

## Q METHODOLOGY (Q FACTOR ANALYSIS) – PARTICULARITIES AND THEORETICAL CONSIDERATIONS FOR MARKETING DATA

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### ABSTRACT

*Data analyses involve the use of some statistical methods. Q methodology, is a relatively new tool not only as approach but particularly following the quite recent rediscovery of its usefulness in those fields where psychometric knowledge of individuals have thorough implications. For marketing, consumers' preferences, opinions, attitudes are subjective and this is the reason for which a Q methodology outlines subjective structures or even subjectivity itself. The purpose of Q methodology is to identify factors and based on them, several individuals can be compared, wherein variables are not grouped but respondents are discriminated among them. The paper shows the technical and methodological aspects of the Q methodology for particularities of marketing data, conclude the advantages and disadvantages for these types of data. Fields with applicability of the Q methodology are many but a better efficiency could be achieved for marketing data as well, where subjectivity plays a major role as a variable that provides important information about consumers.*

**KEYWORDS:** Q methodology, marketing data, particularities, factor analysis

### 1. INTRODUCTION

**Q methodology (or Q factor analysis)** (Gabor, 2008a) is a relatively new tool both as approach (It was mentioned by *William Stephenson* in 1935 – the last assistant of Charles Spearman, inventor of factor analysis – and also parent and supporter of this method) and especially by a relatively recent discovery of its usefulness in those fields for which psychometric knowledge of individuals have thorough implications and results provided by them have a considerably high usefulness than other tools that are better known and easier to use. The main idea that originates Stephenson's attempt was that individuals never acts in social life according to "objectivity" but according to the manner they perceive this objectivity - therefore, according to their own subjectivity (Iliescu, 2005, p. 11)

Eighty years ago the Q methodology suggested using the factor analysis as a quantitative analysis technique of some subjective data. For marketing, consumers' preferences, opinions, attitudes are subjective and that is why a Q-sort emphasizes subjective structures or even subjectivity itself, *Stephenson* using the concept of **effective subjectiveness**. According to it, **the goal** (Iliescu, 2005, p. 82) **of the Q-type factor**

**analysis** is „to identify factors based on which several individuals can be compared, wherein variables are not grouped, but individuals discriminate among them”.

**2. Q METHODOLOGY – PARTICULARITIES AND THEORETICAL CONSIDERATIONS FOR MARKETING DATA**

One of **particularities** – and practically the main difference compared with the R –type factor analysis is that, the Q methodology works not with a representative population sample, of consumers, but with a **representative sample of opinions**.

**The methodology principle** consists in presenting a person of a set of statements – that can be generated through various methods (McLeon, Hurd, Jensen, 2005) - *related to a certain topic, and then is required to order them, usually based on a continuous “agreement”- “disagreement”, this operation being called **Q sorting**, statements being in fact not fact expressions but, exclusively, opinion problems* (McKeown and Thomas, 1988, p. 23 – 30), the subject concerned making ordering in line with its own preference, and therefore implicitly in line with the significance assigned by him to both interpretation of significance of statements and relation with them (Klooster, Visser, de Jong, 2008). **Methods** that can be used to generate statements used in a Q-sort:

- *Qualitative methods*, as : structured interviews and thorough interviews,
- *Quantitative methods*: sampling based previous research,
- „Natural” methods : statements are registered from interviews with subjects,
- „Ready – made” methods that supply statements from other information sources than interviews and can include specialty literature, existing scales or standard items.

Schematically, a **Q-sort** for 30 items (statements) is represented as in **figure no. 1**, the Q-sort meeting the requirement of a normal distribution, distribution of the number of statements on each „pile” being the following: 1 2 4 5 6 5 4 2 1.

DISAGREEMENT				NEUTRAL	AGREEMENT			
- 4	- 3	- 2	- 1	0	+ 1	+ 2	+ 3	+ 4
1								1
	2							2
		4					4	
			5			5		
				6				

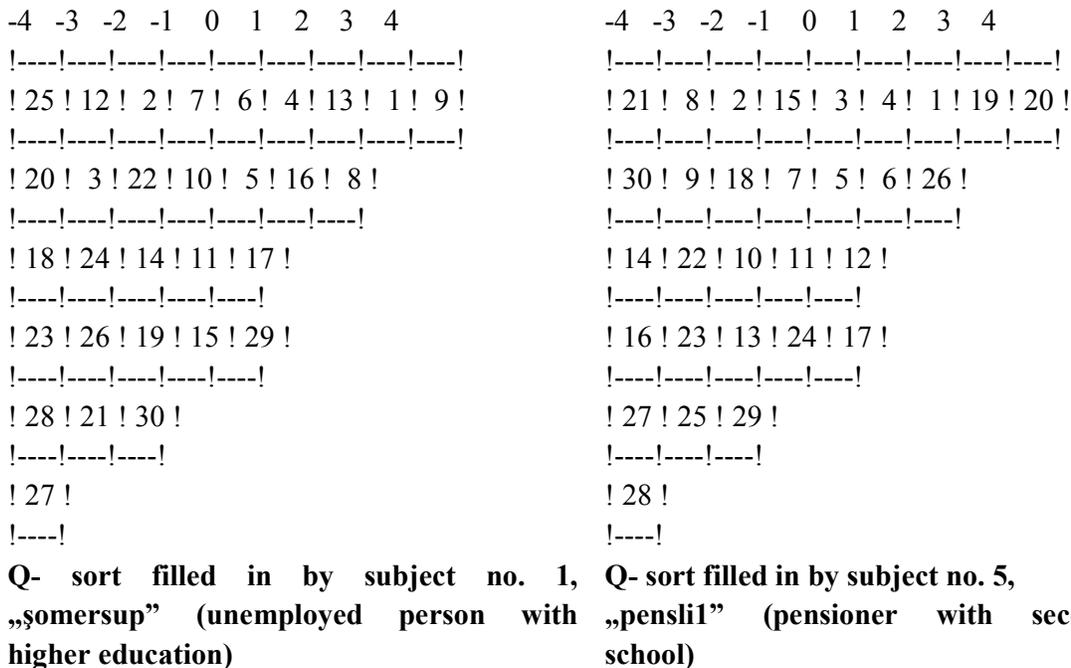
**Figure no. 1 – Example of Q- sort**

(Adaptation after Kramer, B., Hegedus, P., Gravina, V. - *Evaluating a Dairy Herd Improvement Project in Uruguay to Test and Explain Q Methodology*, Proceedings of the 19th Annual Conference Raleigh, Carolina, 2003, p. 347 )

Methodology concerning the application of Q-type factor analysis (factor analysis on subjects and not on variables) assumes the use of two specific categories of „tools”:

- The **Q-sample**, respectively - made of, for example, statements – and of
- The **P-sample** – made of subjects.

Examples of Q-sorts filled in by subjects are shown in figure no. 2, as were generated by the **PQMethod** software, one of the free-of-charge software that can be used to process data gathered by means of the Q-sort.



**Figure no. 2 – Examples of Q-sorts filled in and generated by the PQMethod software**

The Q-type factor analysis is equally a quantitative research method – uses the factor analysis as calculation method – and qualitative - as a result of the descriptive interpretations that should be carried-out for each traced factor (Kufeld, 2006, p. 19).

The Q methodology is especially synthetic (and not analytical as R-type factor analysis) as it does not break the entire in parts but keeps the parts together and evaluates the structure it belongs to (Babcock–Lumish, 2005), a very important issue in marketing, as it is not important to know each consumer as thorough as possible with his opinions, attitudes and preferences (in fact a destructive thing for a firm) but to know as thorough as possible the segment of consumers of which it belongs to (Reber, Cropp, Camiron, 2001), and hence those opinions, attitudes, preferences that are common to them, the Q methodology being a method both **inter – personal** and **intra-personal** (Babcock–Lumish, 2005).

The basic principle of the R-type factor analysis is that to explain the whole by reducing it in components (McLeon, Hurd, Jensen, 2005) (*for example*: regression, multiple regression, variance analysis and others) operating based on the assumption that the whole is equal with the sum of components plus error. It is important for the market study, for marketing in the main, for the study of consumers' behavior and factor identification of variables but, much more effective will be the identification of that key factor (and that is the goal of the Q methodology) that group consumers, that divide them, therefore we consider that, in marketing research, the two different methods to be used additionally and not distinctly, and results of such analyses can be also used additionally.

The **Q methodology** based on correlation of people and not on variables has a significant

importance for marketing data as a result of the specific market studies **and the marketing field<sup>1</sup> in the main, to form, divides the market that means to correlate people according to different variables.** Apart the R-type factor analysis, classical, in Q-type factor analysis, every individual is approached as a different experimental case and represents a factor entity. Thus, instead of distributing a high number of people a low number of items to assessed (R-technique), the researcher distributes a low number of people, a high number of items that should be assessed (Q-technique). Individuals are favored accordingly based on responses to variables, and not variables based on responses provided by individuals. Practically, the Q methodology defines inter-relations and existing similarities between a number of subjects, id est a common variation on a certain topic, either being their opinion about a certain product or subject, personality structure or psycho-behavioral model (Klooster, Visser, de Jong, 2008).

Without detailing the *mathematic-statistical aspects* of the factor analysis methodology in the main, we shall however highlight that, one of the *main differences between the R-type factor analysis and the Q-type*, technically, is that, the first uses *PCA* as the calculation method, and the **Q methodology uses the centroid analysis method of Thurstone**. D. Iliescu presents detailed in his paper, the centroid factor extraction algorithm for the application of a Q-sort of 150 items to an organization in order to investigate the area of organizational psychology in a firm in Romania, the correlation matrix comprises both on rows and columns, subjects comprised in the Q – sort

Also, to determine **the time of ceasing extraction**, the Q methodology uses **two rules**:

- *Proper saturation* and
- *Scree test* that is based on the scree plot analysis,

The type of rotation is **subjective rotation** that *enables the researcher to follow their theoretical assumptions, and impressions, opinions, beliefs, momentary assumptions.*

Related to **factor rotation**, performance of the Q methodology algorithm has certain **particularities**:

- Extraction of factors and rotations should be carried-out independently of researcher's working assumptions operationally;
- Factor rotation should be defined by the *nature of data* available to us and the *goals of investigation* under way;
- When factors were extracted and rotated in the proffered manner, they provide the researcher information related to similarities or dissimilarities of individuals (that are similar and how strong similarity is).

Technical aspects related to **interpretation of factor significance** are also important and show **particularities** and in case of the Q-type factor analysis. Resemblance of subjects by using the Q methodology exclusively reveals *similitude* of opinion and under no circumstances demographic regularities that are much more important as regards consumer's knowledge concerning marketing research. The problem in using the Q methodology consists in measuring the significant differences between statements (items) id est in measuring how different are the factor scores of the Q-sort statements, to set practically what relations are between statements and between various factors of the Q-sort (segments of opinion, groups of consumers). Brown, quoted by D. Iliescu, called them (when he mentioned the designation of consensual or differential statements), "*molecular assumptions of Q methodology*" and represents the easiest manner of testing the assumptions, available in the Q-type factor analysis, to identify those statements that distinguish factors among them, respectively.

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<sup>1</sup> For marketing and market research, the truth related to a product is not important, trade mark, as consumers never buy objectively but buy or react positively to an advertising, to an advertising message based on the way they perceive that product, advertising etc.

The Q methodology means, as the final stage of analysis, the calculation of **average category score**<sup>2</sup> for each factor by means of formula (McKeown and Thomas, 1988, p. 53):

$$z_c = \frac{\sum_{i=1}^{nc} |z_i|}{n_c} \quad (81)$$

where  $\left\{ \begin{array}{l} z_i = \text{Z score of statement} \\ c = \text{category} \\ n_c = \text{number of statements in c category} \end{array} \right.$

Also, the Q methodology, through the **PQMethod** software provides **statistic indicators specific to this type of factor analysis, on subjects**. Therefore, one of indicators that has a major significance is the *fidelity factor* (or *composite fidelity*) of subjects on the factor they form and that, for a good fidelity should be higher than 0.80 (*average relative coefficient*).

The formula according to Steven R. Brown (1993, pp. 91 – 138) is the following:

$$r_{xx} = \frac{0,80 * p}{1 + (p - 1) * 0,80} \quad (1)$$

where  $\left\{ \begin{array}{l} r_{xx} = \text{fidelity factor} \\ p = \text{number of subjects defining the factor concerned} \end{array} \right.$

Another specific statistic indicator is the *standard error of factor scores* whose interpretation, in case of the Q-methodology, has the following significance (Iliescu, 2005, pp. 118 – 119): the higher is fidelity of a factor, the lower will be the error associated with factor scores of the factor concerned.

The formula according to Brown (1993, pp. 91 – 138) is the following:

$$SE_x = \sigma_x * \sqrt{1 - r_{xx}} \quad (2)$$

Where  $\left\{ \begin{array}{l} SE_x = \text{standard error of factor scores concerning X factor} \\ \sigma_x = \text{standard deviation of forced distribution required in the Q-sort structure} \end{array} \right.$

In order to see if scores of the two factors are significantly different, the **PQMethod** software also generates the indicator named *standard error of differences in normalized factor scores* whose formula that belongs to Brown as well is the following:

$$SED_{x-z} = \sqrt{SE_x^2 + SE_y^2} \quad (3).$$

There are **two types** of Q-type factor analyses (Campbell, 1995), mentioned in the foreign literature: *Q – Non-structured sort*<sup>3</sup> and *Q – structured sort*<sup>4</sup> and management of Q-sorts can be carried-out online as well and by **WebQ algorithmically** that provide the possibility of using the reversed factor analysis (Anadarjan, Paravastu, Simmers, 2006). There are also three ways of applying the methods (Brouwer, 1999):

- Analysis of a single case – intra-personal case-,

<sup>2</sup> The z scores of factors relate to position of items related to Q-sort (Brouwer, 1999).

<sup>3</sup> Wherein are comprised variables that are selected without taking into account the basic structures, such items from various sources (or from a single source) that are presumed to be representative for a single population of items of a field, Kerlinger suggesting that basic items can come from measurements of personality or scales of attitudes.

<sup>4</sup> Variables originating from a single field, but are selected to be representative for a certain theory issued by the researcher.

- Comparative analysis of subjectiveness as regards individuals belonging to the same population and
- Comparative analysis of general data (*for example*, results from sampling based studies).

### 3. PRACTICAL EXAMPLES OF THE APPLICATION OF Q METHODOLOGY

**Examples** below it may be easily noticed the diversity of fields and issues possibly to approach by means of this methodology:

- **Testing, identification and modification of the corporate communication factors on-line concerning the marketing of public relations** (Du Plessis, 2005), identified factors being tested on 20 communicators and 20 receivers of those who use on-line corporate communication.

- **Study concerning tracking down of priority educational needs within students in order to extend the fields of study** (Waters, R.G., Haskell, L.J , 1998) that, by using the Q methodology has improved the implementation process of some fields of study in faculty (and led to tracking down some additional information that couldn't be gathered using conventional research methods), fields of study that were previously introduced in the educational process based on sampling the students' preferences using an e-mail sampling that, based on responses to questions, just set in percentage which are the most „requested” fields of study, without considering the motivations these fields of study are based on. Thus, the use of Q methodology could evaluate the students' current knowledge related to a certain topic and – this is the contribution of using the Q methodology– which are the students' abilities concerning the application of their knowledge.

- **Study concerning the perception of their work within lecturers teaching matters of study in the field agriculture** (Delnero and Montgomery, 2001) that, by using 36 items that were describing various educational responsibilities of the professors, the respondents (university men who were teaching matters of study in the field of agriculture) were asked to sort the items in two stages, the first – professors were asked to sort the items based on their own *actual perceptions* related to what they like to their work - and another stage – sorting based on *their perceptions concerning the ideal manner of practicing their work in agricultural higher education*. Forty-six factors have resulted, the first three factors being related to the following types of professors: a *professor working as a trainer, mentor* with a variance of 25%, *academic professor* (14 %) and *educational mentor* (11 %), the results having implications for the professional development of university men. The Q methodology has been used to identify the personal points of view, beliefs, opinions or subjective opinions of university men in order to identify the general types or models of perceptions held by private groups, in that case, professors within the University of Agriculture in California.

- **Study concerning investigation of professor's attitudes in connection with the inclusion of disability students in the groups of students that attend a normal education and to explore the possible diferencies between professors' attitudes concerning inclusion of students, pupils in the public and special education** (Elhoweris and Alsheikh) . Items included in the study were related to academic issues concerning inclusion of disability students in regular classes, social aspects and those related to the legal right of including disability students within the other students. Individuals included in the study were ten teachers teaching in the special education and in public education, six were involved in doctoral programs and other four in master programs. The three factors resulted cover 78 % of variance and included legality, environment and conservatism.

- **Emphasizing the social-behavioural–psychologic profile of internet users participating in online discussions about sociological changes, dissemination of ideas and social actions** (Previte, Hearn and Dann, 2001) (these aspects are tracked from the social marketing developed by market leaders, aiming

to know the profile of consumers reacting to such online discussions, by the firms concerned) that finally led to the identification of five profiles: *techno- optimistic*, *techno- realistic*, *information receiver*, *anti-policy opportunistic* and *techno- skeptic*.

- **Research of students' attitudes concerning objectionable advertising** (Gustafson and Yssel, 1997) (the study concerned referred to the advertising campaign in 1995 made to products –blue jeans- the Calvin Klein brand concerning pornography of children in advertisements) having as respondents, 39 students with age between 18 and 26 years that outlined the two types of consumers within students, respectively those who will not buy those products whose advertising is based on any kind of pornography and another one that, will take into consideration the brand no matter if product is made an objectionable or aggressive advertising.

- **Investigation study of self-descriptors identity of a group of ex-smokers** (Kufeld) resulting factors described by the author as: social independence and maturity, development and personal avoidance, hesitation and nostalgia versus disbelief, health and money.

- **Determination of usefulness concerning the use of Q methodology in order to locate and describe influences of subjectivity concerning ethics in clinical decisions taken in the middle of participants to decisions.**

- **The use of Q methodology in order to study the metaphors of the consumption process** (or, found in the literature as *consumption as experience*, *consumption as integration*, *consumption as manner of play*) **in case of mobile phone users** (Fitzgerald and Drennan).

- **Tourists' perceptions concerning a tourist destination as a starting point in the development of a new tourist product** (Davis, 2003) that used as items in distributing the respondents, tourists, 44 pictures with possible attractions and activities from a tourist region resulting factors defined as: *outdoor explorations* (52 %), *boat and shore*, *observation of environment from the shore*, *experience of the tourist location concerned*, *social entertainment*, *personal experience*.

- **Study concerning perception, photograph and culture in tourism advertising within students in universities in Canada and China** (Dewar, K., Wen Mei Li, Davies), (the group of individuals was made of 27 Canadian students, English speakers, 27 Canadian students within a technical university, and 27 Chinese students) the study having as a starting point the idea that, the photograph of products and tourist destinations is perceived differently by different cultural groups and as a result, they should be promoted differently according to their cultural perception, this issues leading to the making of commercials typical to any typical cultural group. The resulted factors: exotic adventure (specific to Canadian students, English speakers), isolation in nature (typical to technical educated students and Chinese students) and sea, water lovers (typical to Chinese students).

- **Study of customers' orientations, the use of methodology proves that, in the course of time, identification of these orientations was viable by means of this method** (Wolfe, 2000).

In Romania, the Q methodology was used in 2000 in a study concerning segmentation of alcohol beverage consumers, on a reference sample at national urban level resulting eight psychographic profiles typical for Romanian market. The Q –sort used 62 items and approached aspects related to the behaviour of consumption, buying, preferences, attitudes and expectations of consumers with emphasis on brandy and vodka consumers.

#### 4. CONCLUSIONS

In the studied foreign literature, there are many practical *examples*<sup>5</sup> of applying the Q methodology in the field of *market research*, most of them being applied in order to **segment attitudes, for psychographic segmentation, segment opinions related to advertising**, improvement of the implementation process as regards some new disciplines study for students (Waters și Haskell, 1988), research of students' attitudes with regard to objection advertising (Gustafson and Yssel, 1997), survey of customers' orientation (Wolfe, 2000), strategic management plans for hospitals (Popovich and Popovich, 2000), educational responsibility of university men (Delnero and Montgomery, 2001), survey of social-behavioral– psychological profile of internet users that participate in online discussions about sociological changes (Previte, Hearn and Dann, 2001), mobile phone market, tourists' perceptions (Davis, 2003), online communication in public relations marketing (Du Plesis, 2005), investigation of self-descriptor identity of a group of former smokers (Kufeld, 2006), perception of using internet on the job (Anadarjan, Paravastu, Simmers, 2006), perception about food safety in England (Eden, Bear, Walker, 2008). In Romania, the Q-methodology was used in 2000 in a study concerning segmentation of alcohol beverage consumers (Iliescu, 2005).

In the foreign literature the most common study based on the Q methodology is that related to *segmentation of ATM users* carried-out in USA in 1978 that had as direct consequences introduction of ATMs successfully and widely and development of these banking services (it should be mentioned that study has been published as a requirement that, though introduced since 1972, use of ATMs and implicitly of many services provided by these had no success among customers of banks). Therefore by means of this research fully based on the Q methodology two important segments of customers (factors) have been identified: hasty depositors and interpersonal depositors.

Important in the methodological approach of the Q-sort is that, it reveals full of significance psychographic segments, it does not depend on demographic variables but the fact that individuals are not grouped based on similarity or differences as regards attitudes, reasons, opinions, needs and needs that project in future.

As a final conclusion, we enumerate (**table no. 1**) **advantages and disadvantages of this methodology**.

**Table 1 – Advantages and disadvantages of using the Q-type factor analysis**

Advantages	Disadvantages
<p>The completion process takes place shortly</p> <p>Systematic approach wherein preferences are categorized</p> <p>Easiness of implementation</p> <p>Provides a means of thorough study of small samples of population (Rajé, 2007)</p> <p>It can be used together with exploratory research (Iliescu, 2005, p. 72-73)</p> <p>It captures operant subjectivity by means of auto – references (Babcock – Lumish, 2005),</p>	<ul style="list-style-type: none"> <li>• High number of choices required from respondents within a relatively short time</li> <li>• A certain unsafely with regard to <i>for example</i> the number of cards (items, statements) introduced in the process</li> <li>• Vision of individuals is temporary and it can change in time or under different</li> </ul>

<sup>5</sup> M. R. Gabor - *Practical examples concerning application of the Q factor analysis for marketing data* published in the “Annals of University of Oradea, magazine- Științe Economice series” – tome XVII, vol. IV/ 2008, p. 866 – 870

<p>Participants should not be selected randomly</p> <p>It can be managed by internet (there is a site fully dedicated to this method (<a href="http://qmethod.org">http://qmethod.org</a>))</p> <p>It protects auto-references issued by individuals by researcher's influence (Thomas and Watson, 2002)</p> <p>Using the Likert scale not individually for every item but starting from the relation between items<sup>6</sup> (Brewer, Seldan, Facer II, 2000)</p>	<p>circumstances (Iliescu, 2005, p. 72-73)</p> <ul style="list-style-type: none"> <li>• Pressure of researcher's presence (Babcock – Lumish, 2005)</li> <li>• Impossibility of statistic interference of results (Tractinsky, Jarvenpaa, 1995)</li> </ul>
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<sup>6</sup> Therefore, the place of an item is influenced by placing another item as a response of the global attitude form. While samplings produce separate pieces of information that characterize the opinion of an individual by means of a certain subject, the Q methodology produces a comprehensive point of view concerning an individual's attitude (Brewer, Seldan, Facer II, 2000)

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