5. DISCRIMINANT ANALYSIS OF THE ABILITIES OF PUBLIC MARKETING SPECIALISTS

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Abstract

The education and selection of the public marketing specialists is a new challenge that has to be met, due to the new development of the area and the interest paid by the public sector to the marketing theory and practice. That is why first we compare the skills required from the marketing specialist in the private sector that could be applied to the public one. This research aims to obtain an evaluation mechanism of the abilities of public marketing specialists using the discriminant analysis. We used a data base of 905 subjects, which provided a hierarchy of 14 considered abilities. The result is a discriminant equation that could be used to calculate personal indices and two reference values utilizable by the decision makers to place the subject in a certain class.

Keywords: public marketing, abilities, discriminant analysis, decision makers
JEL Classification: M31, M10

Introduction

The image of the public sector at a certain moment represents, in fact, the way it is perceived by the citizens as trust level and, to assure a degree of satisfaction that one can consider reasonable. We have to mention that, unlike the private sector where the operators fight to get the supremacy in the client's mind and preferences, the public sector's objective is the creation of an accurate collective image, the assurance of the citizens satisfaction according to their obligations, especially connected to the "fiscal burden", and the avoidance of instances when discontent regarding the way the state officials spend resources can emerge.

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Public marketing represents a solution to reach the desired balance and to assure an efficient communication between the citizen and public administration. “The improvement of activity can be achieved by adopting tools that the private sector uses to carry on its activity more efficiently. At present, many public executives and employees ‘return to school’”. They attend seminars on finance, marketing, public procurement, management, entrepreneurial spirit, strategy and current activities. They take part in courses organized by public administration or business schools, in view of improving their aptitudes and a better understanding of problems”[3].

Using marketing on an even larger scale in the public sector has determined the occurrence of specialists in public marketing. A frequent question waiting for an answer is that related to the qualities/abilities that those who take in this profession should have, as an extension of their determination to be experts in management or marketing, in general.

Beginning with a general set of aptitudes of the marketing specialists, in a previous work[4], their importance for the achievement of a hierarchy based on the emergence frequency in the subjects’ options was studied.

Another fact we see relevant when selecting persons for training them for the public marketing field, or when employing them, is that of the importance that any ability has in taking a decision.

It is of similar importance the knowledge of the abilities and their hierarchy in substantiating the decision of professional orientation of each young person interested to develop a career in this field.

Philip Kotler and Nancy Lee[5] in *Marketing in public sector* point out the following aspects: “The public institutions can benefit if during their mission, of solving issues and achieving results, they apply a marketing approach and mentality. The administration can transform it from a traditional institution, with a weak contact with its public, into a modern one, with a strong contact to the public, that for the money paid by the tax payer offers things of a better value” and underline the necessity “that the public officers get marketing aptitudes and become responsive to the citizens’ needs”, as a form of change implementation.

To establish the importance and weight of each ability in the decision making regarding the existence of the necessary capabilities for this profession, we used the method of multiple discriminant for a sample of 905 individuals.

The method of multiple discriminant is successfully used in the analysis of customer segmentation, consumer behavior, market positioning/segmentation, focus groups and knowledge management, projects and risk management, destination management and marketing, competitive advantage, strategic differences etc., as one could see on the listed references.

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[3] *Kotler Ph., Lee N. (2008)* Marketing în sectorul public*, Editura Meteor Press, Bucureşti, p. 17.*

[4] *A.Grigorescu, C.Bob,* Skills analysis of marketing specialists from public and private sectors, New trends and challenges in management. Concepts of management*, Printing House Vizja Press & IT, Poland, Warsaw 2008, Chapter 37, pp.307-311.*

[5] *Taken from A. Grigorescu, C. Bob, pp.21-22.*

Research Hypotheses

Multiple discriminant analysis[6] is a method frequently used in the study of problems regarding possible classifications. As a statistical technique, it assumes the hypothesis that a component element of a group in relation to a discriminant line that splits the group into two main classes, places itself into a single one. Thus, the method organizes a block of observations or individuals in one of two classes with increased homogeneity.

The major difference between the two classes is given by the specificity of each representative option, expressed in the distance from the discrimination line.

During the research work, the answers of a group of 905 individuals from Bucharest, Timisoara, Târgovişte and Constanța, from the private and public circles, employed or being trained to be employed in a managerial job, were analyzed.

The research target was, among others, the acquisition of data regarding the aptitudes needed by the experts in public sector marketing. In the questionnaire, 14 answers were given under the below mentioned vectorial notation $\{Vi_{,j}\}$, i=0, … ,14, j=1, … ,14:

V_1 - Creativity and inventiveness/resourcefulness
V_2 - Written/spoken or verbal/interpersonal communication
V_3 - Ability to implement improvement/change
V_4 - Analysis capability
V_5 - Synthesis capability
V_6 - Openness to learning
V_7 – Solving matters
V_8 – Ethics
V_9 - Flexibility and adaptability
V_{10} - Reasoning and independence in judgment of ideas/understanding
V_{11} - Self confidence
V_{12} - Team working
V_{13} - Good planner of work
V_{14} - Multi-disciplinary vision/approach/opinions.

As the gathering of the questionnaire data was carried out by self-filling, the subjects were requested to mark it from 1 to 14, in accordance with their personal criteria of hierarchy. Statistically, the vectors $\boldsymbol{V_{i,j}}$ could take values between i= 0 and 14.

Consequently, two categories of answers were obtained:

- a complete vector of 14 answers, ranked in a certain way, or
- an incomplete vector, where one or more components are null.

Accordingly, the entropy of the data matrix increases by the coming out of zero values[7].

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[6] *Spircu L. (2005)* Analiza datelor – Aplicații economice*, Editura ASE, Bucureşti, pp. 109-112.*

[7] *In a first stage, following the fact that 1 was ranged as the most important and 14 was the least important, a conversion relation was needed to be applied. Consequently, the formula* V_{ki}= 14-V_{ki} +1 *was used. A scale where 14 became the maximum and 1 the minimum came out.*

Subsequently, we have brought in the H1 hypothesis that assumes that the general average can be a discriminant line of the sample of the answers in a matrix:

$$V(k,j)\ cu\ k=1,\ \dots\ ,905\ and\ j=1,\ \dots\ ,14.$$

A vector of averages was determined on this matrix:

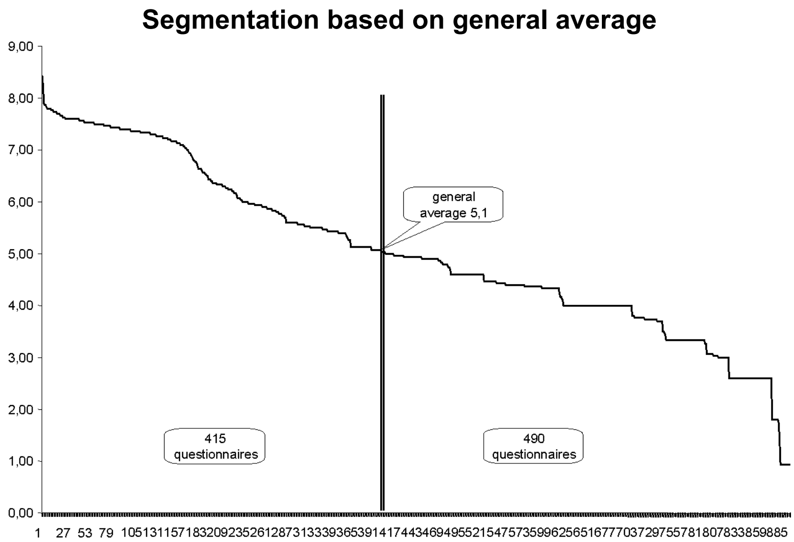
$$Vm_k = \sum_{j=1}^{14} V(k,j)/14$$

and then the average of averages as a general mean:

$$\overline{\overline{V}} = \left(\sum_{k=1}^{905} Vm_k\right)/905$$

For our sample, the general mean equals 5.1. According to the *H1 hypothesis,* the general average disseminates[8] the matrix of data into two segments (see Figure 1):

Figure 1



- the upper segment, which contains 415 lines (according to the questionnaires that have as averages values between 8.43 and 5.03), marked V^{s}_{kj}, k=[1,...,415];
- the lower segment that includes 490 lines (according to the questionnaires with averages ranked between 5.00 and 0.93), marked V^{0}_{kj}, k=[416,...,905].

This segmentation of the data range will be used in the future computing process.

The next stage of the analysis lay in the calculation of the averages of certain thematic vectors X_i according to the *H2 hypothesis* that lays down the relation between the initial vectors V_j and the group vector X_i, in accordance with the below-mentioned criteria. The X_i variable (where i=1,..5) are formed as groups of 2 or 3 vectors V_j from

[8] To simplify, the Vm_k vector is ranked down.

the same thematic category and are determined as the arithmetic average of their values

X_1 – communication, integration	
V_2 - Written/spoken/inter-personal communication V_6 - Desire to learn V_{12} - Team working	$X_{1k}=(V_{2k}+V_{6k}+V_{12k})/3$ k=1, ... , 905, with the components X_1^s and X_1^0
X_2 – working manner	
V_3 - Capability to implement changes V_7 - Matters solving V_{13} – Good work planner	$X_{2k}=(V_{3k}+V_{7k}+V_{13k})/3$ k=1, ... , 905, with the components X_2^s and X_2^0
X_3 – approach	
V_9 - Flexibility and adaptability V_{10} - Judgment reasoning and independence V_{14} - multi-disciplinary visions	$X_{3k}=(V_{9k}+V_{10k}+V_{14k})/3$ k=1, ... , 905, with the components X_3^s and X_3^0
X_4 – thinking processes	
V_1 - Creativity and innovation V_4 - Analysis capacity V_5 - Synthesis ability	$X_{4k}=(V_{1k}+V_{4k}+V_{5k})/3$ k=1, ... , 905, with the components X_4^s and X_4^0
X_5 – attitude	
V_8 - Ethics V_{11} - Self confidence	$X_{5k}=(V_{8k}+V_{11k})/2$ k=1, ... , 905, with the components X_5^s and X_5^0

As a result, the outcome is the matrix of the grouped aptitudes:

$$\begin{pmatrix} X_1^s & X_2^s & X_3^s & X_4^s & X_5^s \\ X_1^0 & X_2^0 & X_3^0 & X_4^0 & X_5^0 \end{pmatrix}$$

At the same time with the working out of the X matrix the process of systematization of the elementary data is finished. Through the classification of V_j initial vectors in X_i group vectors the negative effects of non-answering are diminished. Thus, the new data structure is built up of 5 groups/classes of abilities and two segments of respondents according to H1 hypothesis.

Calculation of the Multiple Linear Discriminant

Data processed in this way are shown in Table 1. The averages for the upper and low segment are shown, in addition to the initial data.

Table 1

Pattern of Primary Processes

No.	Question naires number	Communi-cation X_1	Work manner X_2	Approach X_3	Mental processes X_4	Attitude X_5	General average*
1	732	7.00	7.00	8.00	11.67	8.50	8.43
2	725	7.33	8.67	10.33	9.00	6.00	8.27
……	……	……….	……	……….	……..	…….	………
414	905	6.67	4.67	0.00	7.33	6.67	5.03
415	27	8.33	0.00	10.33	0.00	8.33	5.03
416	170	3.00	3.33	8.00	4.67	3.00	5.0
417	387	8.33	4.33	3.00	3.33	8.33	5.0
…..	……	……	……	…….	…….	……	……
904	807	0	4.67	0	0	0	0.93
905	806	0	4.67	0	0	0	0.93
XI_g*****		5.62	5.14	4.12	5.95	4.45	
XI^S**		6.69	6.79	5.27	7.76	6.00	
XI^0***		4.74	3.78	3.18	4.45	3.16	
D(s-0)****		1.95	3.01	2.09	3.31	2.83	
D(s-g)		1.07	1.65	1.15	1.81	1.55	
D(g-0)		0.88	1.36	0.94	1.50	1.28	

where: * the general average remains in all subsequent calculations as a classification criteria;

** XI^S – is the average of the values determined for the upper segment according to H2 hypothesis;

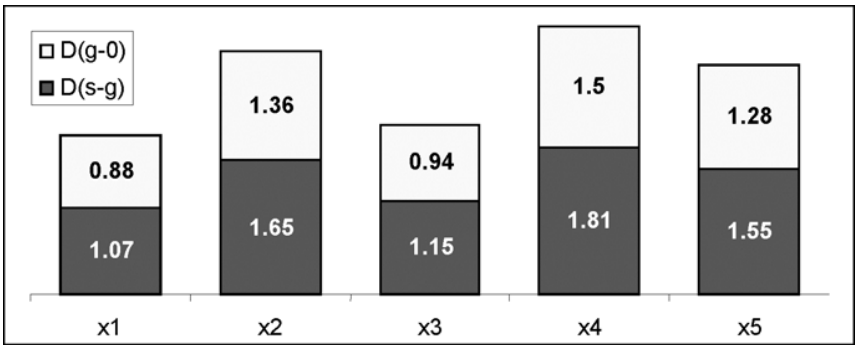
*** XI^0 – is the average of values calculated for the lower segment, according to H2 hypothesis;

**** D(s-0) - discriminant primary parameters, composed from partial parameters D(s-g) that explain the difference between XIS and XIg and D(g-0) that explain the difference between XIg and XI0;

***** XI_g - the general average for each thematic vector.

Figure 2

Influence of x average in primary discriminant parameters



As one may see in Tables 1 and 2, the position of the averages of the upper segment is placed between 38% (from maximum) for X_3 and 55% (from maximum) for X_4. In accordance with the data in Table 2, the upper averages are placed in an area comprised between 3.18 and 4.74, which is nevertheless in the low part of the scale (1,...,14).

Table 2

	X_1	X_2	X_3	X_4	X_5
max	14	14	14	14	14
XI^S	6.69	6.79	5.27	7.76	6
XI^0	4.74	3.78	3.18	4.45	3.16
XI^S/max	48%	49%	38%	55%	43%
XI^0/max	34%	27%	23%	32%	23%

The lower segment averages lie at a level comprised between 23% (from maximum for X_3) and 34% (from maximum for X_1). This condition can be explained by the high degree of dispersion of the respondent estimates.

The results in Table 1 lead to an index/value D(s-0) which is a necessary parameter for the multiple linear discriminant functions. This is calculated according to the relation $DI(s\text{-}0)= XI^S - XI^0$ where: I=1,…,5. We should mention that for the calculation of the discriminant function, which consists in solving a system of five functions with five unknown factors, the DI values form a vector of the free terms.

To build up the system of equations, one has to calculate/compute the sums, the squares sums, and the products sums/amounts for X_1, X_2, X_3, X_4, X_5 without taking into account the affiliation to one of the segments:

$\Sigma X1=5090$	$\Sigma X1^2=37737$	$\Sigma X1*X2=26819$
$\Sigma X2=4654$	$\Sigma X2^2=33857$	$\Sigma X1*X3=21390$
$\Sigma X3=3731$	$\Sigma X3^2=22555$	$\Sigma X1*X4=29884$
$\Sigma X4=5383$	$\Sigma X4^2=45427$	$\Sigma X1*X5=22341$
$\Sigma X5=4025$	$\Sigma X5^2=29827$	$\Sigma X2*X3=19967$
		$\Sigma X2*X4=27769$
		$\Sigma X2*X5=22196$
		$\Sigma X3*X4=22371$
		$\Sigma X3*X5=17181$
		$\Sigma X4*X5=23679$

For a simpler calculation, the square sums and the product ones were given depending on/according to the exception from their averages:

$$\sum x_i x_n = \sum X_i X_n - \frac{\sum X_i \sum X_n}{N}$$

With: *i=1, ... ,5; n=i+1, ...,5; and N=905.*

$\Sigma x_1^2=9109,6$

$\Sigma x_2^2=9920,0$

$\Sigma x_3^2=7170,7$

$\Sigma x_4^2=13412,9$

$\Sigma x_5^2=11925,8$

$\Sigma x_1*x_2=641,9$

$\Sigma x_1*x_3=403,4$

$\Sigma x_1*x_4=-390,0$

$\Sigma x_1*x_5=-296,7$

$\Sigma x_2*x_3=777,1$

$\Sigma x_2*x_4=86,4$

$\Sigma x_2*x_5=1495,5$

$\Sigma x_3*x_4=178,0$

$\Sigma x_3*x_5=586,0$

$\Sigma x_4*x_5=-260,2$

The system of equations at the base of getting the coefficients is the following:

$$\begin{cases} 9109.6\,a + 641.9\,b + 403.4\,c - 390.0\,d - 296.7\,e = 1.9 \\ 641.9\,a + 9920.0\,b + 777.1\,c + 86.4\,d + 1495.5\,e = 3.0 \\ 403.4\,a + 777.1\,b + 7170.7\,c + 178.0\,d + 586.0\,e = 2.1 \\ -390.0\,a + 86.4\,b + 178.0\,c + 13412.9\,d - 260.2\,e = 3.3 \\ -296.7\,a + 1495.5\,b + 586.0\,c - 260.2\,d + 11925.8\,e = 2.8 \end{cases}$$

Solving the system we obtain the value of a, b, c, d, e coefficients, that take the values shown in Table 3.

Table 3

XI^S	6.69	6.79	5.27	7.76	6.00
XI^0	4.74	3.78	3.18	4.45	3.16
D(sup-inf)	1.95	3.01	2.09	3.31	2.83
	a	**b**	**c**	**d**	**e**
COEFIC	0.0002	0.000238	0.00023	0.000252	0.000207
D_{XSUP}	0.00740				
D_{XINF}	0.004379				

Also, the D_{xSUP} and D_{xINF} for the two main classes obtained by discrimination were calculated.

With the obtained information it is possible to build the mechanism to evaluate and to place a subject into one of the main classes.

Conclusions

The first conclusion is that using the multiple discriminant analysis we divide a group of registered elements into two main classes, as we assume by the H1 hypothesis. They are on the opposite side upon the matter in discussion (buyers – non-buyers, segment of interest – non-segment, market – non-market etc.). In our particular case, the classes are:

- subjects with all most requested abilities for public marketing specialists;
- subjects without minimal average of abilities asked for public marketing specialists.

The obtained discrimination equation is as follows:

$$D_x = aX_1 + bX_2 + cX_3 + dX_4 + eX_5$$

where: $a=20 \times 10^{-5}$; $b=23.8 \times 10^{-5}$; $c=23 \times 10^{-5}$; $d=25.2 \times 10^{-5}$; $e=20.7 \times 10^{-5}$

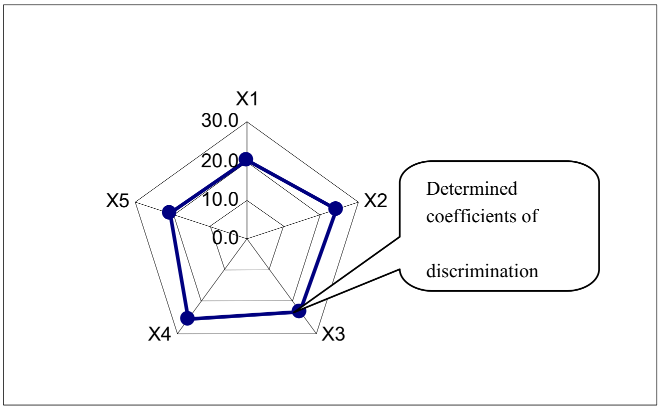
Thus, the equation becomes:

$$\mathbf{D_x =} 20 \times 10^{-5}\,\mathbf{X_1 +} 23{,}8 \times 10^{-5}\,\mathbf{X_2 +} 23 \times 10^{-5}\,\mathbf{X_3 +}25{,}2 \times 10^{-5}\,\mathbf{X_4 +} 20{,}7 \times 10^{-5}\,\mathbf{X_5}$$

Based on the coefficients of the discrimination equation, the weight that each group of X_i abilities has in the calculation of the numeric index D_x for each individual alone becomes clear (see Figure 3).

Figure 3

Abilities contribution to final score



The coefficients of the five groups of abilities, as in Figure 3, are placed at the same level, namely between 20 and 30, more accurately only X4 exceeds the value of 25 (that is 25.2), the other values being placed between 20 and 25. They point out the increased homogeneity between the studied ability groups.

A first conclusion shows that the X_4 factor has the greatest influence, followed by X_2 and X_3, namely the mental processes, the working manner and the way of approach. In case we detail, one can notice that the abilities that determine the positioning of the individual/subject in one of the two classes are:

- creativity and inventiveness, the analysis capacity, the synthesis capacity;
- the capacity to implement change, to solve issues/problem, work planning;
- flexibility and adaptability, reasoning and independent judgment, multi-disciplinary vision.

On a second place is X_5, followed by X_1, which are the aspects related to *attitude* and *communication.*

The calculation of D_{xSUP} and D_{xINF} by means of the averages of all registrations in the upper class and the low one, respectively, we obtain two reference values/figures of the analysis of the multiple discriminant:

$$D_{xSUP} = 0.007400$$
$$D_{xINF} = 0.004379$$

For a concrete case of assessing the abilities of a group of individuals/subjects from the perspective of specialization in the field of public marketing or of employing in such a position, the calculation of the personal/individual numeric indices will determine a set of values.

The individuals/subjects whose D_{xn} indices will be placed near the value of D_{xSUP} will be able to be included in the class of those that have, to a high probability, the necessary abilities for a specialist in public marketing.

Getting a D_{xn} index near the value of D_{xINF} will position the respective individual in the class of those who do not have the analyzed abilities or have them to a low degree.

Based on the previously obtained results one can draw up a mechanism of selecting marketing personnel, those to be trained in the field of marketing or even of students, and the abilities that they have to get during the university, master and Ph.D. education.

It is known that the one having certain psycho-somatic, mental, intellectual, etc., abilities answers only to a part of the professional defining assembly. A continuation of this analysis is the applying of the multiple discrimination method to the classes of the necessary knowledge for the specialists in public marketing and the possibility to get similar equations.

The combination of the two parameters – abilities and knowledge, and obtaining the calculation formula that allows the identification of the combination by categories and the probability of their occurrence represents the final objective of the researches.

Knowing that "Marketing has a dual role: to help promote the view that the most satisfactory outcome has been achieved and to persuade all parties that their interests have been taken into account in achieving the outcomes"[9], it is a challenge to promote de marketing vision and approach in the public sector and to do it with the best professionals.

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