modifies them using the results of a new experiment.

Outranking Method (ELECTRE): It is a methodology developed by Roy², and it is based on the principles of the Utility Multi Attribute Theory. It is a procedure that sequentially reduces the number of alternatives faced by the

¹ Philips, Larry, *Hiview and Equity: The Shampoo Case Study*, London School of Economics, http://www.catalyze.co.uk/resources/docs/pdf/catalyze_case_study_shampoo.pdf

² Roy, B., How outranking relation helps multiple criteria decision making, in *Multiple Criteria Decision Making*, Actes du Séminaire «Théorie de la Décision», Beaulieu-Sainte-Assise, France, 6-7 décembre 1973, Ed. CESMAP,

decision maker. The concept of an Outranking relation “S” defines a binary relation within a range of alternatives A. Given two alternatives A_i and A_j , A_i is better than A_j or A_iSA_j if given everything what is known from both alternatives; there are enough arguments to decide that A_i is at least as good as A_j . The objective of the Outranking Methods is to find all the alternatives that dominate other alternatives and are not dominated by any alternative.

Analytic Hierarchy Process (AHP): It is a systematic procedure to represent the elements of a problem. Its rational base consists of the decomposition of the problem in small parts and the formulation of statements through simple pair comparisons that allow the definition of priorities in every hierarchical level. It offers an interesting concept to work with intuitive, rational, irrational and emotional features at the same time. It is a method used to integrate perceptions and purposes in a general synthesis. It does not require statements to be consistent.

In addition, time series are as well considered as a different allocation methodology:

Time Series: The conceptual base for time series’ models is the idea that suggests that the past behavior of a variable can be repeated in the future. If there is a strong relation between consecutive values in a time series, the next value can be predicted.

After these methodologies are studied, their applicability is evaluated taking into account the problematic situation described and the decision to use AHP is made.

IDENTIFICATION OF THE TOOLS TO BE USED

The methodology proposes the use of two complementary tools: AHP and integer linear programming.

In order to apply AHP effectively it is required to follow the next steps³:

1. To structure the decision in a hierarchical model
2. To make the pair comparison of variables (criteria)
3. To estimate the relative weight of the elements
4. To obtain the compounded weights that refer to the final objective based on the estimation of the relative weights

Integer Linear Programming: In this particular case study, integer programming is used as a complement to AHP in order to find a solution involving advertisement costs as a variable.

5. METHODOLOGY IMPLEMENTATION

The first objective of this chapter is to investigate and describe the marketing available information regarding the relevant variables that become the criteria for each one of the chosen vehicle families. Afterwards the model is built.

DEFINITION OF THE VEHICLE FAMILIES

- Chevrolet Alto
- Chevrolet Astra
- Chevrolet Taxi Diesel

This research memo describes the methodology for the Chevrolet Alto (since it is the same for the three cases) and at the end shows the results obtained for the three vehicle families.

The next step is the definition of the target for each one of the vehicle families studied. The variables that define it are called, in terms of the AHP, “criteria”.

VARIABLES THAT DEFINE THE TARGET OF THE CHEVROLET ALTO

- Age: Between 25 and 40 years old
- Income level: 4 and 5 (1 the poorest, 6 the richest)
- Household Income: Between 2 and 5 million pesos monthly
- Education Level: College (Professionals)
- Number of Children: Between 0 and 2
- Marital Status: Singles or young couples

1975, 81-98, J.L. Cochrane, M. Zeleny (eds.), *Multiple Criteria Decision Making*, University of Carolina Press, 1973, 179-201.

³ Zahedi, Fatemeh, *The Analytic Hierarchy Process – A Survey of the Method and its Applications*. University of Massachusetts – Boston (1986)

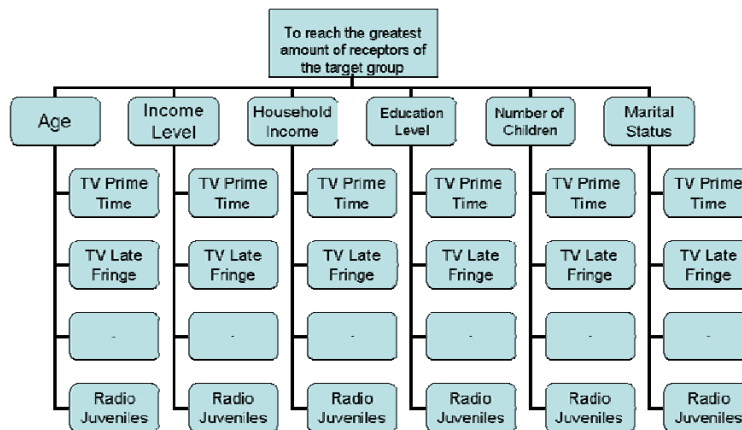
After this is done, the media, in which it is probably going to be advertised, are subjectively selected, along with the possible alternatives within each one of them:

Summary of the advertisement alternatives for each vehicle family

Media / Alternative	Alto	Astra	Taxi Diesel
TV			
Day Time			
Early Fringe			
Prime Time	X	X	
Late Fringe	X	X	
Newspapers			
El Tiempo	X	X	X
La República		X	
El Colombiano	X		
Portafolio		X	
El Espacio			X
El Heraldo	X		X
Vanguardia Liberal	X		X
La Tarde	X		X
Magazines			
Semana		X	
Cambio		X	
Dinero		X	
Cromos	X	X	
Motor	X		X
Automotores			X
Internet			
Terra	X	X	
Uol			
Tutopia	X		
Starmedia			
La Nota Económica		X	
Radio			
RCN Básica	X	X	X
Caracol Básica	X	X	X
Juveniles	X		
Bailable			

In applying AHP for the Chevrolet Alto all the mentioned steps are followed:

1. Definition of the hierarchical structure



In the proposed model all the possible alternatives are included without making any reference to the media they belong to, and ranges are used for grading, as recommended by Robert Dyer, Ernest Forman and Mohammad Mustafa⁴. In this way, alternatives are not compared against each other but classified in a general scale for each one of the criteria.

Each alternative is graded (bad, normal, good or excellent) for each one of the mentioned criteria, according to the information obtained from the media planners based on different studies.

The grade obtained by each alternative in all media for the Chevrolet Alto is as follows:

⁴ Dyer, R., Forman, E., Mustafa, M., *Decision Support for Media Selection Using the AHP*, Journal of Advertising, Volume XXI, Number 1, March 1992

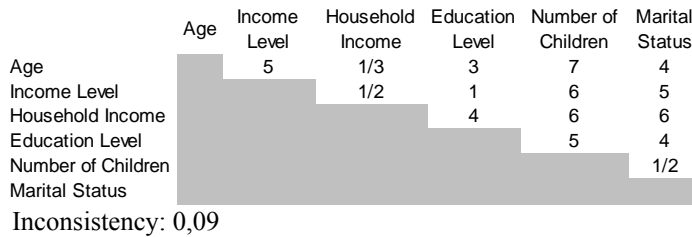
Chevrolet Alto: Grading of Advertisement Alternatives for each Criterion

Media	Age	Income Level	Household Income	Education Level	Number of Children	Marital Status
TV						
Prime Time	Good	Good	Good	Good	Good	Good
Late Fringe	Bad	Bad	Bad	Bad	Bad	Bad
Newspapers						
El Tiempo	Normal	Normal	Excellent	Excellent	Normal	Bad
El Colombiano	Normal	Bad	Good	Normal	Excellent	Normal
El Heraldo	Normal	Bad	Normal	Normal	Good	Bad
Vanguardia Liberal	Normal	Excellent	Normal	Normal	Excellent	Bad
La Tarde	Good	Excellent	Bad	Bad	Bad	Normal
Magazines						
Cromos	Bad	Bad	Normal	Bad	Normal	Bad
Motor	Bad	Normal	Excellent	Excellent	Normal	Normal
Internet						
Terra	Normal	Normal	Normal	Normal	Normal	Normal
Tutopia	Good	Good	Good	Good	Good	Good
Radio						
RCN Básica	Bad	Good	Good	Excellent	Good	Bad
Caracol Básica	Bad	Normal	Bad	Normal	Good	Bad
Juveniles	Excellent	Bad	Bad	Bad	Good	Excellent

2. Pair Comparison

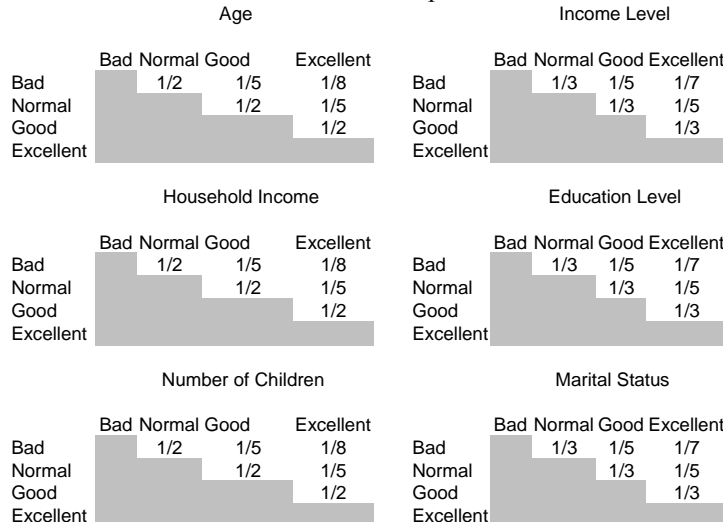
At this point, a scale is defined for comparison purposes and interviews with the decision makers are done in order to capture their own expertise. For each one of the criteria (Age, Income Level, Household Income, Education Level, Number of Children and Marital Status) a relative weight is calculated taking into account the decision makers' opinions and having in mind the general objective: **To reach the greatest possible amount of receptors from the target group of the Chevrolet Alto.**

Chevrolet Alto: Pair Comparison Criteria



The same exercise is repeated for each element of the scale (Bad, Normal, Good, and Excellent) which makes it possible to determine the relative weight each alternative should have according to the decision makers. These comparisons are done for all the criteria and are part of the model input information in the Expert Choice software:

Chevrolet Alto: Pair comparison for each criterion



3. And 4. Estimation of the elements' relative and compound weights

The pair comparisons, made in the point above, are input elements in the Expert Choice software, which through the Principal Eigenvector Method calculates the relative weights of the criteria and of the scale elements for each criterion as well. The results obtained after executing this procedure are presented as follows: In the first place the relative weights per criterion are shown, followed by the weights obtained by each one of the scale grades in the particular case of each criterion.

Chevrolet Alto: Relative Weights Estimation
Criteria

Age	0,286
Income Level	0,141
Household Income	0,375
Education Level	0,121
Number of Children	0,031
Marital Status	0,046

Age

Bad	0,061
Normal	0,122
Good	0,272
Excelent	0,545

Education Level

Bad	0,055
Normal	0,118
Good	0,262
Excelent	0,565

Income Level

Bad	0,061
Normal	0,122
Good	0,272
Excelent	0,545

Number of Children

Bad	0,055
Normal	0,118
Good	0,262
Excelent	0,565

Household Income

Bad	0,061
Normal	0,122
Good	0,272
Excelent	0,545

Marital Status

Bad	0,055
Normal	0,118
Good	0,262
Excelent	0,565

Effectiveness Index Calculation per Media Alternative

Once the grades are obtained, they are aggregated in order to get the grades' weight for each criterion regarding the general objective. The next table shows the results of this exercise.

Chevrolet Alto: Effectiveness Indexes

Media	Age	Income Level	Household Income	Education Level	Number of Children	Marital Status	Chevrolet Alto
TV							
Prime Time	0,07859	0,03861	0,10293	0,03068	0,00797	0,01168	0,2705
Late Fringe	0,01757	0,00863	0,02302	0,00647	0,00168	0,00246	0,0598
Newspapers							
El Tiempo	0,03515	0,01727	0,20585	0,06612	0,00357	0,00246	0,3304
El Colombiano	0,03515	0,00863	0,10293	0,01375	0,01717	0,00523	0,1829
El Heraldo	0,03515	0,00863	0,04603	0,01375	0,00797	0,00246	0,114
Vanguardia Liberal	0,03515	0,07722	0,04603	0,01375	0,01717	0,00246	0,1918
La Tarde	0,07859	0,07722	0,02302	0,00647	0,00168	0,00523	0,1922
Magazines							
Cromos	0,01757	0,00863	0,04603	0,00647	0,00357	0,00246	0,0847
Motor	0,01757	0,01727	0,20585	0,06612	0,00357	0,00523	0,3156
Internet							
Terra	0,03515	0,01727	0,04603	0,01375	0,00357	0,00523	0,121
Tutopía	0,07859	0,03861	0,10293	0,03068	0,00797	0,01168	0,2705
Radio							
RCN Básica	0,01757	0,03861	0,10293	0,06612	0,00797	0,00246	0,2357
Caracol Básica	0,01757	0,01727	0,02302	0,01375	0,00797	0,00246	0,082
Juveniles	0,15719	0,00863	0,02302	0,00647	0,00797	0,02517	0,2285

Using Integer Linear Programming to Solve the Optimization Problem

Working under the assumption that the effectiveness index of each alternative corresponds to the portion of receptors (that belong to the defined target) captured by the use of that specific alternative, the linear programming model is built, defining the objective function as the maximization of the amount of receptors of the target group, taking into account a typical budget restriction.

The probability of generating sales based on advertisement depends on capturing the greatest amount of people that can be influenced by the message and that have the strongest capability to transform this influence into purchasing decisions. In this way, the objective function is defined as follows:

$$\text{Max: } I_1R_1X_1 + I_2R_2X_2 + \dots + I_nR_nX_n$$

Where: I_n : Effectiveness index for each advertisement alternative

R_n : Total amount of receptors in each alternative

X_n : Corresponds to the binary variable (1 or 0) that represents the decision of advertising in that specific alternative or not

The budget restriction is expressed as follows: $C_1X_1 + C_2X_2 + \dots + C_nX_n \leq P$

Where: C_n is the monthly advertisement cost in alternative n

P is the established budget for monthly advertisement for the Chevrolet Alto taking into account the following assumptions:

Annual Budget Amount for Media Advertisement: \$ 5.160 million pesos approximately.

Monthly (typical month)⁵ Budget for Media Advertisement: \$ 430 million pesos.

Monthly Advertisement Budget for the Chevrolet Alto: \$ 200 million pesos

The next table shows the corresponding values for the effectiveness indexes (I), the amount of receptors (R) and the advertisement cost (C)⁶ for each alternative.

Alternative	Effectiveness Index	Number of Receptors	Advertising cost /unit	Monthly Appearances	Total Advertisement Cost
Prime Time	0,2705	1.750.353	\$10.500.000	8	\$84.000.000
Late Fringe	0,0598	1.750.353	\$3.594.485	8	\$28.755.880
El Tiempo	0,3304	1.286.200	\$18.630.000	2	\$37.260.000
El Colombiano	0,1829	320.900	\$18.192.600	2	\$36.385.200
El Heraldo	0,1140	253.900	\$15.390.000	2	\$30.780.000
Vanguardia Liberal	0,1918	85.100	\$3.792.299	2	\$7.584.598
La Tarde	0,1922	22.000	\$4.487.400	2	\$8.974.800
Cromos	0,0847	614.500	\$7.628.000	2	\$15.256.000
Motor	0,3156	1.141.700	\$8.800.000	2	\$17.600.000
Terra	0,1210	202.000	\$47.000	70	\$3.290.000
Tutopía	0,2705	75.600	\$115.000	70	\$8.050.000
RCN Básica	0,2357	227.000	\$1.051.000	20	\$21.020.000
Caracol Básica	0,0820	290.700	\$1.306.818	20	\$26.136.360
Juveniles	0,2285	214.900	\$579.000	20	\$11.580.000

Finally, the calculated values of the main objective function and the budget restriction are introduced in Excel (using the solver function) and the following results are obtained:

$$\begin{array}{ll} X_1(\text{Prime Time}) & = 1 & X_2(\text{Late Fringe}) & = 1 \\ X_3(\text{El Tiempo}) & = 1 & X_4(\text{El Colombiano}) & = 0 \\ X_5(\text{El Heraldo}) & = 0 & X_6(\text{Vanguardia Liberal}) & = 0 \\ X_7(\text{La Tarde}) & = 0 & X_8(\text{Cromos}) & = 1 \\ X_9(\text{Motor}) & = 1 & X_{10}(\text{Terra}) & = 1 \\ X_{11}(\text{Tutopía}) & = 0 & X_{12}(\text{RCN Básica}) & = 0 \\ X_{13}(\text{Caracol Básica}) & = 0 & X_{14}(\text{Juveniles}) & = 1 \end{array}$$

Objective Function Value: 1.489.045 Receptors

Budget Restriction Value: \$ 197.741.880

Results for the Chevrolet Astra

Annual Budget Amount for Media Advertisement: \$ 5.160 million pesos approximately.

Monthly (typical month) Budget for Media Advertisement: \$ 430 million pesos.

Monthly Advertisement Budget for the Chevrolet Astra: \$ 160 million pesos

$$\begin{array}{ll} X_1(\text{Prime Time}) & = 1 & X_2(\text{Late Fringe}) & = 0 \\ X_3(\text{El Tiempo}) & = 1 & X_4(\text{La República}) & = 0 \end{array}$$

⁵ Typical month is defined as that in which it is advertised for 3 vehicle brands approximately. In this case the three brands under study (Alto, Astra, Taxi Diesel)

⁶ Charging cost per unit. In order to get the monthly charges the average of monthly appearances in each media is established. The monthly advertisement cost is the outcome of multiplying these two factors.

$$\begin{array}{rcl}
X_5 \text{ (Portafolio)} & = 1 & X_6 \text{ (Terra)} & = 1 \\
X_7 \text{ (La Nota Económica)} & = 1 & X_8 \text{ (Semana)} & = 1 \\
X_9 \text{ (Cambio)} & = 0 & X_{10} \text{ (Dinero)} & = 1 \\
X_{11} \text{ (Cromos)} & = 0 & X_{12} \text{ (RCN Básica)} & = 0 \\
& & X_{13} \text{ (Caracol Básica)} & = 0 \\
\text{Objective Function Value:} & & & 791.468 \text{ Receptors} \\
\text{Budget Restriction Value:} & & & \$ 150.395.000
\end{array}$$

Results for the Chevrolet Taxi Diesel

Annual Budget Amount for Media Advertisement: \$ 5.160 million pesos approximately.
Monthly (typical month) Budget for Media Advertisement: \$ 430 million pesos.
Monthly Advertisement Budget for the Chevrolet Taxi Diesel: \$ 70 million pesos

$$\begin{array}{rcl}
X_1 \text{ (El Tiempo)} & = 1 & X_2 \text{ (El Espacio)} & = 1 \\
X_3 \text{ (El Herald)} & = 0 & X_4 \text{ (Vanguardia Liberal)} & = 0 \\
X_5 \text{ (La Tarde)} & = 0 & X_6 \text{ (Motor)} & = 1 \\
X_7 \text{ (Automotores)} & = 0 & X_8 \text{ (RCN Básica)} & = 0 \\
& & X_9 \text{ (Caracol Básica)} & = 0 \\
\text{Objective Function Value:} & & & 537.999 \text{ Receptors} \\
\text{Budget Restriction Value:} & & & \$ 65.049.800
\end{array}$$

6. FINAL STRATEGY FORMULATION

The objective of this chapter is to put together two elements: The current way used for budget allocation and the results of the proposed methodology, in order to suggest a general allocation strategy that incorporates the best practices of both methodologies.

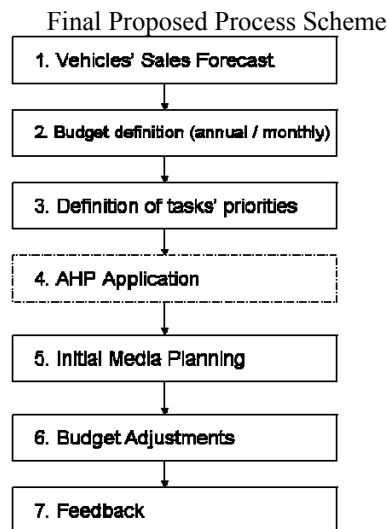
The first step is to describe the elements from the current process that are kept in the new strategy. As a second step, the conceptual development of this study is inserted in the process and finally the proposed strategy is schematically represented.

ELEMENTS THAT REMAIN CONSTANT

- Budget variability
- Forecast Timeframe
- Priorities definition

SCHEME OF THE FINAL PROPOSED PROCESS

This scheme includes the main steps described. The dashed square shows where the AHP methodology is located within the general process of budget allocation:



7. CONCLUSIONS

CONCLUSIONS REGARDING METHODOLOGY

1. The decision theory, as a methodological tool, facilitates complex decision making processes not only at a research level but also at a practical one; helping in finding solutions for typical organizational problems like the one presented in this case study.
2. Although there are multiple theoretical approximations to solve Multi Criteria Decision problems, it is required decision makers' criteria and expertise to be included, not only due to the importance of these elements in real decision making but also to the need of bringing together mathematical models and real organizational situations.
3. Although this study used the AHP methodology proposed by Saaty⁷, there is no reason to affirm that this methodology is better than any other of the ones studied. As it was mentioned before, each problem can be solved using different approaches, and each one of these approaches deserves a particular study which is not part of the scope of this project.
4. The AHP is flexible enough to allow revisions and constant modifications without having to develop new decision models. In the same way, its easiness makes it possible to extend the analysis to different vehicle families, so that the entire product portfolio could be covered.
5. Using integer linear programming can be, as it was in this case, the perfect complement for the AHP. The possibility of adding restrictions that represent real situations is a great opportunity to enrich the proposed model.
6. The team work needed to apply the methodology is one of the points of great benefit and of implicit learning for the decision makers. The integration of concepts and unification of criteria are the best result of a joint effort of a group that usually makes decisions in an individual way.
7. The level of participation generated as a result of the methodology implementation increases the knowledge of the already existing processes. In many cases, the absence of clear processes leads to wrong decision making, and, incorporating AHP, reduces the probability of this happening thanks to the continuous process revision implicit in its application.

CONCLUSIONS REGARDING THE RESULTS OBTAINED

1. The media mix obtained for each one of the vehicle families (Alto, Astra and Taxi Diesel) is very similar to the current one, in spite of having used gross advertisement charges. These results validate the good performance of the current allocation process, in spite of the absence of a more structured methodology.
2. Gross advertisement charges affect, however, the possibility of including traditionally effective media. It is proved then, that better negotiations that allow price discounts in the media charges lead to a better budget allocation.
3. It was not possible to capture the regional advertisement needs for the vehicle families studied through the proposed model. This limitation appears due to the reduced amount of receptors that regional media have, if compared with those of national circulation media. This point deserves a particular analysis since the need of advertising regionally is undeniable.
4. In the vehicle families in which it was tentatively proposed, Internet ended being part of the final media mix after executing the model. This is evidence of its increasing importance and effectiveness, in spite of the still poor penetration it has in the country.
5. The household income is the criterion with the greatest importance in all the vehicle families studied. This is mainly due to the fact that cars in Colombia are still considered as luxurious goods.
6. Age and income level are special variables that strongly influence the purchasing decision. These two criteria appear second in the ranking of importance after the household income.
7. "El Tiempo" (national newspaper) is the most effective advertisement alternative. It is part of the media mix of all the vehicle families studied, in spite of having the highest cost per appearance.

CONCLUSIONS REGARDING THE PROPOSED STRATEGY

1. The AHP is an additional element in the budget allocation process at GM Colmotores. In this way, it reinforces an already effective process and besides, becomes the right link between decision makers inside GM and the advertisement agencies.
2. The final proposed process scheme promotes the creation of a formal decision making group in which managers (Advertising and Marketing) and their teams as well as the advertisement agencies play an active role. The proposed modification assures a more participative model which guarantees better results in the long term.

⁷ Saaty, Thomas The Seven Pillars of the Analytic Hierarchy Process, Proceedings of the International Symposium on the Analytic Hierarchy Process, Kobe, Japan, July (1999)

3. The new scheme demands a greater effort from the advertisement agencies in order to deliver a more structured media plan that takes into account the expertise of the whole decision making group and takes advantage of the knowledge creation inside of it.
4. It could be argued that the addition of a new step in the current process might cause decision makers to lose valuable time. However, using the methodology assures not only the quality of the decisions made, but helps reducing risks like the duplication of efforts or the wrong resources allocation, something that could be much more expensive.

6. RECOMMENDATIONS

1. It could be convenient to use different methodologies like the Bayesian Analysis or the Outranking Method in order to create a comparable decision model. In this way, it would be possible to select in a more accurate way, the most appropriate methodology for the organization.
2. Conducting the analysis for all the vehicle families in order to cover the whole product portfolio is also recommended.
3. In some of the cases (Chevrolet Astra), the budget restriction function shows a residual close to 10 million pesos as an outcome. This motivates the need of sensitivity analysis in which the budget restriction can be modified in a way to make it possible to optimize and use the residuals obtained in other vehicle families' analysis.
4. The use of gross advertisement charges facilitates comparative analysis for any product in any industry. However, it is recommended executing the model taking into account the net negotiated charges. In this way it is possible to guarantee greater precision and to avoid outcomes in which different media may not appear because of their high gross charges.
5. The exercise could be even more enriched if more restrictions are included. For example: Adding a restriction from the type $X_i = 1$, in which, thanks to the existence of already negotiated net charges, it becomes "mandatory" to advertise in certain alternatives due to their low cost.
6. It is necessary to develop additional regional studies that make it possible to identify the best advertisement alternatives in different cities. As it has been mentioned before, this kind of information was not captured in the proposed model.
7. Finally, and taking into account the good results of Internet as an advertisement alternative, developing a deeper study of it as an interesting investment alternative is recommended.

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