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## Article

# Assessment of Influencing Factors on Consumer Behavior Using the AHP Model

Marko Šostar<sup>1,\*</sup>  and Vladimir Ristanović<sup>2</sup>

<sup>1</sup> Faculty of Tourism and Rural Development, Josip Juraj Strossmayer University of Osijek—Faculty of Tourism and Rural Development in Požega, Vukovarska 17, 34000 Požega, Croatia

<sup>2</sup> Institute of European Studies, Square of Nikola Pašić 11, 11000 Belgrade, Serbia; vladimir.ristanovic@ies.rs

\* Correspondence: msostar@ftrr.hr; Tel.: +385-98554442

**Abstract:** The influence of numerous factors determines and changes the daily behavior of consumers. This paper aims to estimate and rank the weight of cultural, social, personal, and psychological factors that change the buying habits of individuals. The research was conducted on a sample of 559 respondents in the Republic of Croatia. Data from the survey were used to create a hierarchical model structure. The analytic hierarchy process (AHP), as a decision-making method, was used in the analysis to estimate and rank the factors that influence consumer habits. An analysis of results showed that personal and psychological factors have the principal influence on consumer habits. Personal budget, as the dominant criterion in a group of set criteria, contributed to the fact that personal factors have the dominant influence on consumer habits.

**Keywords:** consumer behavior; influential factors; buying habits



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## 1. Introduction

Today, we are living a time of great changes. The COVID-19 pandemic, wars, natural disasters, technological developments, and financial crises have changed the whole world and the way of thinking. Consumption gradually becomes a very important part of ensuring an individual's happiness [1]. Consumer habits are changing each day due to a complex interplay of technological, economic, social, cultural, environmental, and health and safety factors. Businesses that understand these factors and adapt to changing consumer habits are more likely to succeed and thrive in the long run. Research on consumer behavior is essential for developing effective marketing strategies, increasing business performance, informing public policy, advancing consumer welfare, and academic advancements. By understanding consumer behavior, businesses and policymakers can make informed decisions that can improve the lives of consumers and promote economic growth.

With the development of technology, the evolution of individual awareness, and societal changes, the nature of consumer behavior becomes different, which complicates marketing planning [2]. Perception varies from individual to individual and not all consumers have the same attitudes about the same product; therefore, they behave differently [3]. Consumers appreciate the social responsibility of companies in terms of sustainable development [4].

Consumer habits are greatly influenced by internal and external factors. Internal factors comprise economic conditions and psychological factors while external ones comprise social and cultural factors [5]. The consumer habits are subject to constant environmental influences. There are daily influences of family, friends, the Internet, social networks, famous public life personalities, and the media on purchase decision-making. Even small things affect consumer perception, ranging from the way of buying and delivering products, to insurance and complaints, after-sales services, and everything that can be classified in the category of marketing mix (product, price, distribution, and promotion).

While it is difficult to predict exactly how consumers will behave in all situations, research on consumer behavior can provide insights into their decision-making processes, needs, and motivations. The lifestyle, habits, trends, wishes, and needs of consumers are changing daily, while consumer behavior is often unpredictable. Marketers need to study consumer behavior constantly to meet the needs of consumers while ensuring mutual satisfaction. It is important to note that not all consumers are the same and individual differences can impact their behavior.

This study is a continuation of an existing consumer behavior study of Šostar et al. [6] where the focus on factors influencing consumer behavior has been expanded to include other areas of influence. This research has shown the significant influence of the COVID-19 pandemic on consumer attitudes as an important psychological factor. With this expanded study, the sample size over which the research is conducted has increased and the impact of all factors (social, cultural, personal, and psychological) has been analyzed. This paper analyzes the scientific literature examining factors influencing consumer behavior. The aim of the paper is to determine whether all the factors affect consumer behavior equally or whether some of them have more dominant influence. The source of the data is secondary research as well as primary research conducted in the Republic of Croatia (survey of consumers using a sample as well as the analytic hierarchy process—AHP method) applied to determine the mentioned impacts.

The analytic hierarchy process (AHP) method has proven to be an excellent tool for managers. This method applies to all management activities. It helps managers in decision-making. A decision is a problem-solving process that does not have to be focused only on deciding but the point is that the problem must be solved. Performance of tasks and problem-solving in business are management challenges. Therefore, it is relevant to consider the circumstances and factors that affect the business process. The impact of individual factors cannot always be predicted. Such elements have a stochastic character and require more complex decision-making processes. Therefore, we will use the AHP method to analyze the impact on consumer habits. The implementation of the AHP model is carried out through a clear hierarchical structure: (1) the problem is defined and analyzed, (2) possible solution variants are proposed, and (3) one variant is selected according to specific criteria [7]. Such an approach will allow us to evaluate factors according to the degree of influence on consumer habits. Also, managers will have the opportunity to manage consumer habits by relying on the ranking of factors that influence the consumer habits. In this study, we first want to rank the variants of influence on consumer habits and then choose the best variant, based on the set criteria, using the AHP method. The data used will be taken from a sample of 559 surveys.

This paper is organized as follows: Section 1 introduces a theoretical framework of consumer behavior and the proposed approach to select right consumer behavior influencing factors. It also provides hypotheses and the analytic hierarchy process as a multicriteria decision-making method. Section 2 presents materials and methods used in research process. Section 3 presents results and a discussion. Section 4 discusses the conclusions.

### *1.1. Problem Statement*

This study aims to determine how consumers in the Republic of Croatia behave in the market due to internal and external factors. There is existing research on these influences, but most of them are not sufficiently focused on the challenges of modern times, such as the COVID-19 pandemic, the war in Ukraine, natural disasters, and the like. This study aims to cover proposed influential factors, determining how much and in what way they affect consumer behavior in the Republic of Croatia.

### *1.2. Significance of the Study*

Consumer behavior is the study of how individuals or groups select, buy, use, and dispose of products, services, ideas, or experiences to satisfy their needs and wants. It is a

crucial aspect of marketing as understanding consumer behavior can help organizations create effective marketing strategies and make informed business decisions.

Research on influential factors on consumer behavior is essential because it helps businesses to identify and understand the various factors that affect consumer decision-making processes. By understanding the factors that influence consumer behavior, organizations can better design their products and services, develop targeted marketing campaigns, and tailor their customer experiences to meet the needs and preferences of their target audience.

The contribution of this research is in the development of the product itself, crafting better marketing strategies and approaches to the consumer, creating a stronger connection with consumers, and creating a competitive advantage. This research will assist companies in better understanding the needs of their customers and organizations in developing more effective communication and sales channels.

The COVID-19 pandemic, war in Ukraine and many other influences have had a significant impact on consumer behavior. Both events have changed the foundations of functioning people and economies, leading to changes in buying habits. The primary benefit of this study is to determine the impacts of the modern age on consumer behavior. There are numerous studies on the influential factors on consumer behavior, but most of the research was conducted before or during the COVID-19 pandemic and war in Ukraine. These events have significantly changed consumer attitudes and behavior, making this research important in understanding the changes that have occurred.

Finally, research on influential factors on consumer behavior is crucial for businesses to make informed decisions about product development, marketing, and customer experience. It helps organizations to identify the needs and preferences of their customers, develop effective marketing strategies, and ultimately improve sales and revenue.

### *1.3. Literature Review*

Communication in everyday life, including in sales, is the key to satisfaction and success. Communication can be verbal or non-verbal. Non-verbal communication has a significant impact on the success of any business. It ranges from the behavior towards employees, partners, and co-workers to the relationship with potential customers buying a particular product or service [8].

Consumer behavior demonstrates how individuals, groups, and organizations behave, how they buy goods and services, and how this satisfies their desires and needs [9]. "We can also define it as the behavior that consumers exhibit when searching for, purchasing, evaluating, and disposing of products that to some extent meet their needs" [10].

The market where customers appear can be divided into individuals and households who purchase products and services for personal consumption. The business entity market purchases goods and services for further processing, refinement, and sale [11].

Consumer behavior affects individual behavior in the process of procuring, using, and disposing of products. Every day, consumers make a series of decisions regarding the aforementioned processes, often unconsciously, so that the process is interactive and most often routine [6].

Consumer behavior is the key to success. As the Pareto principle states that 20% of customers contribute to 80% of sales, the goal is to retain the existing customers. Finding new markets and new customers is an expensive and long-lasting process. To satisfy consumers and create long-term purchases, marketers must invest considerable efforts in the market research and product development. According to Solomon et al. [12], customer satisfaction is measurement of experience of the consumer after purchasing products or using the services. Fruth et al. [13] point out that some consumers rely on their own knowledge and experience to make quick buying decisions, but others may need more information and involvement. Therefore, the level of involvement reflects the consumer interest and use of a given product, but also the amount of information they need to decide. Consumers often behave unpredictably and consumer behavior may differ from person to person, even though we are talking about the same product. For this reason, it is necessary

to do consumer and market segmentation to research, in the most efficient way, what a particular group of consumers needs and how to offer them what they need.

Figure 1 shows a model of consumer behavior where it can be seen that under the influence of the 4 Ps (product, price, distribution, and promotion), as well as other influential factors, there is a change in consumer behavior and, in the end, a decision about purchasing is made. In their research, Schiffman et al. indicated that characteristics of the consumer have impact on how he or she reacts to the stimulants; the consumer decision-making process itself affects the consumer’s behavior, as shown in the model of buyer behavior as marketing and other stimulants entering the consumer’s black box and producing certain responses [14].

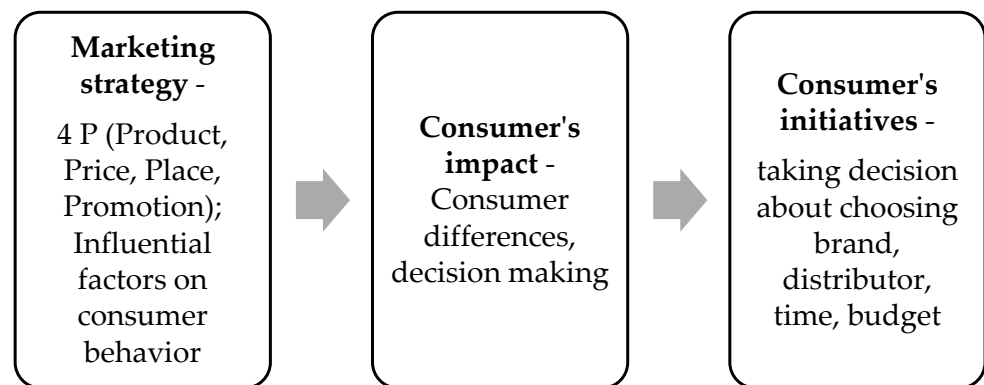


Figure 1. Model of consumer behavior.

“The term consumer buying behavior refers to consumers’ attitudes, preferences, intentions, and choices when purchasing products or services. This behavior is related to consumers’ behavior in the market. Purchase decisions are influenced by many factors including personal, psychological, and social factors” [15].

Figure 2 shows that the influences affecting consumers may be arranged into groups as cultural, social, personal, and psychological factors. Marketers cannot control these factors for the most part but they must take them into account [16].

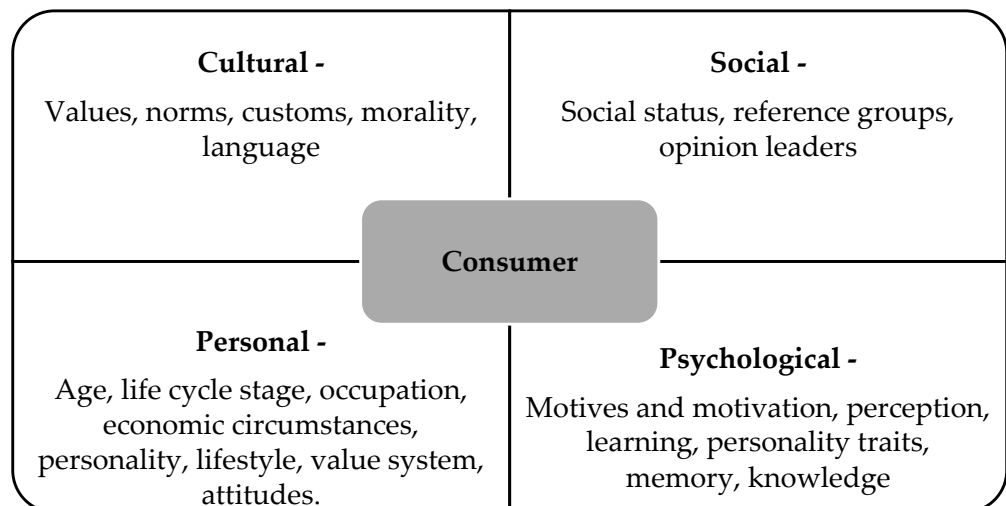


Figure 2. Factors influencing consumer behavior.

Cultural differences play an important role in consumer behavior. Culture is an essential part of every person and determines what they are like, what values and habits they have in life. Culture varies from country to country and geographic area. When that region is large enough, then companies devise specialized marketing approaches in

communicating with consumers [17]. A key finding of Al Ghaswyneh et al. [1] shows that consumer behavior due to cultural identity can have an exceptionally strong and positive impact on creating a connection with a product that is adapted to these cultural differences.

“Reference groups are considered a social influence in consumer purchasing because they are often groups that consumers will look up to while making purchasing decisions” [18]. Reference groups are those that have a direct or indirect influence on consumers’ buying habits. Groups that have a direct impact relate to those in which someone is a member or to which they belong, such as family and friends, while the indirect ones are those we either want or do not want to belong to [17]. Opinion leaders are people whose advice and suggestions are respected by consumers and the consumers come under influence of the opinion leaders when deciding to buy a product. These are most often well-known figures from public life. “Social factors depend on income, social class, and education level. Consumer buying behavior is the selection, purchase and consumption of goods and services for the satisfaction of their wants” [5]. Family and status symbols play a significant role in consumer behavior. Another study from Danish et al. [19] suggests that consumers do not buy eco-friendly products just for functionality but also for their symbolism and acceptance of the product in society. Consumers are satisfied when they buy green products that reduce negative impacts on the environment.

Personal factors will also be influenced by other factors such as age, gender, background, culture, and personal issues in the course of the decision-making process concerning online purchases [20]. Personal factors that influence consumer behavior are one’s age, life cycle stage, occupation, economic circumstances, personality, lifestyle, and value system. Any reduction or increase of one’s personal budget, inflation, or job loss are of big importance here. The study of Liu et al. [21] shows that “demand motivation, the anchor, the product message, the live medium, and consumer attitudes are the main factors that affect the depth of consumers’ engagement and purchase behaviors”.

“Psychological considerations include understanding of needs or circumstances, capacity of a person to absorb or interpret knowledge, as well as the person’s mood. This is when a consumer reacts to the marketing adversity available around him or her based on personal impressions about specific goods or services” [22]. Among the psychological factors, perception is extremely important, while other psychological factors are motives and motivation, learning, personality traits, memory, and knowledge. It is necessary to mention pandemics, wars, natural disasters, social networks, and media as psychological influences that are always associated with similar or the same consumer behavior patterns over time. “Emotional marketing comes from the emotional needs of consumers; it can induce an emotional resonance in consumers and integrate emotions into marketing. In the era of emotional consumption, consumers not only care about the quantity, quality and price of products, but also need emotional satisfaction and psychological identification when shopping” [23].

In their study, Nawi et al. [24] conclude that respondents are influenced to make an online purchase when the researchers realize that the most influential factor of habitual behavior is the desire to find a particular product useful, and actual buying habits highly influence intention towards making an online purchase. Research of Al-Ghaswyneh [1] analyzed the perception of prices, rewards, social network posts, and online reviews as consumer behavior influences, where they proved that rewards have the greatest influence on purchases. Studies conducted by Chowhury et al.; Khaniwale et al.; Lai et al.; and Sangroya et al. [25–28] on consumer buying behavior in less developed economies show that consumers are always considering price, religious orientation, and culture in the context of their buying behavior.

Studies of Al-Salamin et al.; Aschemann-Witzel et al.; and Waheed et al. [29–31] have demonstrated the effect of prices on consumer behavior, where consumers were in a position to bargain for a price and decide on which product to buy considering the price and quality of the product. Svatosova [32] stated in her research that consumers are mostly facing challenges which will affect them emotionally and psychologically. Bezzaoua et al. [33]



found out in their study that there was no relationship between perceived cultures and concrete personality traits. The study conducted by Kwajaffa [34] confirms that there are positive and significant relationships between one's motivation and consumer buying behavior, between prices and consumer behavior, and between one's perceived cultural importance and consumer buying behavior. Also, there are positive and significant relationships between one's perceived cultural importance and religious orientation, and between prices and one's religious orientation.

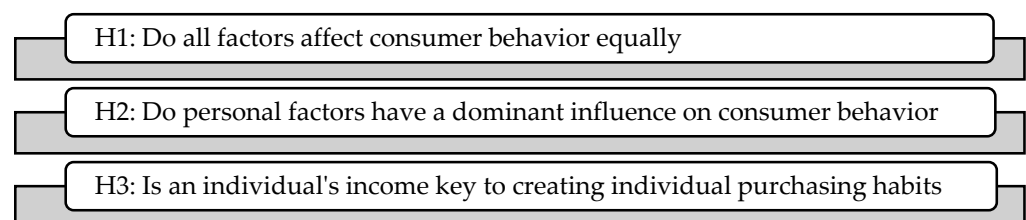
In their research, Al-Ghaswyneh; Lawan et al.; and Nawawi et al. [1,35,36] indicated that cultural factors have a significant effect on one's buying decision. The study of Etuk et al. [37] indicates that that family, reference groups, and culture have a significant positive influence on the decision-making process regarding purchases.

Sonwaney et al. [38], in their research explains "that aimed to discover the elements that influence online customer purchasing behavior, they concluded that psychological and demographic characteristics have a major influence on consumer purchasing choices". Research of Šostar et al. and Zwanka et al. [8,39] "investigated the potential impact of the 2020 COVID-19 pandemic on global consumer traits, buying patterns, global interconnectedness and psychographic behavior, and other marketing activities and finally their paper found long term behavioral shifts due to the COVID-19 pandemic which resulted in shifts in consumer behavior". In their study Hall et al. [40] show that different countries and regions have similar behavior in terms of panic buying during the COVID-19 pandemic. The influence of a product's brand and trust in it is associated with ethical behavior [41].

Findings of Etuk et al. [37] indicated that the most significant influence on consumer buying behavior in Egypt came from personal factors, while culture was the least influential factor. In Saudi Arabia, the economic factor was the most significant factor of consumer buying behavior and culture was the least influential factor. Research of Ayaviri-Nina et al. [42] "reveals that emotions, feelings, and motivation are the factors that are significantly related to consumer attitudes toward purchases". The study of Victor et al. [43] "confirms that, when consumers purchase durable items, personal characteristics such as their age, employment, economic position, lifestyle, and personality have a substantial impact on their purchasing decisions".

#### 1.4. Research Objectives and Hypothesis

The research objective of this study is to determine the impact of consumer behavior influencing factors. The challenge (existing problem) is that it is very difficult to monitor consumer behavior, which is highly unpredictable due to internal and external influences. We determine four main impacts that influence consumer behavior: cultural factors, social factors, personal factors, and psychological factors and analyzed them through the mentioned hypotheses 1, 2, and 3 (Figure 3).



**Figure 3.** Hypotheses of the study.

In this study, we set up hypotheses to test whether all the factors influencing consumer behavior have an equal impact or whether some of them dominate. For this purpose, three hypotheses were tested: H1: Do all factors affect consumer behavior equally? H2: Do personal factors have a dominant influence on consumer behavior? H3: Is an individual's income key to creating individual purchasing habits?

## 2. Materials and Methods

The methodology of research is crucial because it provides a systematic and structured approach to investigating a research question or hypothesis. A well-designed methodology ensures that the research is conducted in a rigorous, systematic, and objective manner, increasing the validity and reliability of the results. By providing a structured framework for data analysis, facilitating replication and peer review, and enhancing the generalizability and relevance of the research, a well-designed methodology supports the advancement of knowledge and understanding in the field of consumer behavior.

The methodology used in this research refers to the collection of primary and secondary data. The secondary data was collected through an analysis of existing relevant literature (scientific studies, scientific papers, books/textbooks, analyses, and statistical data). A questionnaire survey was also conducted as a research method and responses were statistically processed later. The obtained data were used in the analysis using the AHP method. In this paper, artificial intelligence was used to a small extent as one of the tools to achieve higher quality of the work.

Questionnaires were sent to 1127 respondents from Croatia who were randomly selected from the author's initial research sample, which consisted of 2000 registered users of the social network Facebook, e-mail, and other databases of researchers. Random sampling was carried out by assigning a unique number to each individual in the database. We then used an online random number generator in the range of 1–2000 to get a sample of 1127 to which we later sent the questionnaire. A sample of this size can also provide adequate statistical power to detect meaningful differences or relationships between variables. The respondents were consumers of all age groups selected at random. Choosing a random sample of the population in a survey is significant in researching consumer behavior for several reasons:

- **Representativeness:** A random sample provides a representative sample of the population being studied, ensuring that the results are generalizable to the larger population. This helps to minimize bias, and increase the validity and reliability of the research.
- **Avoidance of Sampling Bias:** A random sample can help to avoid sampling bias, where certain groups or individuals are overrepresented or underrepresented in the sample. This can result in biased results and can limit the generalizability of the findings.
- **Increased Precision:** A random sample can increase the precision of the results, reducing the margin of error and increasing the accuracy of the research. This helps to ensure that the findings are robust and reliable.
- **Ethical Considerations:** Selecting a random sample helps to ensure that all individuals in the population have an equal chance of being included in the study. This helps to ensure that the study is conducted ethically and respects the rights of all participants.
- **Improved Generalizability:** The use of a random sample helps to ensure that the findings are generalizable to the larger population, making the results more applicable to real-world situations. This is essential for informing business decisions and developing effective marketing strategies.

The questionnaire survey was conducted in 2023 using the Google forms tool. The survey questionnaire link was sent to the respondents via e-mail, through social networks and mobile applications. In the Table 1. We can see a demographic data of that survey.

A demographic analysis of the respondents showed that more women than men responded to the questionnaire. Most of the respondents were in the 36–45 age group, while the fewest were 56 and older. Most of the respondents were employed and married. Statistical processing shows that most respondents had a monthly income above EUR 1099, while the group earning up to EUR 499 per month was the least numerous. It is important to note that the sample participating in the research was chosen by random selection without any intention of directing or prompting respondents' answers. As the field of consumer behavior is broad and encompasses various gender and age groups, as well as differences among them with respect to certain characteristics, the respondents had to be covered by a wider research area.



**Table 1.** Respondent demographic data.

Gender	Number
Male	201
Female	358
Age	Number
18–25	134
26–35	117
36–45	173
46–55	79
56+	56
Employment status	Number
Unemployed	148
Employed	411
Marital status	Number
Not married	241
Married	318
Monthly income	Number
Up to EUR 499	127
EUR 500–799	83
EUR 800–1099	153
Above EUR 1099	196

These materials clearly show that numerous influences define customer behavior. It is often hard to define all of them. It is even more difficult to classify them into only the four groups of influences that we have analyzed in this paper. If one were to ask for a list of criteria, it would be very long and it would be difficult to assess all the influences on consumer behavior individually. This study proposes a multi-criteria decision-making model (MCDM) based on the weight calculated from the AHP method tool to obtain a ranking of the various influences on consumer behavior.

The multi-criteria decision-making (MCDM) is a method of evaluating multiple conflicting criteria to determine the best one among different variants [44]. In this method, according to Rao [45], several different variants/alternatives are examined based on the constraints, preferences, and priorities of the decision-makers. According to Jurik [7] decision-making is an activity that (1) defines and analyzes a decision-making problem, (2) proposes possible variants of solutions, and (3) chooses one of the variants according to certain criteria. In this study, we use the AHP method, which has been applied to numerous decision-making problems for decades. It is a decision-making method based on subjective evaluations of certain criteria and variants. The tools of the AHP method are used to assign pairs of weights to rank the variables/criteria to make the correct decision. It is the preferred tool for assigning pairs of weights to rank variables/criteria to make the right decision. The advantage of the AHP model decades ago is reflected in its numerous capabilities and in its flexibility. Decision-making, ranking, and prioritization of problems allow managers to manage and formulate a hierarchical model according to their situation.

It enables the preparation of effective decisions and speeds up the decision-making process. The logical concept of problem structuring is adaptable and functional. Such a concept enables the quantification of the relationship between components (goals, criteria, and variants). Furthermore, it facilitates the evaluation of alternative solutions, then their ranking, and, in the end, the selection of the best variant. The application of the AHP method is widespread and used in many different areas. As we can see from the studies

of Canco et al.; Gago et al.; Lacurezeanu et al.; Khan et al.; Xi et al.; Costa et al.; Chang et al.; Tošović-Stevanović et al.; Amzat et al.; and Elvis et al., the solutions obtained by the AHP method have led to a series of helpful decisions in economics [46], energy [47], management [48], environment [49,50], health [51], transportation [52], agriculture [53], education [54], and industry [55]. Through numerous iterations of problem-solving, which are carried out through a hierarchical algorithm, the decision maker directs his actions within the AHP model to increase the quality and efficiency of all his decisions [56]. Saaty [57] emphasized that, to reach the right decision, it is necessary to decompose the decision into several iterations: defining the problem, defining the hierarchy structure, creating matrices for pairwise comparisons, and making prioritization. All of the above indicate that the AHP is one of the most preferred methods in multiple decision-making. Figure 4 summarizes the advantages of the AHP method for problem-solving and decision-making.

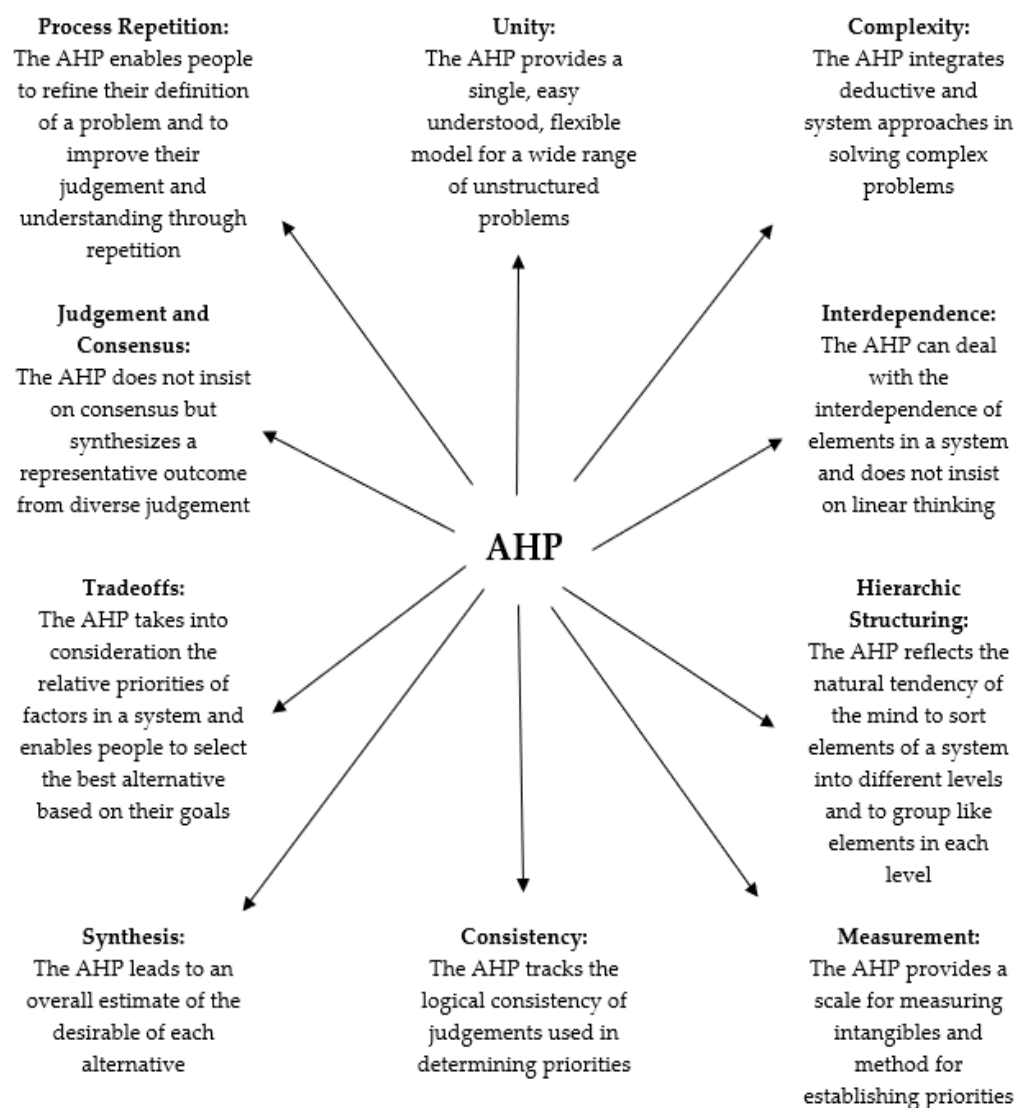


Figure 4. Advantages of AHP method [58].

The basic concept of the AHP method consists of three principles of analytical thinking. Within the framework of the principle of structuring the hierarchy, a logical structure of interconnected components is created, as shown in Figure 5 [7]. A detailed explanation of the use of AHP methods and results through iterations can be found in the article [53]. The principle of prioritization implies a mutual comparison of all evaluation levels. Pairwise comparisons are created according to numerical scale. The resulting numerical values allow

experts to create a new matrix. The principle of logical consistency includes measuring the intensity of consistency between objectives, criteria, and variants. Also, the study of Ristanović et al. [59] emphasizes, the hierarchical structure of the AHP method first calculates the priority of the criteria according to the given problem; then the priority of the alternatives for the specified criteria is calculated; and, finally, the priorities of the alternatives according to the defined problem. A pairwise comparison is made within the matrix. Weight vectors for each level are obtained. In the last step, all results are ranked according to the size of the calculated weight. The highest values give the best solution to choose. Based on this, a final decision is made on the influence of factors on consumer habits.

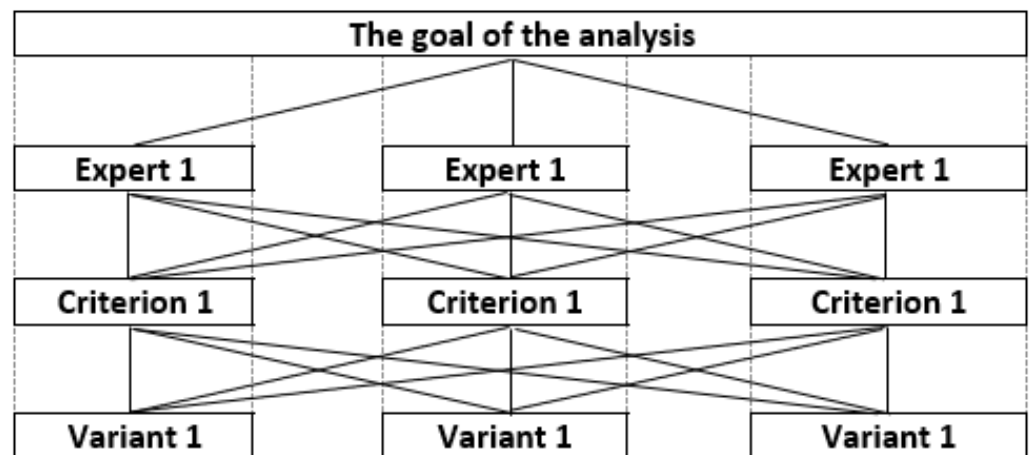


Figure 5. The hierarchy structure of the AHP method [7].

Unlike many researchers who before us presented the application of the AHP method through basic steps, we will present the basic concept of the AHP method in more detail, through a series of the following smaller steps:

1. Determine the aim, criteria, and variants of the decision problem—to compile the hierarchical structure. This process is often referred to as problem decomposition into a hierarchical tree.
2. Select experts who will generate a pairwise comparison matrix ( $A = n \times n$ ).

To make pairwise comparison of the elements, the method of eigenvalues is used, by which the weight vectors of the entered elements are determined through a linear system (Equation (1)):

$$A \times \omega = \lambda \times \omega, \quad e^T = 1, \quad (1)$$

where  $A$  is the comparison matrix of the dimension  $n \times n$ ,  $\omega$  the eigenvalue vector,  $\lambda$  the eigenvalue, and  $e$  is the unit vector.

The vector  $W$  can be defined as a set of priority vectors  $w$  which satisfy the normalization and the positive constraint:

$$W = \{w | w > 0, e^T w = 1\}, \quad (2)$$

where  $e$  is the  $n$ -component singular vector,  $e^T = (1, \dots, 1)$

The experts carried out the process of weighting the criteria and variants. Experts come from the academic community, business bodies, and research centers. The weighting process meant that each expert analyzed the answers to the questions from the completed questionnaires, namely those that directly related to the criteria (customs, morals, influence of famous people, environment, lifestyle, budget, COVID-19, social networks), and then on variants (social, cultural, personal, and psychological factors). For the weighting process, the experts used the Saaty scale (see also [59,60]).

3. Using Saaty's [56] scale, the relative importance of two criteria is calculated.

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14
R.I.	0	0	0.58	0.89	1.11	1.25	1.35	1.40	1.45	1.49	1.51	1.48	1.56	1.57

Saaty's scale is used for pairwise comparisons of target-related criteria and then pairwise comparisons of the variants related to each criterion. A scale of comparison allows the decision-maker to incorporate the experience and represent the relationship between the elements of a hierarchical structure.

4. The weights of the relative criteria are obtained after the matrix is previously normalized.

Pairwise comparisons of the criteria are arranged in a reciprocal matrix. Let  $A = (a_{ij})$  be the pairwise comparison matrix generated in this analysis, where

- $a_{ij} > 0$ , for  $i = 1, 2, \dots, n; j = 1, 2, \dots, n$ ,
- $a_{ji} = 1/a_{ij}$ , for  $i = 1, 2, \dots, n; j = 1, 2, \dots, n$

After the pairwise comparison matrix is normalized, the relative weight of the elements at each level concerning the given criteria is carried out.

5. The distribution of the criteria should be specified.  
6. Calculate the criteria weight vector.

The weights of the relative criteria are calculated as the components of the normalized eigenvector associated with the largest eigenvalue of the comparison matrix  $A$ . The AHP method finds the variants that give the maximum benefit to the final goal. Variants that are "less bad" get more points for the final score.

7. Check the consistency of pairwise judgments.

To check the consistency of the pairwise comparison and the quality of the obtained result, the consistency index is calculated using the form:

$$CI = \frac{\lambda_{\max} - n}{n - 1}, \quad (3)$$

where  $\lambda_{\max}$  is the main eigenvalue of the matrix  $S$  and  $CI$  is the consistency index.

The last phase in the AHP method's hierarchy structure is the calculation of the consistency ratio (CR). This is an essential rating because it shows how consistent the ratings are across the samples. If the CR is much higher than 0.1, the estimates are unreliable and the procedure must be repeated. The equation for calculating the consistency ratio is as follows (Equation (4)):

$$CR = \frac{CI}{RI}, \quad (4)$$

where  $CR$  is the consistency ratio,  $CI$  is the consistency index, and  $RI$  is the random consistency index. According to Saaty [57], if the value of  $CR$  is less than or equal to 0.1, it represents an acceptable range. (Statistical data are available on request: pairwise comparison, standardized matrix, and  $CR$  and  $CI$  worksheets.)

8. From the obtained results, a ranking list is created by the degree of priority in relation to the goal.

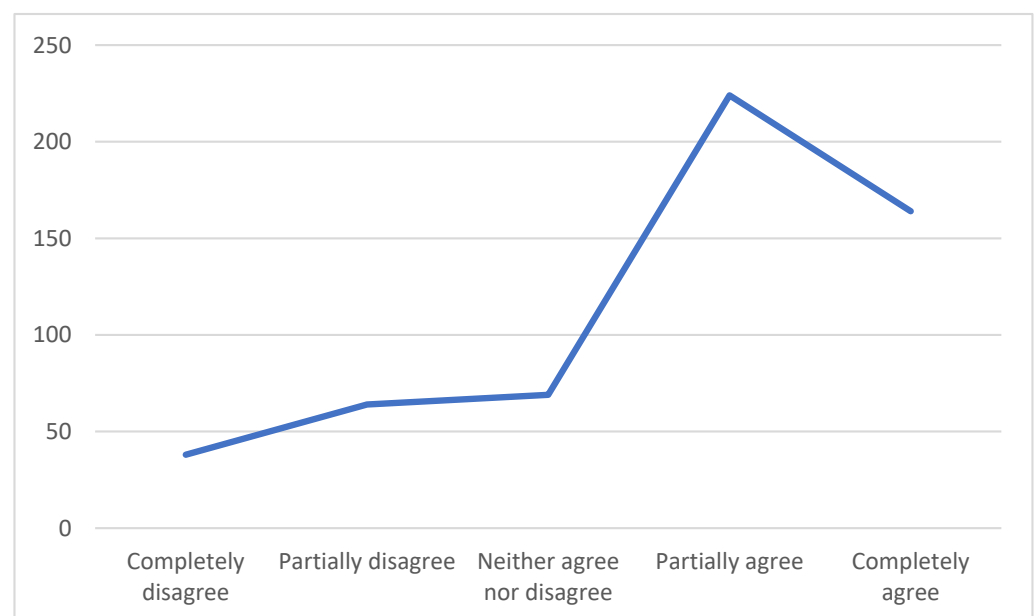
### 3. Results and Discussion

Through statistical data processing of the survey questionnaire, we have summarized the analysis into four categories of influential factors on consumer behavior. The survey results show us the attitudes of respondents related to the influences on their behavior. The results provide a significant basis for further research and investigations through different models. The results give us insights into future perspectives of approaching consumers in the market and timely adapting to their needs. The research results have provided us

with a foundation for understanding consumer behavior, as well as an excellent basis for expanding and continuing the research.

To check the relationships between variables, we conducted numerous correlations between different variables. We observed that the correlations between categories changed depending on the survey question. Let us examine the question: “I prefer to buy products that are made in the country where I was born”. There is an almost perfect correlation between men and women, among adults (categories 46–55 and 56+ years), and among those with higher incomes (categories EUR 800–1099 per month and above EUR 1099 per month), while there is a weak correlation between, say, married and unmarried. We also find a perfect correlation between older people and people with higher monthly incomes when we considered purchasing domestic products. Gender shows a high correlation, while this is not the case with marital status (the correlation is relatively low) or for young people. The influence of friends and acquaintances on purchasing decisions is significant, as there is a correlation in all categories. On the other hand, there is a high correlation among all categories for the question about changing habits over time or for the question about the impact of budget cuts on purchases. The impact of the COVID-19 pandemic on the increase in online shopping shows a higher correlation among middle-aged people (categories 26–35 and 36–45) and the oldest population (category 56+), as well as among people with a high salary (categories EUR 800–1099 and EUR 1099+ monthly income). Here we have listed only a few examples of correlations that we have calculated for specific groups of people or categories (all correlation calculations are available upon request from the reader). We considered that the obtained results by groups or categories correspond to the average and that the existing differences by categories are insufficient to jeopardize the overall result.

Following are Figures 6–10 which display the mentioned research results. We emphasize that the data in the figures pertain to the number of respondents during the conduct of the questionnaire survey.



**Figure 6.** Consumer behavior over time.

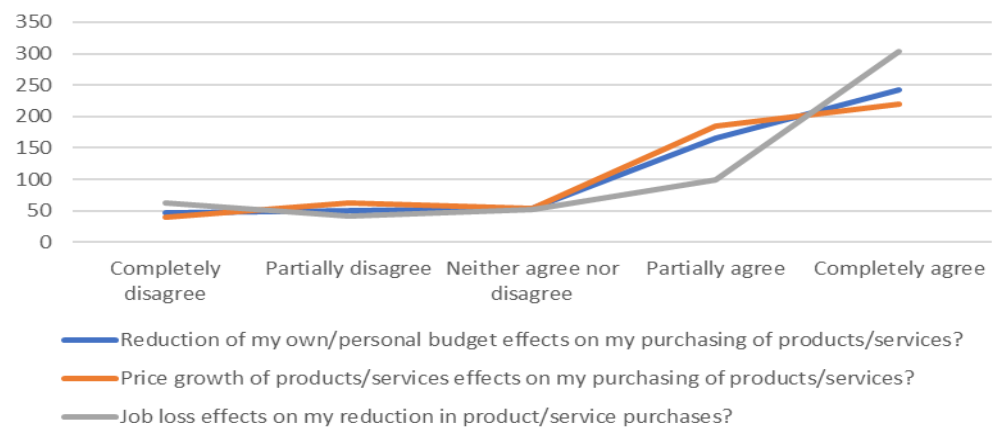


Figure 7. Impact of personal factors on consumer behavior.

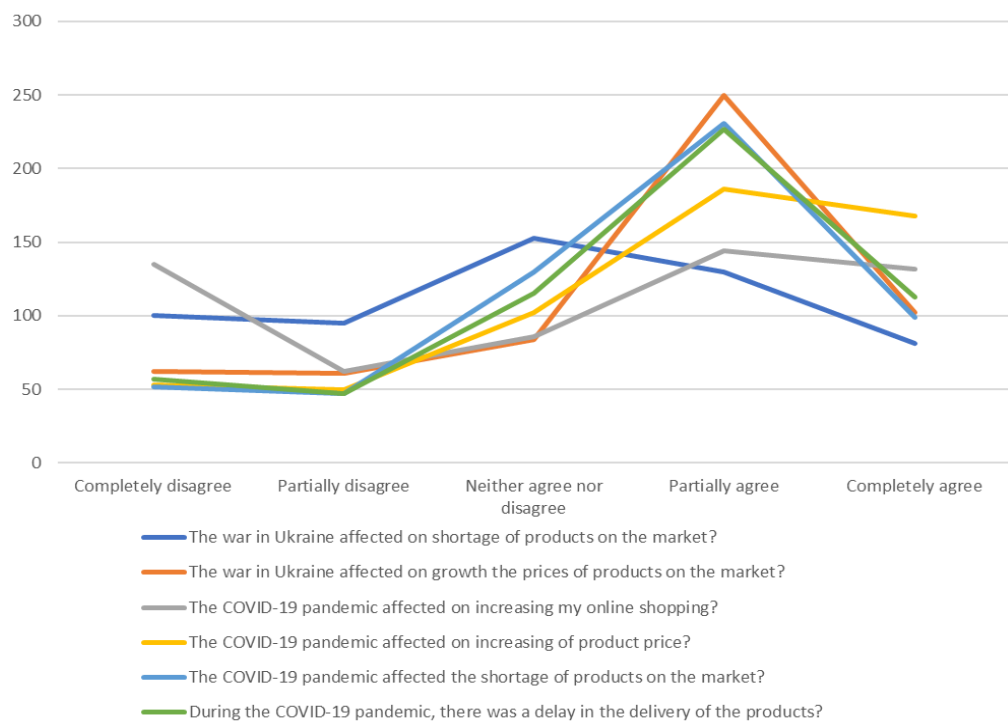


Figure 8. Impact of psychological factors on consumer behavior.

Synthesizing Pairwise Comparison

Our idea is to check the obtained results in the following part, using a method that can be used in both cases in complete and incomplete pairwise comparisons. This is the logarithmic least squares method (LLSM). In this method, the decision maker is assumed to minimize his measure of inconsistency when choosing attribute weights [61–63]. In this context, a LLSM is proposed to synthesize a set of pairwise comparisons to obtain an attribute weight vector,  $w = (w_1, w_2, \dots, w_n)^T$ . This method successfully solves the single criterion optimization problem by minimizing:

$$\sum_{i=1}^n \sum_{j>1}^n \left[ \ln(a_{ij}) - \ln\left(\frac{w_i}{w_j}\right) \right]^2$$

only if

$$\prod_{i=1}^n w_i = 1, w_i > 0, i = 1, 2, \dots, n$$



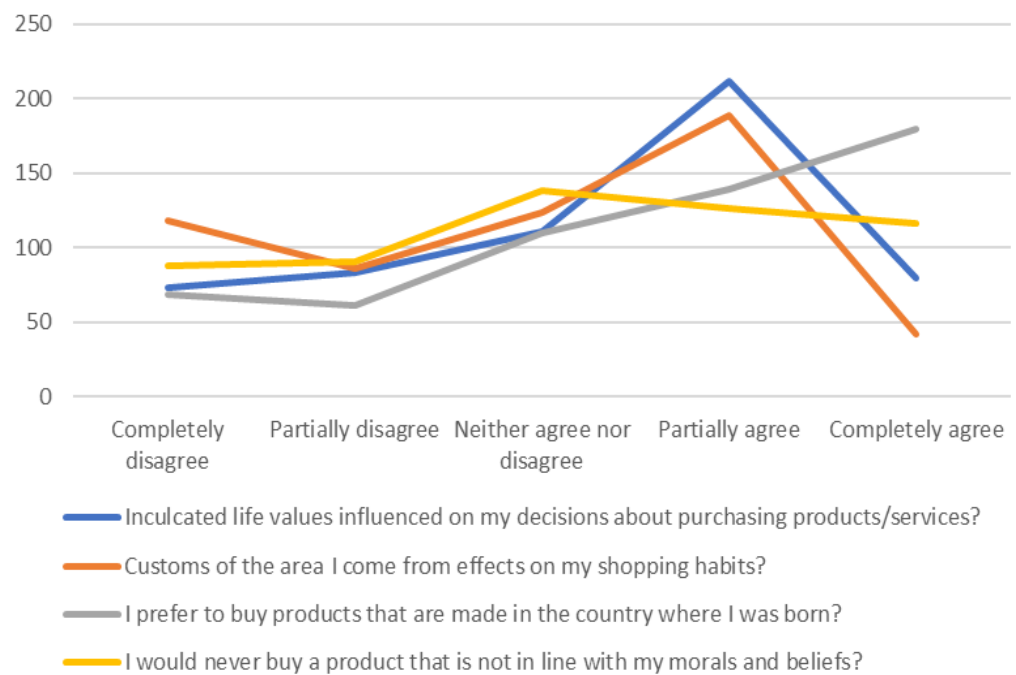


Figure 9. Impact of cultural factors on consumer behavior.

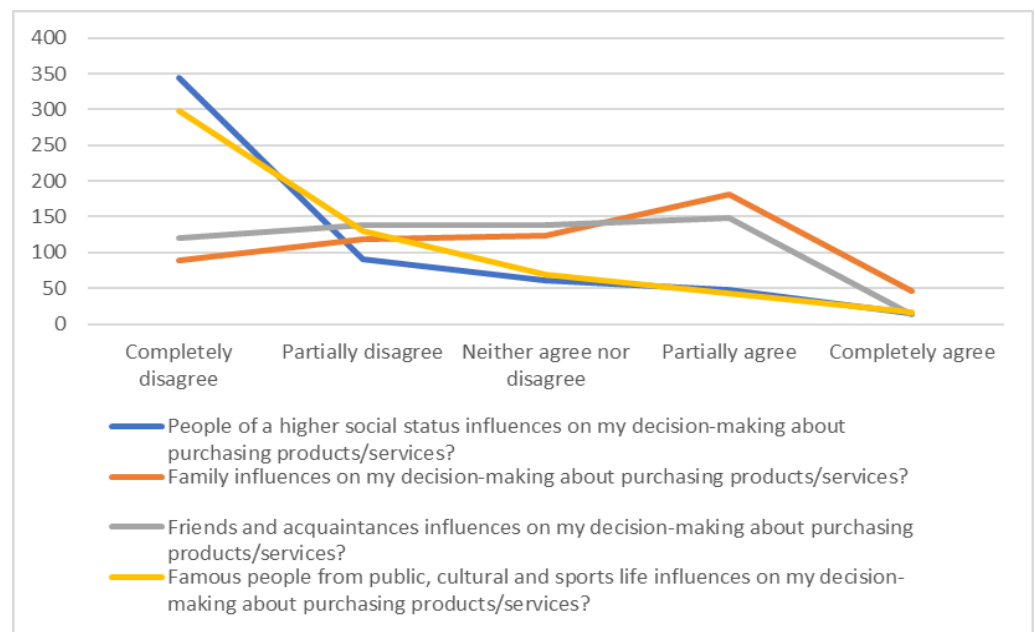
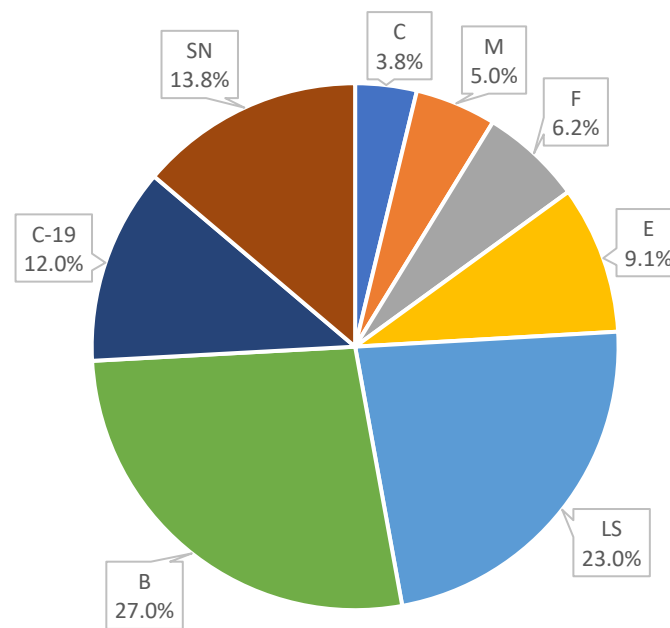


Figure 10. Impact of social factors on consumer behavior.

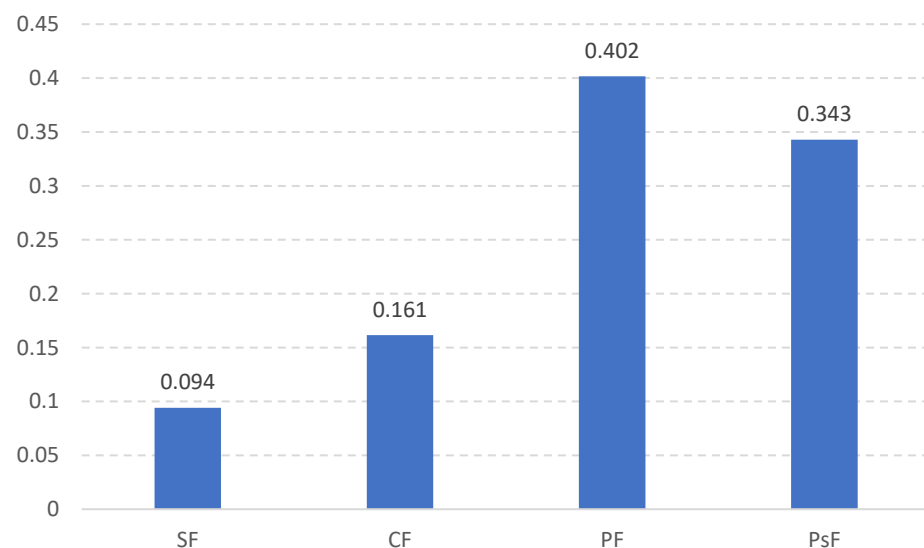
The LLS method does not require a vector of normalized values  $w$  (Equation (2)), which is the opposite of the additive normalized method. It searches within the entire sequence of positive real numbers for each  $w_1$  provided that all input vectors  $v$  are multiplicatively normalized.

In the Figure 11 we can see a priority vectors using the LLSM.



**Figure 11.** Priority vectors for criteria using the LLSM. Note: C—customs, M—morals, F—influence of famous people, E—environment, LS—lifestyle, B—budget, C-19—COVID-19, SN—social networks.

The application of LLSM confirmed the previously obtained results. The results obtained according to the standard AHP method are sufficiently precise in assessing the learnedness of consumer habits. Here we also found that (according to Figure 12) budget (B) and lifestyle (LS) are the most important goal criteria. On the other hand, morality (M) and customs (C) are the criteria with the least influence. Now, using LLSM, we computed a sufficiently high real eigenvector ( $\lambda_{max} = 8.640$ ) and a consistency ratio of less than 10% ( $CR = 0.065$ ), which must be considered consistent. There are differences in the values of certain criteria between the two models (AM and LLSM in AHP) but they are negligible. What we can see is the following: the order is the same in both methods used.



**Figure 12.** Final priority vectors using LLSM. Note: SF—social factors, CF—cultural factors, PF—personal factors, PsF—psychological factors.

The synthesis of the priority vectors of variants concerning all criteria according to LLSM also confirmed the results of the priority vector estimation. It was again shown, as

in the standard AHP method, that personal and psychological factors dominate the other variants—cultural and social factors.

All the above clearly shows that in the conducted analysis there was no error in the vector priority estimation, which in this case was obtained by applying the standard AHP method.

Figure 6 shows that most respondents agree that their shopping habits have changed over time, indicating that some of the listed factors played a role in the behavior of the surveyed consumers. The respondents mostly answered that their shopping habits change over time, which is logical. Shopping habits can change over time due to a complex interplay of technological, economic, social, cultural, environmental, and health and safety factors. As consumers' needs, preferences, and motivations change, businesses must adapt their marketing strategies, product offerings, and customer service to meet the evolving needs of their customers. As an individual grows and progresses through learning and experience, their attitudes also change. Everyone is different, and these influences change in different ways and at different times. It depends on the individual which influencing factor they are more susceptible to in their behavior.

Figure 7 shows the impact of personal factors on consumer behavior, where a significant impact of personal budget, price increases, and job loss on consumer behavior is visible.

Psychological factors play a crucial role in shaping consumer behavior by affecting individuals' perceptions, motivations, and decision-making processes. Perception of products is influenced by personal experiences, beliefs, and attitudes, while motivation drives the desire to fulfill specific needs or wants. Decision-making processes involve factors such as problem recognition, information search, and evaluation of alternatives. Marketers need to consider these psychological factors to create targeted campaigns that resonate with consumers' needs, emotions, and thought processes. Figure 8 shows the impact of psychological factors on consumer behavior, where the war in Ukraine and the COVID-19 pandemic as significant events in the recent past have a significant impact on the market situation, which is reflected in consumer behavior. This includes product shortages, price increases, increased online shopping, and product delivery delays. There are also many other psychological factors that influence consumer to behave like this: financial crisis, crisis in the oil and gas market, and many others.

Cultural factors have impact on consumer behavior by influencing preferences, purchasing decisions, and consumption patterns. Values and beliefs shape attitudes towards products, while norms and customs guide behavior within a culture. Social class affects preferences for specific brands, and language and communication styles determine how marketing messages are perceived. To effectively target consumers, businesses must consider these cultural elements and tailor their marketing strategies accordingly. Figure 9 shows the impact of cultural factors on consumer behavior, which exists but is not as dominant as the impact of personal and psychological factors. However, the influence of life values, habits, and historical heritage has a certain role in consumer behavior.

Figure 10 shows the impact of social factors on consumer behavior, where the impact is negligible, and the respondents are indifferent to social status, the influence of family, friends, or acquaintances.

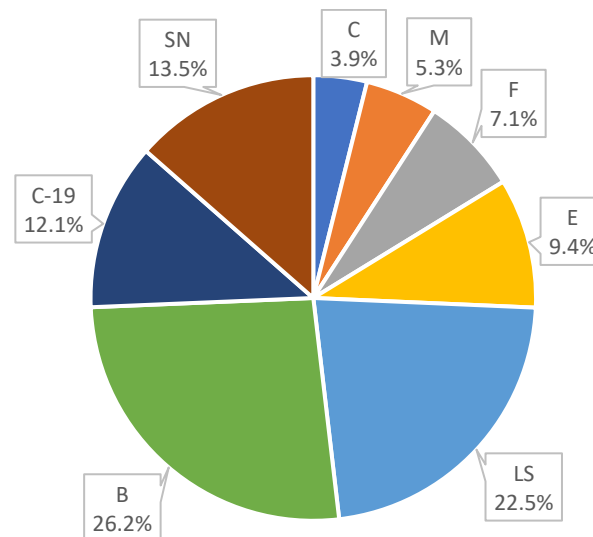
The results of the questionnaire survey conducted on the sample of consumers to determine the influencing factors on consumer behavior unequivocally show that intensity of all the factors that influence consumer habits is not uniform. Thus, we rejected the first hypothesis of the model (H1). By evaluating the presented alternatives, the results showed the dominance of personal factors in the creation of consumer habits, compared to other factors. This confirms the second hypothesis of the model (H2). The evaluation of the criteria showed that the budget, among other criteria, plays a key role in purchasing habits, thus confirming the third hypothesis of the model (H3).

Based on the analyzed expert evaluations and the results of the survey conducted through direct interviews with the respondents, we came to results that unequivocally

show the influence of various factors and determinant consumer habits: (i) personal and psychological factors dominate, while (ii) the key criteria for the consumer are budget and lifestyle. Analyzing the results of the consumer habits survey in the Republic of Croatia, we formed the structure of the AHP model as follows. At the highest level of the hierarchical structure, a goal or problem is set. These are consumer habits. We evaluate how much and which criteria affect consumer habits, and which alternatives exist depending on the criteria. At the middle level of the hierarchical structure, criteria are set. The following criteria specific to the Republic of Croatia were selected for the AHP method: Criterion 1—customs, Criterion 2—morals, Criterion 3—influence of famous people, Criterion 4—environment, Criterion 5—lifestyle, Criterion 6—budget, Criterion 7—COVID-19, Criterion 8—social networks. The lowest level of the hierarchical structure consists of variants. The following four variants are included in the hierarchical structure of the AHP method: Variant 1—social factors, Variant 2—cultural factors, Variant 3—personal factors, Variant 4—psychological factors. Here it is possible to see the advantage of the AHP method. In the first step, a complex hierarchical structure was created. In the second step, the impact of each element is evaluated. In the following, these elements are connected and combined. This is how the analysis progresses.

We started the evaluation with the AHP method by creating a hierarchical structure. We divided the elements by hierarchical levels. The elements are compared with each other, at different levels and in relation to the general goal. Then, the matrix is formatted using expert paired estimates.

The priority vectors for each matrix in AHP are determined by the additive normalization method. Applying this method (according to Figure 13), budget (B) is the most important goal criterion, lifestyle (LS) is in second place, the social network criterion (SN) is the third in rank, and COVID-19 is the fourth (C-19). The criteria environment (E), celebrity influence (FP), morality (M), and customs (C) were observed with a lower level of influence. This matrix is accurately generated because the relations are generally correct. Using this method, we calculated a sufficiently high real eigenvector ( $\lambda_{max} = 8.662$ ) and a consistency ratio of less than 10% ( $CR = 0.067$ ), which must be considered consistent.



**Figure 13.** Priority vectors for criteria in standard AHP method, using the additive normalization method. Note: C—customs, M—morals, F—influence of famous people, E—environment, LS—lifestyle, B—budget, C-19—COVID-19, SN—social networks.

In relation to the two dominant criteria (B and LS), according to Table 2, the best variant is represented by personal and psychological factors. The worst variants are cultural and social factors.

**Table 2.** Priority vectors for variants by criteria.

Variants/Criteria	C	M	FP	E	LS	B	C-19	SN
SF	0.141	0.088	0.098	0.074	0.088	0.106	0.080	0.096
CF	0.141	0.158	0.145	0.171	0.180	0.150	0.160	0.161
PF	0.455	0.482	0.327	0.471	0.460	0.435	0.294	0.277
PsF	0.263	0.272	0.430	0.284	0.272	0.309	0.466	0.466

Note: SF—social factors, CF—cultural factors, PF—personal factors, PsF—psychological factors, C—customs, M—morals, FP—influence of famous people, E—environment, LS—lifestyle, B—budget, C-19—COVID-19, SN—social networks.

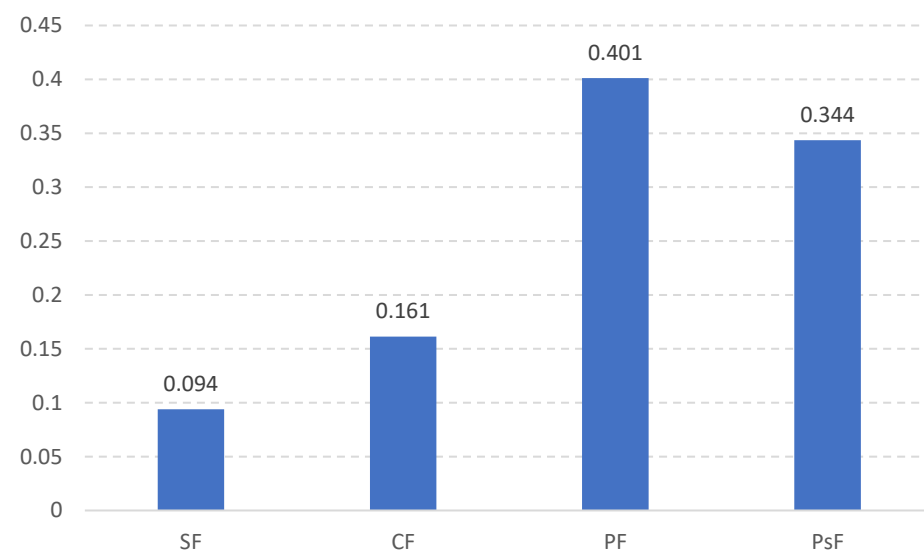
As the eigenvalue (EV) method is an integral part of the standard AHP method the so-called consistency index (CR) is calculated. This procedure evaluates the correctness of the ranked priorities. Table 3 gives the maximum matrix eigenvalues ( $\lambda_{max}$ ), coincidence index (RI), consistency index (CI), and consistency rate (CR) [64].

**Table 3.** Degree of pairwise comparisons consistency by the method of eigenvalues.

	Matrix							
	V1	V2	V3	V4	V5	V6	V7	V8
$\lambda_{max}$	4.01	4.01	4.13	4.05	4.09	4.12	4.13	4.03
RI	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
CI	0.00	0.00	0.04	0.02	0.03	0.04	0.04	0.01
CR	0.00	0.01	0.05	0.02	0.03	0.05	0.05	0.01

It is easy to find that the consistency rate (CR) does not exceed the tolerance value of 0.10 when all variants are evaluated against the criteria. Therefore, it can be said that, in this case, there is no need for a new evaluation of the variants in relation to the mentioned criteria.

The final priority vectors of the variants in relation to the criteria and in relation to the goal are obtained by multiplying the priority vector of certain criteria with the values of the priority vector of the variants in relation to the given criteria (Figure 14).

**Figure 14.** Final priority vectors in standard AHP method, using the additive normalization method. Note: SF—social factors, CF—cultural factors, PF—personal factors, PsF—psychological factors.

By synthesizing the priority vectors of the variants in relation to all criteria, it is also obtained that the influence of personal and psychological factors dominates over the other variants, cultural and social factors.

Verification of all steps in the hierarchical structure of the AHP method was carried out through a common table of all weight vectors. In the final table (Table 4), the last field in the lower right corner reflects the sum of all alternative values (the last column), which corresponds to the sum of all criteria values (the last row). That identity is equal to 1. In other words, it is a confirmation that the whole process was carried out methodologically correctly.

**Table 4.** Total weight and rank of variants.

	C	M	FP	E	LS	B	C-19	SN	Priorities	Rang
SF	0.01	0.00	0.01	0.01	0.02	0.03	0.01	0.01	0.09	4
CF	0.01	0.01	0.01	0.02	0.04	0.04	0.02	0.02	0.16	3
PF	0.02	0.03	0.02	0.04	0.10	0.11	0.04	0.04	<b>0.40</b>	<b>1</b>
Psf	0.01	0.01	0.03	0.03	0.06	0.08	0.06	0.06	0.34	2
Weight vector	(0.04)	(0.05)	(0.07)	(0.09)	(0.22)	<b>(0.26)</b>	(0.12)	(0.14)	1.00	
Rank	8	7	6	5	2	<b>1</b>	4	3		

Note: SF—social factors, CF—cultural factors, PF—personal factors, PsF—psychological factors, C—customs, M—morals, FP—influence of famous people, E—environment, LS—lifestyle, B—budget, C-19—COVID-19, SN—social networks.

The results of the implemented AHP method are presented in the final Table 4. A summary of the obtained values criteria and variants is given. The figures in the last two rows of Table 2 show the criteria results (values in parentheses and rank). Budget (0.26) is considered the most influential factor in consumer habits. Therefore, the financial element dominates from the point of consumption because it determines the purchasing power. The next important factor is lifestyle (0.22), which refers to the usual way of life and daily activities. This is followed by social networks (0.14), the COVID-19 pandemic (0.12), the social environment (0.09), the influence of famous people (0.07), morals (0.05), and customs (0.04). This result implies that consumer habits are more determined by the income and lifestyle of the individual and that external impulses play a smaller role. In addition, the consistency coefficient is 0.07, which is lower than the critical value (0.1). Therefore, it was confirmed that the survey results are effective and consistent.

The figures in the last two columns of Table 4 show the results of the variant evaluation (value and rank). It was shown that the most dominant factor of consumption habits comes from the corpus of personal influences (0.40). Next in value and rank are psychological factors (0.34), then social (0.16) and cultural influences (0.9). This result implies that consumer habits are mostly influenced by personal and psychological factors and less by social and cultural factors. Since the value of the consistency coefficient is less than 0.10, the results are accepted as satisfactory. This means that a new evaluation of the variants of the mentioned criterion is not required.

The main limitation in assessing the impact on consumer behavior stems from the large number of impacts that are difficult to measure. Even those impacts that can be measured are not always comparable, such as emotions, feelings, belonging, acceptance, etc. The number of publications applying consumer neuroscience research is gradually increasing [21]. This includes highly complex functional magnetic resonance imaging (fMRI)-based research on consumer decision-making and emotion-specific brain regions, and consumer studies based on machine learning models to optimize decision-making. Chaudhary et al. [65] used machine mathematical modelling based on learning for prediction of social media behavior using big data analytics. We can find studies in the field of cultural, personal, social, and psychological factors that influence consumer behavior. In their research, Al Hamli et al.; Rojhe; Rozy et al.; Santosa et al.; and Shamri et al. [66–70] conclude that cultural, social, personal, and psychological factors have significant impact



on consumer behavior. Ahmadi [71] shows the importance of publicizing the pandemic's penetration among the population and the visible impact it has on stockpiling products by customers. Furthermore, this varies from culture to culture and the impact is not the same on everyone. The study of Li et al. [72] "investigated the relationship between the pandemic severity, sense of fear, sense of control, and conformity consumer behavior in the context of COVID-19. The results show that sense of fear plays a mediating role in the impact of the pandemic severity on conformity consumer behavior, while sense of control does not play a moderating role in the impact of the pandemic severity on sense of fear, and in the impact of sense of fear on conformity consumer behavior". The results of the research of Danish et al. [19] "suggested that functional value price, functional value quality, social value identity, social value responsibility, emotional value, and conditional value have a significant and positive effect on consumer choice behavior".

Jia et al. [73] point out that, in the hotel industry, social influence is dominant if the consumer's attitude towards the brand is to be maintained. The results of Kumar et al. [74] showed that ethical obligations drive consumers' green purchase intention and highlight that they are important for marketers and policy makers. The research of Yang et al. [75] showed that trust, habit, and intention for e-shopping significantly influence consumers' e-shopping behavior. They particularly highlighted personal factors, innovation, ease of payment, habit, risk, prices, hedonic motivation, service quality, and trust. The impact of social networks on consumer behavior was measured by Muller-Perez et al. [76]. Like our results, they found a positive impact of social networks on consumers, especially during the COVID-19 pandemic. Ali et al. [72] showed that the behavior of milk consumers can be predicted through raw milk prices.

#### 4. Conclusions

Consumer behavior is changing due to the accelerated pace of life, changes in lifestyle, life values, and the influence of external and internal stimuli on the human body. Also, consumer attitudes and perceptions change due to financial crises, natural disasters, wars, and pandemics. For the above reasons, it is necessary to monitor the behavior of consumers and adapt the offer on the market to their needs.

In this paper, an analysis of the impact of various factors on consumer decisions among respondents in Croatia was carried out using the multi-criteria AHP decision-making model. The results show that personal factors dominate over other factors, such as psychological, social, and cultural. Also, personal budget has a dominant role for consumers compared to other criteria (COVID-19, lifestyle, habits, social networks, etc.).

The use of the AHP model proved to be an excellent tool for evaluating multi-criteria problems in assessing the impact on the consumer. It is proved, again, that the AHP method is the most widely used in the multi-criteria decision-making (MCDM) process.

This study provides valuable new insights into the growing consumer perception literature. Future research should conduct a more detailed analysis of underlying consumer influence factors, identify new influence factors, and examine the significance of expanding consumer influence, including the undoubted differences between nations and regions.

In our research, it has been proven that influential factors on consumer behavior have different levels of impact. The greatest influence comes from personal factors as well as an individual's income and financial capabilities. An individual's financial capabilities and income affect what they can afford, which directly influences their purchases. A person with higher income is more likely to buy expensive and luxury products, while one with lower income will be forced to shop rationally. Personal factors significantly influence decision-making regarding purchases. For instance, if someone cares about ecology, they will certainly buy eco-friendly products. The motives and motivation of an individual for buying a product are very important, and the influences on motivation are varied.

Studying consumer behavior and its impact on their purchasing decision-making is challenging for the following reasons:

- **Complexity of Consumer Behavior:** Consumer behavior is a complex and multifaceted phenomenon that involves various psychological, social, personal, and cultural factors. Studying all these factors can be challenging and requires a significant amount of time, resources, and expertise.
- **Rapidly Changing Consumer Trends:** Consumer behavior is continually evolving and new trends are emerging at a fast pace. Keeping up with these changes can be difficult for researchers and it may be challenging to capture the nuances of consumer behavior accurately.
- **Limited Funding:** Conducting research in the field of consumer behavior can be expensive and securing funding can be challenging. This can limit the number of studies that can be conducted, and researchers may have to prioritize certain areas of research over others.
- **Lack of Collaboration:** Collaboration among researchers, businesses, and policymakers can be essential in advancing research in the field of consumer behavior. However, there may be a lack of collaboration among these stakeholders, which can limit the scope and impact of research in this field.
- **Ethical Considerations:** Research involving human subjects must adhere to strict ethical guidelines, which can be time-consuming and costly. These guidelines can also limit the scope of research in some areas.
- **Sample Size:** The size of the sample can significantly impact the generalizability of the findings. Small sample sizes may not be representative of the population, while large sample sizes may be difficult and expensive to obtain.
- **Time Constraints:** Conducting longitudinal studies can provide valuable insights into consumer behavior over time, but they can be time-consuming and expensive. Researchers may face challenges in securing funding for long-term research projects.
- **Limited Access to Data:** Access to data can be a significant limitation in consumer behavior research. Some data, such as sales data or customer data, may be proprietary and difficult to obtain. Additionally, data privacy laws and regulations may limit the use of certain types of data.
- **Influence of Social Desirability Bias:** Social desirability bias occurs when participants respond in a way they believe is socially acceptable rather than their true feelings or behaviors. This can be a limitation in self-reported studies and researchers must take measures to reduce the impact of this bias.

Future research on consumer behavior may face limitations related to sample size, time constraints, ethical considerations, limited access to data, the influence of social desirability bias, and the complexity of consumer behavior. Researchers must be aware of these limitations and take steps to mitigate their impact on the validity and generalizability of their findings. The complex nature of consumer behavior, rapidly changing trends, limited funding, lack of collaboration, and ethical considerations can all contribute to a shortage of research in the field of consumer behavior. However, understanding consumer behavior is crucial for businesses and policymakers to develop effective strategies and policies, and more research in this area is necessary.

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