

## CHALLENGES AND OPPORTUNITIES IN ROMANIAN MEDIA CHANNELS MIX MODELING\*

Cristina BURLACIOIU<sup>a</sup>, Ioan SIMU<sup>b</sup>, Cristina BOBOC<sup>c</sup>

### Abstract

*Advertisers must understand the effectiveness of their media spending for increasing sales in order to optimize budget allocations. A common and widely used approach is media mix models. Two myths exist in Romania. The first one is that there is a solid know-how in Romania by which the money is allocated between communication channels. The second one is that a small media budget does not give any result. In this paper we prove that it is not worthwhile to use print media as long as nobody reads this anymore. Moreover, as long as the number of internet users increases exponentially, it is better to reduce the TV advertising budgets and increase online advertising, this channel being also cheaper. The analysis is based on 660 Romanian brands organized in different categories (food, beverage, care and cleaning, shops - including online stores, electronics, health services) and their monthly investments in advertising during 2011 to 2014 on various media channels (TV, internet, print, radio).*

**Keywords:** marketing mix, statistical models, Romania.

**JEL Classification:** C55, C52, M37, M31.

### Authors' Affiliation

<sup>a</sup> - Bucharest University of Economic Studies, Doctoral school: Cybernetics and statistics, [cristinaburlacioiu@yahoo.com](mailto:cristinaburlacioiu@yahoo.com)

<sup>b</sup> - University of Bucharest, Romania, [ioan\\_simu@mercury.ro](mailto:ioan_simu@mercury.ro)

<sup>c</sup> - Bucharest University of Economic Studies, Department of Statistics and Econometrics, [cristina.boboc@csie.ase.ro](mailto:cristina.boboc@csie.ase.ro)

\* This work was co-financed from the European Social Fund through Sectoral Operational Programme Human Resources Development 2007-2013, project number POSDRU/187/1.5/S/155656 „Help for doctoral researchers in economic sciences in Romania”

## 1. Introduction

The concept of marketing mix was developed by Neil Borden who got his idea from James Culliton. He states that “an executive is a mixer of ingredients, who sometimes follows a recipe as he goes along, sometimes adapts a recipe to the ingredients immediately available, and sometimes experiments with or invents ingredients no one else has tried” (Culliton, 1948). According to Borden, a marketing program must be a mix of procedures that fit the company resources in terms of money, product line, organization and reputation. The marketing manager has to know that his company is only a small organism in a large universe of complex forces (Borden, 1964).

E. Jerome McCarthy, was the first person to suggest the four P’s of marketing – price, promotion, product and place (distribution). According to him they constitute the most common variables used in constructing a marketing plan. In the long term, all four of the mix variables can be changed, but in the short term it is difficult to modify the product or the distribution channel. (McCarthy, 1960). Marketing mix varies depending on the company resources, market conditions and changing needs of clients. The importance of each element of marketing mix is changing in time and decisions must be taken on each element of the marketing mix by considering its impact on the other elements (Pheng and Ming, 1997). As McCarthy (1960) pointed out “the number of possible strategies of the marketing mix is infinite”.

Within the broad range of marketing elements, media mix modelling typically measure the effectiveness of the advertising spend. Media mix modelling attempt to answer causal questions as: “What was my return on advertising spend on TV last year?”, “What would my sales be if more or less money were spent next year?”, “How should my media budgets be allocated to maximize sales?”.

This paper takes into account the media channel strategies through which the brands could be better known by Romanian consumer. Known as media mix modelling, these analyses typically use a regression or some similar statistical or econometric technique to determine how much each channel impacts your conversion goal. The question addressed into this paper is: “Are the money efficiently allocated between communication channels in Romania?”.

The paper is structured into 3 chapters. The first one is a review of literature on marketing mix modelling. In the second chapter there are presented some methodological aspects about how to analyze the effectiveness of communication channels. The third one is an empirical study based on a survey conducted by Mercury Research agency on 660 Romanian brands, about the effectiveness of communication media channels in Romania. In the fourth chapter there are formulated some conclusions about how to use media channels efficiently and which are the most profitable channels to invest in.

## 2. Literature review

Marketing mix modeling looks at the historical relationships between marketing spending and business performance in order to determine the business drivers and how much should be spend-along with the best allocation across products, markets, and marketing programs. Media

Mix Modeling (MMM) is a top-down approach used to assess how to best allocate spend between media channels in terms of the results obtained: sales, brand awareness, client satisfaction etc.

Clancy, Krieg, et al. (2006) describe in “Market New Products Successfully: Using Simulated Test Market Technology” how to use simulated test marketing (STM), a technology that can help companies dramatically improve the odds of introducing a successful new product or service. By making simulations on 21 products and 4 services they prove why STM is important.

Rubinson (2009) examined three hypotheses on the effectiveness of TV advertising by using seven different databases, accounting for a total of 388 case histories. The first conclusion is that impressions from TV advertising appear to be as effective as ever, even possibly increasing in effectiveness. In terms of specific marketing objectives, the evidence suggests that the impact of TV on sales lift appears to operate primarily by generating brand awareness. This suggest that an effective marketing plan that uses TV should be done in conjunction with other forms of marketing in order to impact all stages of the consumer purchase process.

Media mix models are used by advertisers to measure the effectiveness of their advertising and provide insight in making future budget allocation decisions. Jin, Wang, et al. (2017) propose a media mix model with flexible functional forms to model the carryover and shape effects of advertising in order to make use of prior knowledge accumulated in previous or related media mix models. Moreover they show how to calculate attribution metrics such as ROAS (Return on ad spent) and mROAS (marginal Return on ad spent) from posterior samples on simulated data sets.

Chan and Perry (2017) outline the various challenges such models encounter in consistently providing valid answers to the advertiser’s questions on media effectiveness. The paper also discusses opportunities for improvements in media mix models that can produce better inference.

### 3. Methodological aspects

In this paper we will use a simplified version of the Chan and Perry (2017). They describe a general regression model for media mix modelling by using a parameterized function chosen by the modeler:

$$y_t = F(x_{t-L+1}, \dots, x_t, z_{t-L+1}, \dots, z_t; \Phi), t = 1, \dots, T,$$

where  $y_t$  is the result of advertising (sales, brand awareness, etc.) at time  $t$ ,

$F(\cdot)$  is the regression function,

$x_t = \{x_{t,m}, m = 1, \dots, M\}$  is a vector of advertising channel variables at time  $t$ ,

$z_t = \{z_{t,c}, c = 1, \dots, C\}$  is a vector of control variables at time  $t$ ,

$\Phi$  is the vector of parameters in the model,

$L$  indicates the longest lag effect that media or control variables has on resulting variables (sales, brand awareness, etc.).

In order to enable optimization of media budgets and to capture diminishing returns, the response to a change in one ad channel can be specified by a one dimensional curve which is called the response curve for that channel. A common approach is to have the media variables enter in the model additively.

Additionally, the control variables are often parameterized linearly with no lag effects, so that a media mix model may look like:

$$y_t = \sum_{m=1}^M \beta_m f_m(x_{t-L+1,m}, \dots, x_{t,m}) + \gamma^T z_t + \varepsilon_t,$$

where  $\beta_m$  is a channel-specific coefficient,

$\gamma$  is a column vector of coefficients on the column vector of control variables  $z_t$ ,

$f_m(\cdot)$  captures nonlinearity in the effect of a single channel due to reach/frequency effects,

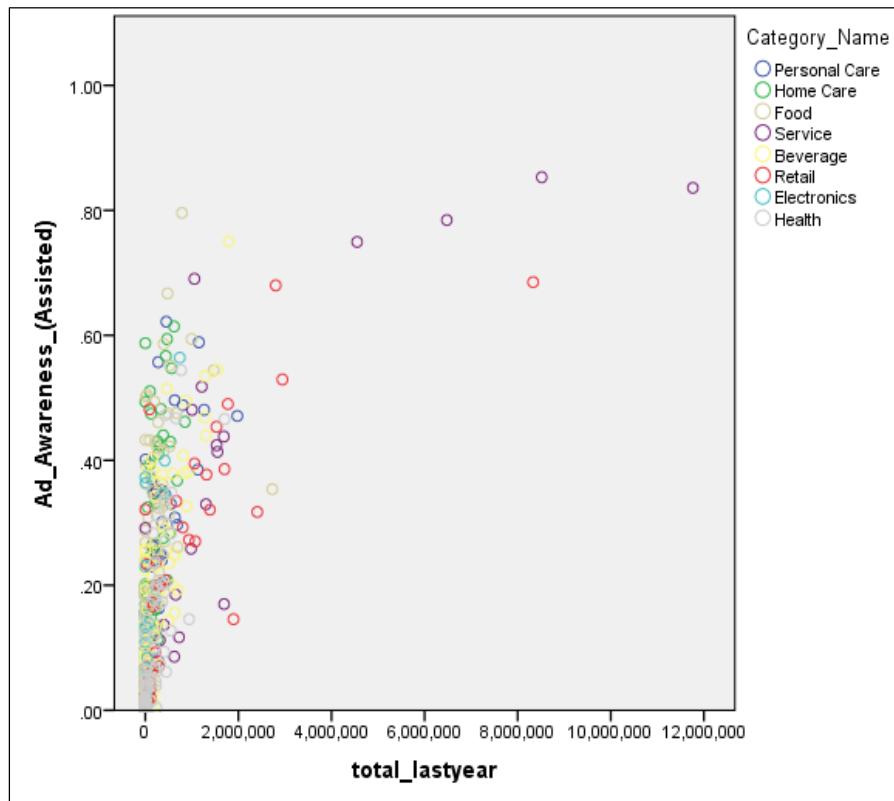
$\varepsilon_t$  is an error term that captures variation in  $y_t$  unexplained by the input variables.

Such a function can be converted to a likelihood and fit to data using maximum likelihood estimation, Bayesian inference or other methods.

#### **4. The effectiveness of communication media channels in Romania**

This paper uses the data from a survey conducted by Mercury Research agency. A representative sample at national level which includes 660 Romanian brands organized in different categories (FMCG - food, beverage, care and cleaning, shops - including online stores, electronics, and health services) is studied. Their monthly investments in advertising during 2011 to 2014 on various media channels (TV, internet, print, radio) are registered. In addition, data regarding brand and advertising indicators (brand awareness, trial, usage and how much the ad was appreciated) are added.

It could be observed that up to 700k EUR investment, brand awareness occurs in direct proportion to the investment. After 700k results are very difficult to be obtained; the increase in ad awareness is obtained with significant additional budget. Moreover, there are very few brands that succeed to raise awareness over 70% (especially services and retail), but only sustained by a huge budget.



**Figure 1. Media investment and ad awareness.**

*Source: own contribution*

Based on market trends, it is rooted that nobody reads print media, so it is not worthwhile to use this channel. Internet grows, therefore the budget of online advertising could be increased from the budget of TV, especially because online advertising is cheaper than TV advertising.

**Table 1. Media channels trend based on 2015 Initiative Media Factbook**

Year	Total (Mil euro)	TV	Print	Radio	Other channel mix (OTH)	Internet
2008	540	337	82	35	70	16
2009	345	222	37	25	42	19
2010	316	209	26	21	33	26
2011	309	200	24	20	31	34
2012	303	193	22	19	29	41
2013	305	193	19	19	28	46
2014	313	198	17	18	28	51
2015 est.	322	205	16	18	27	56

*Source data: 2015 Initiative Media Factbook*

The brands are grouped by media channels into 6 categories:

- investment=0, when no advertising was made within last year on any channel
- TV\_pred (if TV weight is higher than 60%)
- online\_pred (if online weight is higher than 60%)
- radio\_pred (if radio weight is higher than 60%)
- print\_pred (if print weight is higher than 60%)
- all the rest for any other mix (OTH\_mix).

By analyzing the mean of the variable advertising awareness, it could be seen that no investment on media advertising implies an advertising awareness 3 times lower than the average for all. One way ANOVA analysis reveals that at least one group is significant different from another. Post - HOC analysis reveals that TV advertising used as main media channel is producing more awareness than print, online or no investment. And also, the brands that invest significantly on online do not reach the levels of awareness brought by TV or OTH (Table 2, Table 3).

**Table 2. Advertising awareness for brands category based on type of advertising**

Category	No investment	TV_pred	Online_pred	Radio_pred	Print_pred	OTH_mix	Total
Number	325	250	18	15	21	31	660
Mean	0.04	0.27	0.14	0.16	0.13	0.22	0.14
Std.dev.	0.06	0.17	0.14	0.18	0.18	0.23	0.17

**Table 3. Mean differences – Tukey test**

	TV_pred	Online_pred	Radio_pred	Print_pred	OTH_mix
No investment	-0.21***	-0.079**	-0.12***	-0.09**	-0.32***
TV_pred		0.13***	0.09**	0.12*	0.11***
Online_pred			-0.04 <sup>NS</sup>	-0.01 <sup>NS</sup>	-0.24***
Radio_pred				0.03 <sup>NS</sup>	-0.20***
Print_pred					-0.23***

*Note: \*\*\* Significance at 0.01 level, \*\* Significance at 0.05 level, \* Significance at 0.1 level, <sup>NS</sup> Not significant*

In order to estimate the impact of investment of advertising on brand awareness, a stepwise multiple linear regression analysis is used with:

- endogenous variables: ad awareness (assisted) or Usage
- exogenous variables: investment on TV, print, radio and online advertising
- control variables: category of brand by the predominant advertise channel used.

For each endogenous variable, 9 models are estimated. In the first model there are considered all brand categories. Then, for each brand category a different model is estimated. The results obtained for “Ad awareness” as endogenous variables are presented in Table 4 and for “Usage” as endogenous variable are presented in Table 5. It could be observed that the models considering “Ad awareness” as endogenous variable are better than those that consider “Usage” as endogenous variable (in terms of R square). There is only one exception, for electronics category, where the model for “Usage” as dependent variable ( $R^2=0.81$ ) is better than the model for “Ad awareness” as dependent variable ( $R^2=0.63$ ).

TV communication have the highest impact on ad awareness on electronics category (for 10,000 k EUR invested on TV, the advertising awareness increased by 0.77%). Moreover, if the brand chooses to invest also on online and the weight of investment in online is more than 60%, the ad awareness could increase by 0.17%. This could be a cheaper method to obtain growth on awareness due to the fact that budgets on other channels different than TV are considerably smaller. This fact could be underlined also by comparing standardized coefficients. The magnitude of the coefficient tells about how much the dependent variable will change when the independent variable changes by one standard error. This standard error is itself the measure of the variability of the independent variable, which is important, because by contribution to the model we mean not only the sensitivity to change in the input but also the variability of the inputs themselves. Therefore, the real impact of TV investment is only 2.5 times higher than that of being in online predominant category.

**Table 4. Multiple linear regression models considering Ad awareness (assisted) as endogenous variable**

	Model 1 ALL	Model 2 (Personal Care)	Model 3 (Home care)	Model 4 (Food)	Model 5 (Service)	Model 6 (Beverage)	Model 7 (Retail)	Model 8 (Electro nics)	Model 9 (Health)
<i>Exogenous variables</i>									
TV adv.	0.130*** Std=0.41	0.199*** Std=0.38	0.356*** Std=0.35	0.286*** Std=0.50	0.106*** Std=0.67	0.336*** Std=0.66		0.766*** Std=0.79	0.261*** Std=0.52
Radio adv.				-13.97*** Std= -0.27			0.896*** Std=0.81		
Online adv.			1.485*** Std=0.28						3.603*** Std=0.2
Print adv.		1.053*** Std=0.30		7.239*** Std=0.27					
<i>Control variables</i>									
No_inv	-0.091*** Std= -0.26	-0.150*** Std= -0.37	-0.146*** Std= -0.40	-0.160*** Std= -0.43		-0.076*** Std= -0.27	-0.083** Std= -0.17		-0.062*** Std= -0.25
TV_pred	0.072*** Std=0.19				0.122** Std=0.18		0.133*** Std=0.28		
Radio_pred							0.216*** Std=0.24		
Online_pred		-0.227*** Std= -0.31	-0.202** Std= -0.17					0.167** Std=0.30	
Print_pred						-0.053** Std= -0.09			
Oth_Mix	0.124*** Std=0.21				0.210*** Std=0.38	0.047** Std=0.08			
Constant	0.131***	0.207***	0.204***	0.227***	0.029***	0.101***	0.101***	0.075***	0.083***
<i>Model quality</i>									
R <sup>2</sup>	0.57	0.67	0.60	0.62	0.81	0.74	0.82	0.65	0.65
No. obs.	659	47	87	114	42	189	42	26	113

**Note:** \*\*\* Significance at 0.01 level, \*\* Significance at 0.05 level, \* Significance at 0.1 level, <sup>NS</sup> Not significant. Std. means Standardized coefficients.

The highest impact of the other advertising channels different than TV is the one of the Print channel. It influences a lot food category (for 10,000 k EUR invested on print for food category, the advertising awareness increased by 7%). Being on radio for this category might not represent any gain in awareness, but on contrary. Comparing also to the influencers in usage, it seems that the print channel remains consistent as the main driver also in brand usage (for 10,000 k EUR invested on print, the usage increased by 8%).

**Table 5. Multiple linear regression models considering Usage as endogenous variable**

	Model 1 ALL	Model 2 (Personal Care)	Model 3 (Home care)	Model 4 (Food)	Model 5 (Service)	Model 6 (Beverage)	Model 7 (Retail)	Model 8 (Electro nics)	Model 9 (Health)
<i>Exogenous variables</i>									
TV adv.	0.060*** Std=0.29	0.079* Std=0.28	0.206** Std=0.27		0.055*** Std=0.6	0.087*** Std=0.36	0.139*** Std=0.70	0.290*** Std=0.62	0.118*** Std=0.46
Radio adv.									2.249*** Std=0.63
Online adv.		0.630*** Std=0.54				0.465** Std=0.18			
Print adv.				7.978*** Std=0.42					
<i>Control variables</i>									
No_inv	-0.059*** Std= -0.26		-0.063** Std= -0.22	-0.103** Std= -0.39		-0.030*** Std= -0.22			
TV_pred		0.052** Std=0.28							
Radio_pred							0.346*** Std=0.52		-0.315** Std= -0.47
Oth_Mix	0.062*** Std=0.16		0.231*** Std= 0.39		0.085** Std=0.27			0.137*** Std=0.37	
Constant	0.092***	0.047***	0.105***	0.179***	0.027 <sup>NS</sup>	0.048***	0.023 <sup>NS</sup>	0.023***	0.020***
<i>Model quality</i>									
R <sup>2</sup>	0.30	0.62	0.42	0.43	0.56	0.41	0.67	0.81	0.32
No. obs.	659	47	87	114	42	189	42	26	113

*Note:* \*\*\* Significance at 0.01 level, \*\* Significance at 0.05 level, \* Significance at 0.1 level, <sup>NS</sup> Not significant. Std. means Standardized coefficients.

## 5. Conclusions

The question addressed into this paper was: “Are the money efficiently allocated between communication channels in Romania?”. Generally, being into No\_investment category (0 advertising investment in any channel) is a negative factor for almost all brand categories. Investing in any channel might bring approximately 0.1% increase in advertising awareness.

Being predominant on certain type of communication channel will not imply for a fact increasing results. For certain categories it happens that a good mix of communication channels will increase by 0.1 – 0.2% the awareness or usage of the respective brand.

An interesting result is the fact that the important impact of certain channel might conduct to some predominance of that channel in the total budget of investment. There are cases (for example in home care category) when being predominant in the channel with the most influence will affect negatively the awareness. For example, 10,000 k Euro invested in online will increase by 1.5% the ad awareness and keeping a good mix - not online predominant - will mean another 0.2% increase in ad awareness.

Based on market trends, it is rooted that nobody reads print media, so it is not worthwhile to use this channel. Also, radio is another channel that accounts for low budget and being consider insignificant versus TV. However, there are categories that react very well to investment through these channels: food and personal care to print and retail to radio.



## References

1. Baalbaki, Y. (2015). *History of Marketing Mix from the 4P's to the 7P's*. [Online]. <https://www.linkedin.com/pulse/history-marketing-mix-from-4ps-7ps-yousef-baalbaki/>
2. Borden, N.H. (1964). The concept of the marketing mix. *Journal of Advertising Research*, **4**, pp. 2-7.
3. Chan, D. and Perry, M. (2017). *Challenges And opportunities in Media Mix Modeling*. [Online]. <https://research.google.com>
4. Chen, A., Chan, D., Perry, M., Jin, Y., Sun, Y., Wang, Y. and Koehler, J. (2017). *Bias correction for paid search in media mix modeling*. [Online]. <https://research.google.com>
5. Clancy, K.J., Krieg, P.C. and Wolf, M.M. (2006). *Market New Products Successfully: Using Simulated Test Market Technology*. Lanham, Maryland: Lexington Books, Rowman & Littlefield.
6. Culliton, J.W. (1948). *The Management of Marketing Costs*. Boston: Division of Research, Graduate School of Business Administration, Harvard University.
7. Jin, Y., Wang, Y., Sun, Y., Chan, D. and Koehler, J. (2017). *Bayesian Methods for Media Mix Modeling with Carryover and Shape Effects*. [Online]. <https://research.google.com>
8. McCarthy, E.J. (1960). *Basic marketing, a managerial approach*. Homewood, Ill., R.D. Irwin.
9. Pheng, L.S. and Ming, K.H. (1997). Formulating a strategic marketing mix for quantity surveyors. *Marketing Intelligence & Planning*, **15**(6), pp. 273-280.
10. Rubinson, J. (2009). Empirical Evidence of TV Advertising Effectiveness. *Journal of Advertising Research*, **49**(2), pp. 220-226.
11. [https://en.wikipedia.org/wiki/Marketing\\_mix\\_modeling](https://en.wikipedia.org/wiki/Marketing_mix_modeling)