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APPLICATION OF THE Q-METHODOLOGY IN THE RESEARCH OF THE PERCEPTION OF OWNERSHIP GROUPS OF CAR TIRE BRANDS ON THE CROATIAN MARKET

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ABSTRACT

The aim of this research was to examine the perception of car tire brands and thus the group of car tire brands among Croatian drivers by using the Q-methodology. Q-methodology is still considered an avant-garde approach in social sciences, but broadly used when researching prevailing opinion regarding important matters. The research determined there are 45 car tire brands and 7 brand groups present in Croatia. As expected, the leading car tire brands have a significantly more positive perception among Croatian drivers, when considering the average of the brand group results however, they score more poorly. Given that the range of sub-brands covers the entire spectrum of car tires in different price and quality classes, the perception of brands should be clearly separated from the driver's payment options. Croatian drivers have access to a wide selection of different brands and sub-brands of car tires, with only a part of it familiar to them.

Keywords: *tire brand; Q-methodology; brand perception; Croatian tire market*

1. INTRODUCTION

According to Singh (2022), customer perception refers to their subjective impression of a product or service and is based on many aspects when meeting the object of their interest. As many as 71% of consumers choose brands with which they share the same values. Companies that are perceived positively usually achieve positive business results or exceed business plans year after year. When we talk about car tires, Venkat research (April 17, 2016), which has been conducted in India for the 16th year in a row, found that car owners would remain loyal to a car tire brand in 94% of cases if they had no experience with OEM (Original Equipment Manufacturer) tires. If at least one problem occurs with OEM tires, it will cause a decrease in satisfaction of at least 5.7%. When changing tires, those car owners who are looking for a preferred brand or have different quality expectations from car tires will choose another brand of tires. There are many brands of car tires and according to ASDA (2017), independent testing of their characteristics, as well as the conclusion about the best value for money, are becoming increasingly more important. Car tire tests try to put tires in extreme circumstances that go beyond their everyday use in order to get a reliable basis for deciding which brand of car tire to choose for your vehicle. Such tests often exceed the basic obligations of the EU car tire categorization on the label: wet braking, fuel efficiency and external noise levels. According to some sources (GummiBereifung, 2018), tire tests are not of crucial importance for the purchase decision, i.e. that secondary brands fail to significantly translate good test results into increased sales of their products. Only about 24% of customers believe that the results of tire tests are important for the purchase decision. The authors of this research found it interesting to question the perception of active drivers regarding the most significant groups of car tire brands present on the market in the Republic of Croatia. Therefore, the aim of this paper was to list the (umbrella) brands and subbrands of car tires present on the Croatian market and to investigate their popularity among a sample of active drivers using the Q-methodology.

The first hypothesis is that active drivers mainly prefer the 6 biggest car tire brands.

The second hypothesis is that the perception of brand groups among active drivers follows the perception of umbrella brands.

2. GROUPS OF CAR TIRE BRANDS

Brand groups are characterized by an umbrella brand and subsidiaries or sub-brands linked by ownership stakes (Law Insider, n. a.). According to O'Connor (2021), the world car tire market is dominated by five leading manufacturer groups: Michelin, Bridgestone, Continental, Goodyear/Dunlop and Pirelli. They are not only brands but have a whole range of other brands under them. According to Brandirectory (2022), the ranking of the world's most valuable car tire brands looks like this: Michelin (\$7.7 billion), Bridgestone (\$7.1 billion), Continental (\$4.3 billion), Dunlop (2.5 billion USD), Goodyear (2.3 billion USD), Pirelli (1.5 billion USD). It is not surprising that in the world of car tires there are several long-living umbrella brands that are also premium brands individually. Michelin has existed since 1889, and by 1930 it had become the 17th largest tire manufacturer in the world (Zippia, n. a.). Bridgestone's history started with foundation of the Tire Division

of Nihon Tabi Company in 1930 and by year 1953 it surpassed 10 billion yen of annual sales (Bridgestone, n. a.). Continental was founded in 1871 and by 1950 had over 13.500 workers in the parent plant and annual sales of ca. 158 million € (Continental, n. a.). Dunlop was founded in year 1888 after the founder John Boyd Dunlop patented his invention of inflated tyre and by 1962 is credited with the discovery of tire aquaplaning and the solution to that problem with its "aquajet tires" (Dunlop, n. a.). Goodyear was founded in 1898 and his 1200 sets of tires were mounted on the first Ford T-model car in year 1907 and by the 1916 it become the largest tyre producer in the world (Goodyear, n. a.). Pirelli was founded in year 1872 and today it employs around 30.700 workers and had a turnover around 5.3 billion € in year 2021 (Pirelli, n. a.).

3. RESEARCH

With the aim of exploratory research into the perception of car tire brand groups in the Republic of Croatia, the so-called Q-methodology, a methodological tool for observing, collecting and analyzing quantitative data is used (Rogers, 2011, p. 148). The purpose of this research was to find out which groupings of car tire brands according to the respondents' perception have the best reputation in Croatia in 2021, which is when the field research was conducted, and to conclude on the justification of applying the Q-methodology for this form of perception research.

3.1. Use of Q-methodology

The authors have no knowledge if the Q-methodology has been used so far in the research of the perception of car tire brands. Nevertheless, according to Given (2008, p. 699) Q-methodology is a composite of philosophy, concepts, data-gathering procedures, and statistical methods that provides perhaps the most thoroughly elaborated basis for the systematic examination of human subjectivity. Central to Q-methodology is the concept of concurrence, a term denoting the volume of common communicability with regard to any topic. According to Gao and Soranzo (2020), Q-methodology was originally designed to investigate subjectivity (e.g., attitudes, viewpoints, perspectives, and so on) where it shows strength as robust and systematic method to reveal consensus and disagreement among responders. It is widely applied in fields such as sociology (e.g., Hedges, 2014), education (e.g., Gao, 2019) and political sciences (e.g., Lehtonen & Aalto, 2016) it has not yet gained much attention from psychologists interested in decision-making, despite of its methodological advantages.

3.2. Subject of Research

According to data from 2016 (Regionalni tjednik, June 1, 2016), the number of members in the Croatian Auto Club (HAK) totalled 194,000, and today it has more than 224,000 members (HAK, n. a.). This information is important because HAK publishes the HAK Review, a bimonthly magazine that is delivered to all members and in which relevant car tire tests are published periodically, as a rule, taken from European car clubs (HAK, November 11, 2022). Considering the official data (MUP, 2022) that the total number of drivers in Croa-

tia in 2021 came to 2,376,766, and the percentage of drivers in the older age category 55-64 and 65+ totalled 33.7%. It is possible to assume that for the subject of the research (automotive tire brands) a significant part of the perception, along with word of mouth, advertisements in the media, Internet sources, is also formed through the test results presented in HAK's review and applies to the most represented automotive tire brands in several dimensions. All of the mentioned sources were also used when formulating the final number of brands for which the perception research was conducted, and it logically applied only to brands and associated sub-brands that can be purchased in retail in Croatia. Final tire brands list was extracted by analyzing webshop retail offers from the largest tire retailers in Croatia (Vulkal, n. a., Autohrvatska, n. a.). As the methodology allows asking additional questions to respondents such as introductory questions regarding demographics and opinions which can be used for additional clarification of their choices, in this research, the respondents were asked about the features of tires that are most important to them, what kind of tire changing habits they have, and their profession and work status.

From the aforementioned groups of brands and several additional ones (O'Connor, June 2, 2021), it was determined that the following are present in Croatia:

1. Michelin with the Michelin brand and sub-brands: Tigar, Bfgoodrich, Taurus
2. Continental with the Continental brand and sub-brands: Barum, Semperit, Matador, General and Viking
3. Bridgestone with the Bridgestone brand and sub-brands: Firestone, Lassa, Nokian
4. Goodyear with the Goodyear brand and sub-brands: Fulda, Sava, Dunlop
5. Hankook with the Hankook brand and Laufen sub-brand
6. Sumitomo with the Sumitomo brand and Falken sub-brand
7. Pirelli.

The mentioned groups of brands with sub-brands represent a total of 21 (46.7%) out of a total of 45 established car tire brands in Croatia.

3.3. Research Methodology

The creator of Q-methodology is Professor William Stephenson, doctor of physics and psychology, who described the methodology for the first time in 1953 in his book "The study of behavior: Q technique and methodology" (Stephenson, 1953, according to Taylor, 1960, p. 400). According to Rogers (2011, p. 47-48), the abductive reasoning that characterizes Q-methodology is aimed at achieving insights and discoveries to a greater extent than at creating theories. Q-methodology does not require a large sample of respondents to achieve a statistically satisfactory composite reliability factor of 0.9524, which can be achieved with less than 35 respondents (Brown, 1980, p. 191-192, according to Marshall, 2003, p. 109). A higher value of the composite indicator in the Q-methodology (0.9985) was achieved in one study that included 170 respondents, which under normal conditions would represent a disproportionately large stake in fieldwork for a marginal increase in statistical reliability. The research methodology provides for the formulation of a clear research question. The research question for this research was: "Which manufacturer do you trust the most when choosing tires for your vehicle?". Second is the selection of an

adequate number of statements (possible answers to the research question), a Q-grid/pyramid in which the statements/answers will be placed, and an interval in an arbitrary range $+0/-$ and a vertical division on the interval as shown in Figure 1. As an acceptable width of the interval, the range from a narrow $-3/+3$ to a wide $-6/+6$ as explained in the available literature (Rogers, 2011, p. 158).

Figure 1. Layout of a Q-grid of 45 places on the interval -4 to $+4$ and showing the number of available places for statements/answers

-4	-3	-2	-1	0	+1	+2	+3	+4
2								2
	3						3	
		5				5		
			7		7			
				11				

Source: Author's research

Q data can be analyzed (factorial analysis) using dedicated software e.g. Ken-Q Analysis 1.0.8. (Banasick, 2019). Each Q sort produces a set of scores (typically ranging from $+4$ to -4) representing the degrees of preference for all statements, and each person's subjective response is then statistically correlated with every other, the magnitude of the correlation coefficients indicating the degree of similarity among the various perspectives. The factor analysis of the correlations reveals the number of qualitatively different ways in which the Q-methodology various Q sorts have been organized, that is, the number of different viewpoints (or attitudes, identities, narratives, schemata, etc.) that are inherent in the population. Were all participants to organize the Q statements in essentially the same order (an indication of a commonly held outlook), then all of the correlations would be highly positive, and only one factor would be in evidence. Other extreme would be that all participants' views are idiosyncratic, then there would be as many factors as persons, each factor representing a unique view. Usually, two to five factors prevail depending upon the degree to which the audience is segmented, each of the factors representing a perspective held in common by a subset of the participants (Given, 2008, p. 700-701). Some limitations for Q-methodology are present. Q-methodology according to Gao and Soranzo (2020) requires a relatively large number of stimuli for Q-sorting to ensure the validity and credibility of statistics tests. Secondly, given that all the stimuli need to be presented at the same time for participants to choose from, it may turn out to be tricky to conduct online Q-sorting or use digital stimuli because they may not all fit in the

screen. Finally, as Q methodology is not yet widely used in experimental psychology, the researcher may require more effort to describe the method to disseminate their finding. Other significant limitations for the Q-methodology refer to the volatility of perception over time where any external stimulus can affect respondents and consequently the order of preferred brands.

3.4. Results and Discussion

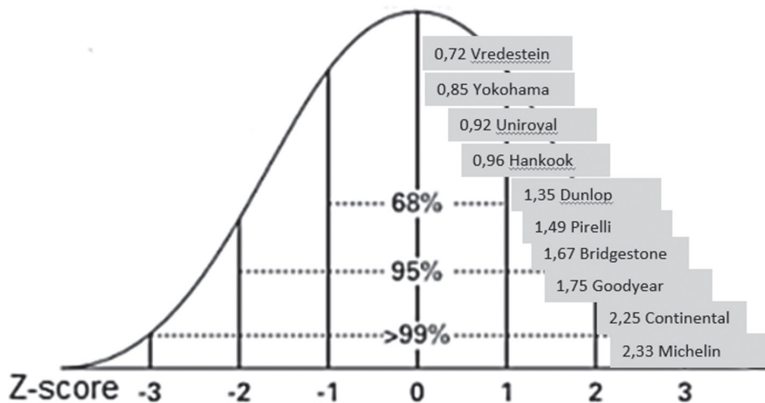
The respondents for this research were reached through acquaintances with the authors of the research. A part of the respondents was asked to participate while they were waiting for their car's tires to be changed at a tire fitter business that is owned by one of the authors of the research. All respondents were from the City of Zagreb and the sample was adequate. Of the total number of respondents, 87.5% were male and 12.5% were female. The average age of the respondents was 37.5. In terms of educational background, 59.4% of the respondents have attained secondary and 37.5% have attained higher education. Out of the total number, 91% of respondents are permanently employed. During the field-work (May and June 2021), that is, data collection, there were difficulties, considering that one respondent had to spend 20-30 minutes of time for the survey questionnaire, specifically, arranging the cards with the car tire brands according to the subjective impression. Therefore, the total number of collected completed Q-grids was a methodologically satisfactory 32 subjects. The research was conducted in paper form over a period of 30 days in 2021, and then the data was digitized and systematized in the Ken-Q Analysis program version 1.0.7 (Banasick, 2019). The program enables the creation of a correlation matrix, factor extraction, and simple data interpretation. Out of the total number of 32 respondents, the following were highlighted as the three most important characteristics of car tires - tire adhesion for 37.5% of respondents, safety for 25% of respondents, and design for 37.5% of respondents. Regarding the habits of changing car tires, 66% of respondents have 8 tires for their car (winter and summer set). Regarding the possibility of changing their habits in the sense of listening to the advice of their tire fitter on the recommendation for an unknown brand of car tires, a score of 3.21 was obtained on a scale of 1 to 5, which indicates that the respondents have developed an attitude when considering the brands. When asked if they would choose an unknown brand of car tires that they would hypothetically see on a luxury car, the rating is 2.7. When buying in installments, expensive premium grade tires that could be bought in 12 installments received a rating of 4.3 from the respondents. The factor analysis of the responses revealed 6 factors, and only the first two were selected for interpretation, for which the factor analysis was relevant. The selection of the factor is done because the eigenvalues of the factor begin to take a similar deviation from the x-axis of the diagram in the so-called "Scree-plot" plot of factors and represent redundancy Rahn (n. a.).

For Factor 1, the selection with the most votes was for the brands in the following order from perceived as most important to least important: Michelin, Continental, Goodyear, Bridgestone, Pirelli, Dunlop, Hankook, Uniroyal, Yokohama, Vredestein, Nexen, Sava, Fulda, Toyo, Falken, Nokian, Firestone, BFGoodrich, Semperit, Kumho, Barum, Matador, Lasa, Avon, etc.

For Factor 2, the selection with the most votes was for the brands in the following order from perceived as most important to least important: Falken, Tigar, Wanli, Linglong, Taurus, Semperit, Fulda, Avon Viking, Laufenn, Pirelli, Minerva, Firestone, Hifly, Federal, Sumitomo, Yokohama, Goodyear, Bridgestone, Rotalla, Lassa, Michelin, Continental, etc.

Factor analysis for the first and second factors yielded eigenvalues of 17.09 and 1.73, which confirms their importance to be considered as relevant factors and their influence on the dependent variable. Factor analysis enables the reduction of a large number of data to a smaller number of factors with the maximum variance of all variables. Factor 1 and 2 have a variance explanation percentage of 55 and 6, that is, a total of 61%, which meets the recommended minimum of 50 or, according to other sources, 60% in the social sciences (Researchgate, 2020). If you look at the results for Factor 1, it is notable that premium brands really take the first place and other more famous brands follow. For Factor 2, it was not possible to find the criterion by which some brands jumped so high according to the calculated Z-score (Falken 2.02, Tigar 2.02, Wanli 1.51, Linglong 3.0, Taurus 1.52, Semperit 1, 01, etc.). It can be assumed that it was a matter of complete ignorance about car tire brands and their characteristics. Given the dispersion of the results in Factor 2, Factor 1 was interpreted as a relevant factor for further analysis. Figure 2 shows the (standard) Z-score for the perceived most important brands for Factor 1. The Z-score represents the deviation from the mean value in the natural distribution.

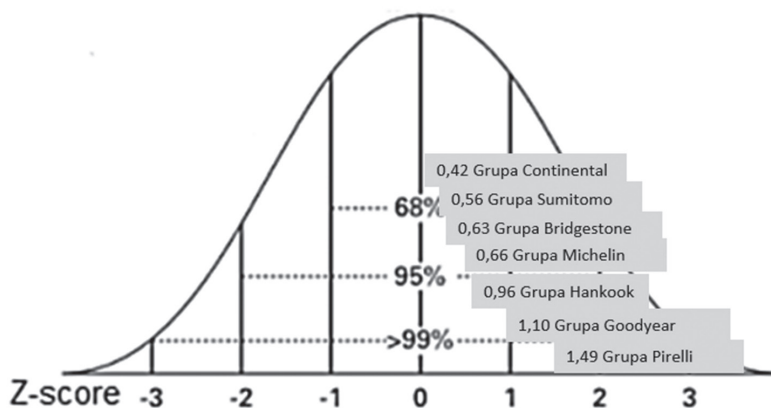
Figure 2. Z-score according to the 10 perceived most important brands



Source: Q-sorting

In order to obtain results for groups of brands, only positive Z-scores for individual brands were taken into account. They are divided by the number of brands of each group of brands depending on the positive Z-score achieved individually. The ranking of the brand groups was achieved as shown in Figure 3.

Figure 3. Z score according to Brand Groups and the average of positively achieved Z-score results



Source: Q-sorting

Some of the brand groups had only one brand on average (Pirelli, Sumitomo, Hankok) because in this research no positive result was recorded for the Z-score of the brand or sub-brand.

4. CONCLUSION

The 1st hypothesis was confirmed because the research showed that the 6 most famous car tire brands are indeed perceived more significantly than the other 39. The 2nd hypothesis was not confirmed because the negative influence of sub-brands on the overall result of the umbrella brand. Certain groups of brands are represented by only one brand on the Croatian market, such as Pirelli, and this may represent a relative advantage (as seen in this research) in product marketing but it does not represent the satisfaction of the needs of customers with different payment options. The Hankook Group would achieve a better Z-score if the Laufenn sub-brand achieved a much better result than the current one (-1.23). The Goodyear Group with its sub-brands (Fulda, Sava, Dunlop) has on average an excellent perception among Croatian customers because they are already well-known brands, especially Sava and Dunlop. The Sumitomo group (one of the world's largest producers of multi-purpose tires) is a group of brands completely unknown to the respondents, but its sub-brand Falken is known to Croatian buyers of car tires. The Michelin Group with its sub-brands achieves, on average, a comparable result with the Bridgestone Group and Continental. The weaker results of the leading individual car tire brands can be linked to the weaker results of the perception of the sub-brands, which significantly reduce the average result. Regardless of the significantly weaker results of car tire sub-brands, customers want the best tires for their vehicle, but in practice they choose car tires that they can afford. They wish that the sub-brand has a link with the umbrella brand, i.e. that they get a product with approximately the same characteristics but with a "weaker name". The same thing is exploited and communicated by sellers. They often emphasize

some sub-brands as parts of stronger producer groups, produced with same material mixtures used for premium brands and produced on same machines as premium brands or designed with last year's design (abandoned premium brand tire design). The results of this research can serve as a basis for considering the strategic communication plans of individual brand groups, depending on the importance of each market in Europe, taking into account the objective limitations of the Croatian car tire market. The results of this research can also serve as a basis for considering the approach of expanding the offer of those umbrella tire brands, especially for tire brands that do not have a developed range of offers for several price ranges. This research showed the potential for studying the perception of consumer products through the Q-methodology with the aim of considering strategies for expanding the range of products in accordance with the particular product or market and the development of the competition.

PRIMJENA Q-METODOLOGIJE U ISTRAŽIVANJU PERCEPCIJE MARKI AUTOMOBILSKIH GUMA NA HRVATSKOM TRŽIŠTU

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SAŽETAK

Cilj ovog istraživanja bio je ispitati percepciju brandova automobilskih guma te time i grupa brandova automobilskih guma kod hrvatskih vozača upotrebom Q-metodologije. Q-metodologija se i dalje smatra avangardnim istraživačkim alatom u društvenim znanostima ali nalazi široku primjenu kod utvrđivanja prevladavajućeg mišljenja kod važnih pitanja. Istraživanjem je utvrđeno 45 brandova automobilskih guma i 7 grupa brandova prisutnih u Hrvatskoj. Vodeći brandovi automobilskih guma očekivano imaju značajno pozitivnu percepciju kod hrvatskih vozača, no u prosjeku rezultata za grupe brandova ostvaruju slabije rezultate. S obzirom da se asortiman podbrandova odnosi na cijeli spektar automobilskih guma po različitim cjenovnim i kvalitativnim razredima, percepciju brandova treba jasno razdvojiti od platežnih mogućnosti vozača. Hrvatskim vozačima je dostupan širok izbor različitih brandova i podbrandova automobilskih guma od kojih im je tek jedan dio poznat.

Ključne riječi: *tire brand; Q-methodology; brand perception; Croatian tire market*

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