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A Fuzzy-Based Application for Marketing 4.0 Brand Perception in the COVID-19 Process

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Abstract: One main point distinguishing Marketing 4.0 from other marketing approaches is the “customer”. Marketing 4.0 focuses on “act” and “advocacy” within the 5A (aware, appeal, ask, act, and advocate) customer path. In Marketing 4.0, advocacy is as important as the purchase of customers. In order to have good competitive power in the digital world, and to follow and guide their digital customers, brands need to determine their marketing strategies by considering the 5A customer path, in which there may be touchpoints where brands can intervene. During the COVID-19 pandemic, there was a significant decrease in the incomes of consumers due to the closure of businesses and/or personnel dismissals. With this decrease in income, consumer purchasing habits have changed. For this reason, many companies have started studies to explore how to increase customer loyalty. This study aimed to understand how the marketing process and brand loyalty of a company operating in the cleaning products category were affected before and during the pandemic and to identify weak touchpoints in the customer path by developing a 5A customer path model based on fuzzy logic. The study also aimed to monitor customer purchasing and brand advocacy rates during the pandemic and detect the problematic touchpoints on the 5A customer path. The main contribution of this study to practitioners and brand strategy managers is that it brings a different dimension to the field of Marketing 4.0 applications with a fuzzy logic approach. In this study, a rule-based fuzzy logic application was used for the first time to identify the deficiencies in the 5A customer path. With the fuzzy logic approach, an artificial intelligence technology, failure points on the 5A customer path can be known in advance, and brand managers will be able to determine appropriate strategies to increase the advocacy of their brands and take precautions where necessary. Brand managers can periodically collect customer data and use fuzzy logic to identify and eliminate 5A customer path disruptions.

Keywords: COVID-19; rule-based fuzzy logic; 5A customer path; Marketing 4.0



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1. Introduction

The effects of developing technology in recent years have touched every aspect of life. Technology provides convenience in every area, from health, education, and tourism to industry, business, and social life. New concepts emerging with new technologies create innovations for both manufacturers and consumers. With the adoption of the Industry 4.0 concept, the effect of digitalization has been seen in many applications, such as smart factories [1,2], lean manufacturing [3,4], airport systems [5], and flexible production systems [6]. Review sources such as Fuertes et al. [7], Baran and Korkusuz Polat [8], and Contini and Peruzzini [9] can be consulted for more detailed information on Industry 4.0. In the face of the evolving world market, the desires and needs of human beings also change. These changes provide the formation of new markets, new products, and new sectors. Manufacturers who follow innovations and technology have a say in these new products/markets/sectors and increase their profitability. However, manufacturers who cannot follow innovations and technology and cannot respond to consumer needs will

fail [10,11]. Today, consumers are interested in the product; they want to access whatever they want in terms of time, location, quantity, and quality. This situation increases the market competition in all sectors [12]. Increasing market competition leads to changes in companies' sales and marketing strategies. Firms that switch from traditional to digital marketing do not hesitate to increase their marketing budgets [13].

Along with digital transformation, there have been changes in management strategies and forms. Digital transformation is very effective in marketing communication. With the transformation, the importance of the customer and brand value increases. Study by Hughes and Vafeas [14] followed a methodology using qualitative and quantitative questionnaire data. It was revealed among the study's findings that the relationship between the customer and the brand is proportional to how much the customer meets the needs and wishes of the brand. Although consumption increases in the digitalized world, market competition increases as product diversity increases. Marketing activities should be open to changes and diverse, as marketing is a dynamic structure. For this reason, companies want to increase their chances of competing in the market by integrating the concept of Marketing 4.0 into their strategies, which has been called the transition from traditional to digital in recent years. Marketing 4.0 is a marketing evolution that aims to make the customer part of the brand and addresses digital and traditional marketing methods together, caring only on behalf of the non-profit brand and about its identity and using online and offline systems together to complete the customer's path from brand awareness to customer advocacy [15,16]. Marketing 4.0 adheres to the Internet when digitizing economic activities and creates new marketing strategies that improve the brand–customer relationship [16].

Many studies on digital marketing can be found in the literature. Hwang and Kim [17] conducted a Marketing 4.0 study investigating the 5A customer path of food tourists of generations X and Y in Korea. In the study, it was shown that although generation Y has more social interactions than generation X, both consumer groups use social media quite frequently. In addition, it was shown that the effect of brand advocacy on social media is relatively high in the action phase. Székely et al. [18] observed low productivity during the distribution of industrial semi-finished products in Southeast Europe. Therefore, to increase efficiency in their work, they conducted 500 h of observation and two rounds of questionnaires in four countries in Southeast Europe; the 5A customer path constituted the industrial customer path. Dash et al. [19] demonstrated that brand quality and stance impact customer satisfaction and affect customer purchases according to a Marketing 4.0 study on 508 first-time real estate buyers. Aoki et al. [20] drew attention to two questions in the customer purchase journey with their study: What touchpoints increase the brand experience? Moreover, what is the impact of brand experiences on customer contribution? In the study, they investigated the customer experiences and the contribution of customers of the brand Nike in Japan. The researchers stated that brand experience can increase customer contribution according to their results, and that non-monetary contribution is a defining feature of the brand experience. It has been observed that when brand experiences are improved, brand advocacy can also be increased. Duncan's [21] study stated that the most effective touchpoints are "customer-created touchpoints".

Artificial intelligence studies have gained momentum in recent years and are used to make activities more efficient, effective, reliable, etc. [22]. With the digitalization of marketing studies, artificial intelligence technologies are frequently used in marketing applications as in other business subjects. Mustak et al. [23] revealed ten major research points in their study examining artificial intelligence applications in marketing. These include understanding the customer correctly [24], industrial studies of artificial intelligence [25,26], and insights based on customer conversations in electronic environments [27,28] to improve market performance, to utilize artificial intelligence applications for brand management, to increase and improve customer loyalty [29], to use artificial intelligence to improve new side applications and customer services [30], and to implement artificial intelligence and strategic marketing together [31]. The fuzzy logic approach is an artificial intelligence

technology frequently used in many business problems where uncertain knowledge needs to be processed. Janarthanan et al. [32] created a fuzzy system with 23 rules using temperature and precipitation parameters to calculate wind speed. Mijović et al. [33] used fuzzy logic to determine airline market shares in long-haul flights. In their study, Yıldız and Kişoğlu [34] made the most appropriate upper body estimation application with a rule-based fuzzy logic approach in the women's clothing sector. A model with two inputs and one output parameter was created for the application, and a rule base consisting of 25 rules was prepared. Sarmah et al. [35] used rule-based fuzzy logic to evaluate the quality of a hydroelectric power plant environmental impact assessment report. Soylu and Carman [36] used fuzzy logic in the automatic slip control systems they developed for agricultural tractors. In the study, they aimed to automatically change the working depth of the equipment by measuring the amount of slippage that occurs during tillage activities. Iancu [37] developed a model to diagnose heart disease using a rule-based fuzzy logic application. In the study, 44 rules were created for the model, which consisted of eleven input variables and one output variable with the Mamdani fuzzy logic approach. Arslankaya and Celik [38] used the fuzzy logic approach for heart attack prediction in their study, creating 576 rules. Another area where fuzzy logic has been applied is COVID-19, which emerged unexpectedly in 2020 and affected the whole world. One of these studies is the fuzzy logic programming and adaptability design study of medical products for anti-epidemic normalization by Fu and Liang [39]. The study proposes a design method with the fuzzy logic approach for medical products. Meanwhile, Kokoç et al. [40] developed a fuzzy inference system to choose a marketing strategy in their study.

With the fuzzy logic approach, productivity increases with the opportunity to make more detailed and different analyses in marketing activities. Li and Li [41] developed a decision-making model to support international marketing planning. The researchers used multiple software tools, simulation, and the fuzzy logic approach in the model in an integrated manner. Lin et al. [42] used the fuzzy logic approach to develop a decision-making model that accurately analyzes human thoughts during market research and reveals the partial mediation of time. Social media usage rates, which are increasing daily, have reached levels that attract the attention of companies. Companies now carry out customer relations and management through social media networks. Howells and Ertugan [43] used the fuzzy logic approach to analyze sensitivity in social media data. The study also mentioned that fuzzy logic applications are used in customer comment analysis and effective marketing campaigns.

When the studies in the literature were examined, no application was found in which the fuzzy logic approach was used in the Marketing 4.0 concept. Thus, fuzzy rules were used for the first time here to measure the weaknesses in the touchpoints of the 5A customer path, which is one of the foundations of Marketing 4.0. In this study, a 5A customer path model based on fuzzy logic was created to understand how the marketing process, brand loyalty, and advocacy were affected before and after the pandemic in the cleaning products category. When the sales data for the first six months of 2020 for e-commerce, the most significant digital marketing source, were examined, an increase was seen compared to 2019 [44]. The increase is thought to be due to COVID-19, and mainly due to the increase in supermarket shopping from home [45]. The COVID-19 era has caused the primary needs of consumers to change. Cleaning and hygiene products have become a priority need for customers. Most customers who want to be protected from the disease have turned to e-commerce sites to avoid contact and for ease of access. The reason for choosing cleaning and hygiene products as an application example in this study is that the importance of these products for consumers has increased considerably with the pandemic. The application was made for a local brand providing tissue paper, paper towels, napkins, toilet paper, and hygiene products. Marketing 4.0 was used to assess the brand's sales before and during the pandemic, and a new model using rule-based fuzzy logic was proposed to measure weaknesses in the touchpoints of the 5A customer path. As a result of the implementation of the model, the changes in the purchasing and customer advocacy rates of the brand before

and during the pandemic as well as the insufficient points for awareness, attractiveness, curiosity, action, and advocacy in this process were determined, and solutions were offered for these points. The study consisted of five parts. In Section 2, the Marketing 4.0 and fuzzy logic approaches are explained. The developed rule-based fuzzy logic-supported 5A customer path model is explained in Section 3. In Section 4, the findings obtained from the study are evaluated. Finally, Section 5 contains the conclusions, strategies, and recommendations on how to work in the future.

2. Methodology

PAR (purchase action ratio) and BAR (brand advocacy ratio) values related to brand advocacy and the 5A customer path emphasized by Marketing 4.0 and the fuzzy logic approach were used in the application. The PAR and BAR values of the brand were calculated according to the data obtained from questionnaires given to the brand customers, who are the subject of the application. At the same time, weaknesses in the touchpoints of the 5A customer path were identified with the rule-based fuzzy logic approach.

2.1. Marketing 4.0

Traditional marketing is essential for raising brand awareness and attracting customers, and the customer is the first stage of the company relationship [46]. Recently, customer preferences have shifted from market-leading brands to lesser-known private ones. The increase in Internet usage and the development of technology have changed market competition because they positively affect the elimination of shopping restrictions (time, place, access, payment methods, etc.). Today, customers have become more valuable and powerful when market competition is high. Companies try to connect customers with the brands they create while making them valuable. Thus, they also create brand value. With the increase in brand value, their purchasing awareness increases. As customers gain purchasing awareness, they continue researching the product they will buy by looking at their user experiences, reviews, prices, and campaigns and even going to the physical store [47]. This situation has led businesses to use digital marketing strategies. The most important step of digital marketing is to increase purchasing and advocacy based on brand loyalty [48]. To adapt to digitalized marketing, marketing activities in companies have also started to digitalize [49]. As customers prefer brands they can reach anywhere and anytime, companies often combine offline marketing with online marketing [50].

Marketing 4.0 integrates online and offline systems between companies and customers, makes the brand transparent, and is a marketing approach that increases customer engagement [51,52]. Marketing 4.0 has changed over time, similar to Industry 4.0, reaching its current form following the latest updates after Marketing 1.0 (product-oriented), Marketing 2.0 (consumer-oriented), and Marketing 3.0 (human-oriented) [53,54]. In addition to human-oriented Marketing 3.0, Marketing 4.0 has been developed by detailing customer decision-making regarding brand advocacy. Marketing 4.0 consists of brand identity, brand image, brand integrity, and brand interaction [19]. With the new dimension of brand interaction, companies take their value from the brand to the customer and raise their customers' awareness about the impact of value-based actions. It is not enough for a brand for a customer to complete a purchase. The customer must be satisfied with the purchase, product, procurement, packaging, etc., and must repeatedly come to the point of purchase [55]. Providing brand advocacy is one of the most important goals of Marketing 4.0. To maintain their competitiveness, businesses have to measure brand advocacy and identify weak points in the touchpoints of the 5A customer path to increase brand advocacy.

5A Customer Path

The customer becomes a brand advocate by establishing an emotional bond with the brand with the positive experiences he or she has gained from the brand. Companies aim to achieve 100% satisfaction with the customer experience by increasing channels

to constantly communicate with the customer [56]. While this increases the interaction between the customer and the company, it also increases the BAR value by enabling the customer to be a brand advocate at the touchpoints on the 5A customer path [31]. Defining the 5A customer path correctly is essential when determining strategies to win, retain, and maintain customers. The 5A concept, also known as the new customer path, is a marketing approach that considers the customer's behavior towards the brand in the following steps: aware, appeal, ask, act, and advocate [57,58]. The touchpoint is defined as customers' interaction on the 5A route with the brand or other customers related to the brand on online and offline channels [59]. For successful omnichannel marketing, marketing experts should correctly examine the touchpoints on the 5A customer path and reach the customer at critical touchpoints to satisfy the customer [60].

Brand managers conduct research to determine their position in the market. Some consider the profit margin, while others consider customer loyalty. Increasing customer loyalty also increases the rate of recommendation of the brand by customers. To increase this rate, companies also calculate the rate of recommendation and purchase by customers aware of their brands. The PAR and BAR are used in these calculations. The PAR shown in Equation (1) is the calculation of brand awareness in the purchasing process. The BAR shown in Equation (2) transforms customers' aware of the brand into "loyal brand advocates" [48].

$$\text{Purchase Action Ratio (PAR)} : \frac{\text{Purchase Action}}{\text{Spontaneous Awareness}}, \quad (1)$$

$$\text{Brand Advocacy Ratio (BAR)} : \frac{\text{Spontaneous Advocacy}}{\text{Spontaneous Awareness}}, \quad (2)$$

The PAR and BAR show how companies' brand awareness efforts will receive feedback on investments. In the next step, companies that see the PAR and BAR and the level of awareness leading to purchasing and advocacy either revise their advertising and marketing strategies or introduce new strategies. The failure of a company to translate brand awareness into purchasing or advocacy indicates that the customer is experiencing a disconnect between steps in the 5A concept [57,58]. They can, however, observe where work and advertisements are missing in the process; identifying and solving the problems can provide the desired efficiency level in the PAR and BAR [48]. In the purchasing process, brand awareness does not turn into a buying action due to reasons such as the possibility that the customer knows the brand but does not find the brand's product attractive and does not wonder about the brand, the customer struggles to access the product, or the customer is not satisfied with the customer service they received when asking for information. During the advocacy process, the customer who has made a purchase is asked to defend the brand. If the customer is unsatisfied with the brand experience, they will not advocate it. This situation shows low emotional intimacy between the customer and the brand [48].

Different industry archetype models have emerged because customers' industry expectations are different in terms of the customer touchpoints during marketing: aware, appeal, ask, act, and advocate. These models are the Doorknob, Goldfish, Trumpet, Funnel, and Bow Tie models [17]. The "Doorknob" model is the most common. The model's feature is that customers with a low level of curiosity have a high tendency to repurchase the same brand. The second largest model after the Doorknob model is the "Goldfish" model. The feature that distinguishes the latter from the former is the high level of customer curiosity. The sales process of the product or service is long-term, and customers who fit this model conduct extensive research and evaluation and are influenced by the brand conversations around them while purchasing the product. The "Trumpet" model is where customers with the lowest purchasing tendency stand in the 5A customer path due to high product prices. However, even those who cannot buy the product due to its high price but are exposed to brand conversations with the influence of the environment constitute a customer profile that recommends and researches the product. The "Funnel" model is the only one in which

customers plan their purchasing decisions well and go through every stage from brand awareness to brand advocacy. Customers who fit this model research the information they have gained from brand conversations and decide to buy the product when they come to the results they like. However, the customer must be satisfied with the product and brand [17,61].

The first four industry archetype models have strengths and weaknesses in the points located on the 5A customer path. The “Bow Tie” model, the last sector archetype model, eliminates the weaknesses of the other four models and includes the strengths of all four models. The brand awareness value is equal to the brand advocacy value, and the BAR value of the mentioned brand has the best performance of one point in the ideal Bow Tie model. Since the model’s brand attractiveness and liability are the same, everyone who has attraction to the brand buys the brand. In this case, while the level of curiosity enables the customer to buy the brand, it also prevents unnecessary research on the brand. Figure 1 shows the “Bow Tie” model compared with the other four models.

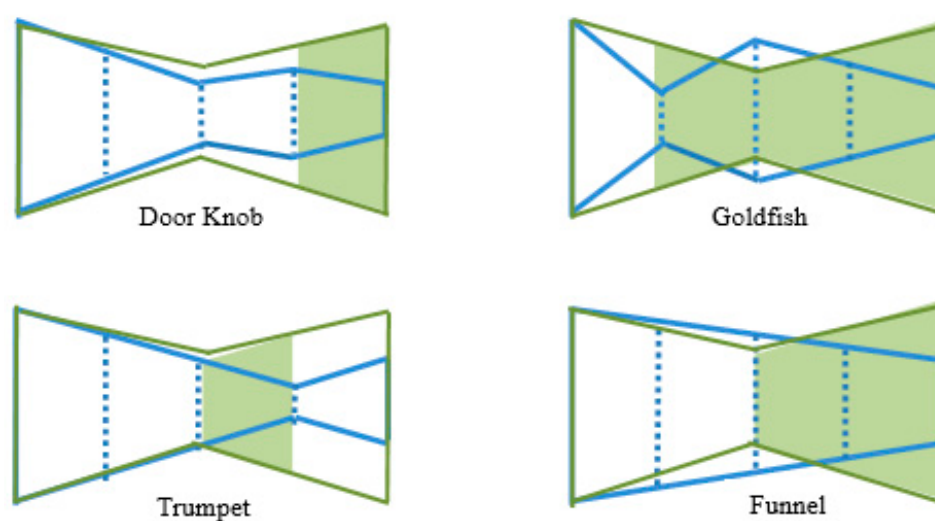


Figure 1. Improving a company’s success with industry archetypes [48].

2.2. Fuzzy Logic Approach

Various systems have been produced to facilitate human life in the past years, and today, these systems are developing more with global standards. Along with technology, the fuzzy logic approach developed under artificial intelligence systems is one of them. The fuzzy logic approach is used in these systems because it is challenging to apply classical logic in systems where mathematical modeling is complex, there is no model, or there are many variable members [62,63]. The fuzzy logic approach systematically arranges the collected data under specific rules, considering user experiences. In fuzzy logic applications, linguistic variables that vary according to everyone instead of absolute actual variables create fuzzy data and cause fuzzy results [64]. Results from the rule-based fuzzy logic approach, different from mathematical models, are obtained according to the users’ rules, considering the users’ experience [65].

Fuzzy logic is an artificial intelligence technology that does not work on exact values but rather operates on fuzzy values. Generally, a membership function is assigned to fuzzy sets, where linguistic variables create flexibility [66]. A fuzzy set is a collection of objects with continuity, in which the membership function of the objects is characterized by changes in the range of 0–1 [62]. Fuzzy logic is a method that creates a decision-making mechanism with symbolic expressions by using subjective data instead of numerical data without a specific mathematical model and produces efficient and acceptable results [67–73]. Within the framework of the fuzzy approach, it is necessary to consider problems more clearly and consider all possibilities. To solve such problems, rules can be created. Fuzzy rules are the

linguistic expression of control rules that reflect the experience and knowledge of experts. The process of the rule-based fuzzy logic approach is summarized in Figure 2 [74].

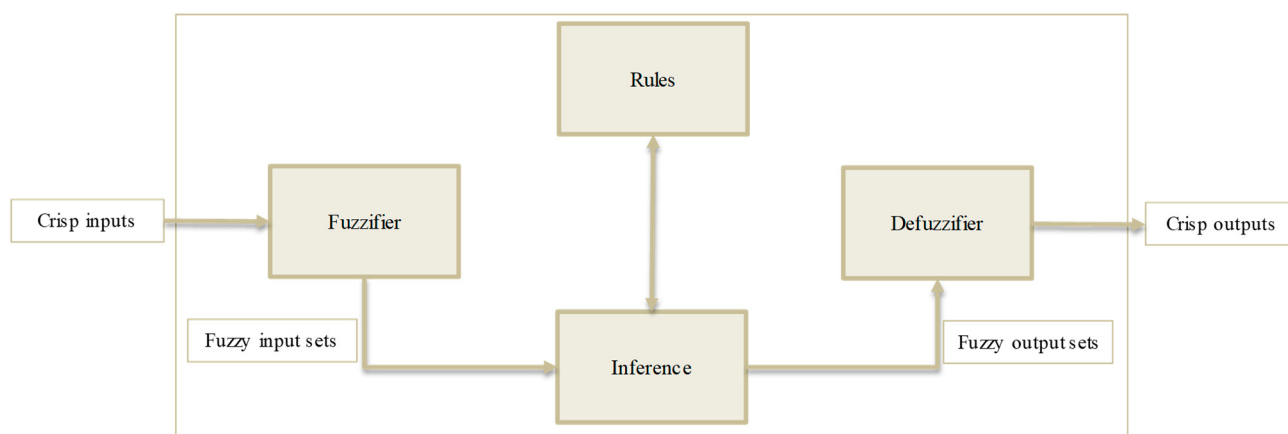


Figure 2. Rule-based fuzzy logic system.

Fuzzifier: The fuzzifier converts variables into symbolic values and linguistic qualifiers with the help of determining membership functions. In fuzzy logic systems, different membership functions can be used in different structures that shape sets and show the boundaries of linguistic expressions on the graph. Triangle, trapezoidal, bell curve, Gaussian, and sigmoid functions are the most widely used membership functions [75–78]. In this study, after using several different types of membership functions, the triangular membership function was considered to give the most relevant results and had a single value of “1”. When the linguistic variables of each input are evaluated, the linguistic variable corresponds to the value “1” for customers to buy the product “never”.

Setting the Rule: Rules are created to convert linguistic input variables to output variables. In rule-based fuzzy logic approaches, rules are prepared using “If–Then” statements as well as “and” and “or” [79,80]. In Equations (3) and (4), examples of “and” and “or” rules are shown. According to the established rules, “and” gives minimum or maximum results. The number of rules may change depending on the number of input variables and fuzzy sets. Rules should be created to cover all possibilities in problem-solving, and all established rules should be added to the fuzzy inference system [81,82].

$$\text{If } X_1 \text{ is } A \text{ and } Y_1 \text{ is } B, \text{ then } Z_1 \text{ is } C \quad , \quad (3)$$

$$\text{If } X_2 \text{ is } D, \text{ or } Y_2 \text{ is } E, \text{ then } Z_2 \text{ is } E \quad , \quad (4)$$

Determination of Fuzzy Inference System: Based on the linguistic variables, different fuzzy inference systems such as Mamdani systems, Sugeno or Takagi–Sugeno–Kang (TSK) models, and Tsukamoto models can be used [83,84]. The Mamdani fuzzy inference system (MFIS) method is used in this study. The MFIS method gives fuzzy values that reveal the value of the variables in net values [83,85–88]. Moreover, it is an intuitive and widely used system suitable for a user-friendly interface [89]. The MFIS is used to study uncertain parameters such as nonlinear attribute parameters [90].

Defuzzifier: A fuzzy result is obtained by making fuzzy calculations, but crisp (non-fuzzy) results are needed to complete the problem [91]. Thus, the result obtained by performing calculations based on fuzzy rules should be clarified. Clarification can be performed as shown in Equation (5) [92].

$$(x) \begin{cases} a \leq x < b & \rightarrow \frac{(x-a)}{(b-a)} \\ b \leq x \leq c & \rightarrow \frac{(c-x)}{(c-b)} \\ x < a \text{ or } x > c & \rightarrow 0 \end{cases} \quad , \quad (5)$$

Various programs have been developed for fuzzy logic approaches, which have many applications, to give correct and quick computer environments. One of them is the MATLAB program, in which fuzzy logic applications can be made by creating and editing a system via the Fuzzy Logic Toolbox (FLT). In this study, the fuzzy logic application was made with the support of the MATLAB program.

3. Proposed Model

The new coronavirus disease which first appeared in Wuhan, China, in December 2019 was named COVID-19 [93,94]. Before the first case was seen in Turkey on 11 March 2020, various precautions were taken by following the cases and developments in the rest of the world. After April 2020, curfews/restrictions were imposed, sometimes covering only metropolitan cities and sometimes the whole country. With the suggestion of health officials, the obligations of mask–distance–hygiene started to be implemented in the country as per the state policy. During the whole pandemic process, especially in March–April 2020, while the sales of products such as surgical masks, cologne, hand disinfectants, and hygiene/cleaning products peaked, there were cases where the products were out of stock. Consumers' preferences in their products (significantly increasing the demand for hygiene products) and their purchasing habits have changed with the pandemic. Therefore, it has been necessary for businesses to make changes in their marketing strategies to adapt to these new habits in customers. This study provides data on how a brand operating in the cleaning products industry acts at the points on the 5A customer path where it can communicate with customers and how this has changed with the pandemic, and whether this has been affected by the COVID-19 pandemic will be analyzed. Since these data are linguistic and contain uncertainty, the fuzzy logic approach, which processes uncertain knowledge, was used while evaluating them. Unlike the 5A customer path studies in the literature, the present evaluations of the touchpoints on the 5A customer path were made using the fuzzy logic approach for the first time. The rule-based fuzzy logic approach was used to identify weaknesses at touchpoints in the 5A customer path. The rule base consists of 3137 rules, which is quite large compared to fuzzy logic applications in the literature. The summary flowchart of the application is shown in Figure 3.

According to the developed model, in the first stage of the application, a questionnaire was conducted to collect data on customer behavior and attitudes in a local area where the brand operates. Moreover, a customer portfolio was created by analyzing the data obtained from the questionnaires. In the second stage, the PAR and BAR values of the brand (using Equations (1) and (2)) were calculated according to the results obtained from the analysis. In the last stage of the application, the weak touchpoints for the brand's 5A customer path were determined by the rule-based fuzzy logic application, simultaneously with the calculation of the PAR and BAR values.

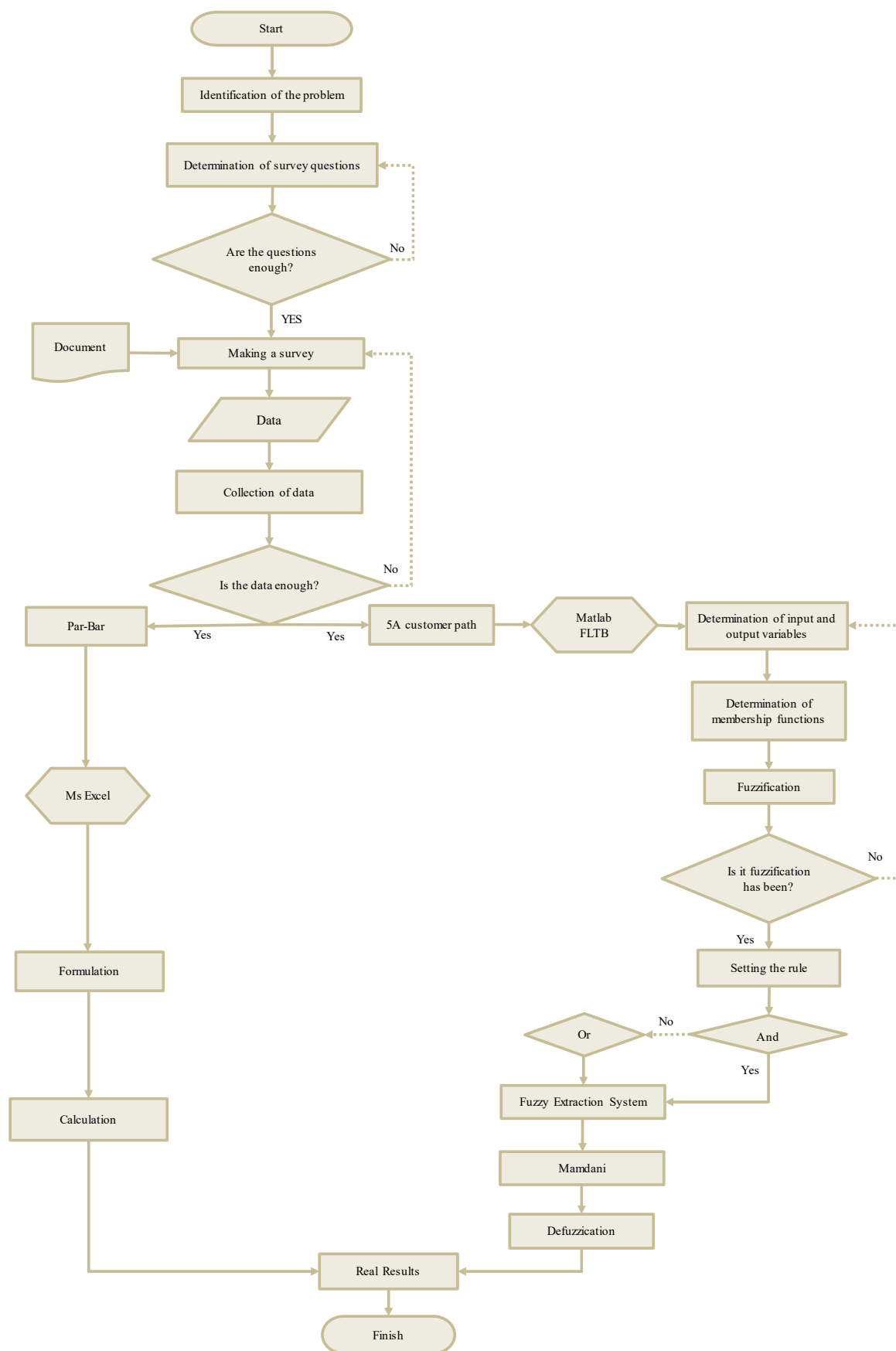


Figure 3. Application flowchart.

4. Results and Discussion

4.1. Obtaining and Evaluating Data

The study created a ten-question questionnaire to monitor customers' behavior, which was applied to 300 people (196 online and 104 face-to-face). The research sample consists of 300 people of different gender, ages, and education levels residing in Yalova and selected by the convenience sampling method. The research data were obtained by a questionnaire form developed by the researchers. While some participants could be questioned face-to-face in this process, about two-thirds of the participants completed the questionnaire online due to the pandemic conditions. While conducting the questionnaire, all participants were informed about the purpose of the questionnaire, and informed consent was obtained. The questionnaire, prepared in the Google forms environment, consisted of four parts (the questionnaire form is shown in Appendix A). The scope of the research was stated in the first part of the questionnaire to inform the customer filling out the questionnaire. Then, the second part obtained the customer's personal information to understand the customer portfolio closely. Name, age, sex, education level, and monthly income range were the data collected in this section. The third part of the questionnaire examined the customer's brand usage before the COVID-19 pandemic. The five questions created by taking the touchpoints on the 5A customer path into consideration addressed the brand awareness, curiosity, attraction, purchasing, and action touchpoints from the customer's perspective. With this part of the questionnaire, it can be observed how customers saw the brand before the COVID-19 pandemic, and if they did not choose the brand, why they did not choose it. The questions in the fourth part assessed the customer's attitude towards the brand during the COVID-19 pandemic and the customer path followed in this process. The large sample size will ensure that the results are close to the actual values during the questionnaire application.

A customer portfolio was created with the participation of 300 people living in the region where the brand's company is located (60% of the participants were female, and 40% were male). The age, education, and income levels of the participants are shown in Figure 4.

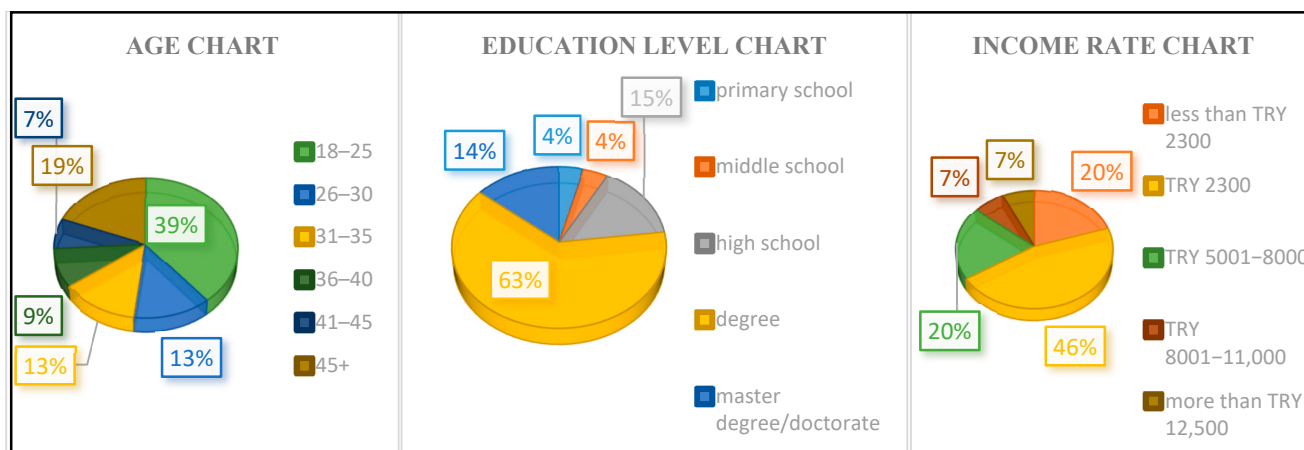


Figure 4. Data chart.

While some of the data collected by the questionnaire consist of demographic data, the rest consist of customer responses to be used in the third phase of the application, the fuzzy logic application. The graphs drawn according to the data obtained from the questionnaire results are shown in Figures 5 and 6. With the pandemic, purchasing rates in the questionnaire results were expected to decrease due to the decrease in purchasing power, the choice of substitute products in cases where access to the product was complex, and the decrease in shopping due to curfews. Figure 5 shows the purchasing and brand advocacy rates before and during the pandemic according to age and gender. Highlights in

the chart are that the number of purchases increased in the 31–35 age range, the advocacy rate for the 36–40 age range remained the same, and the advocacy rate for the 41–45 age group increased during the pandemic. The purchasing rate of female customers decreased by 24%, and the advocacy rate decreased by 16%. The most crucial result observed in male clients is that their advocacy rates remained constant.

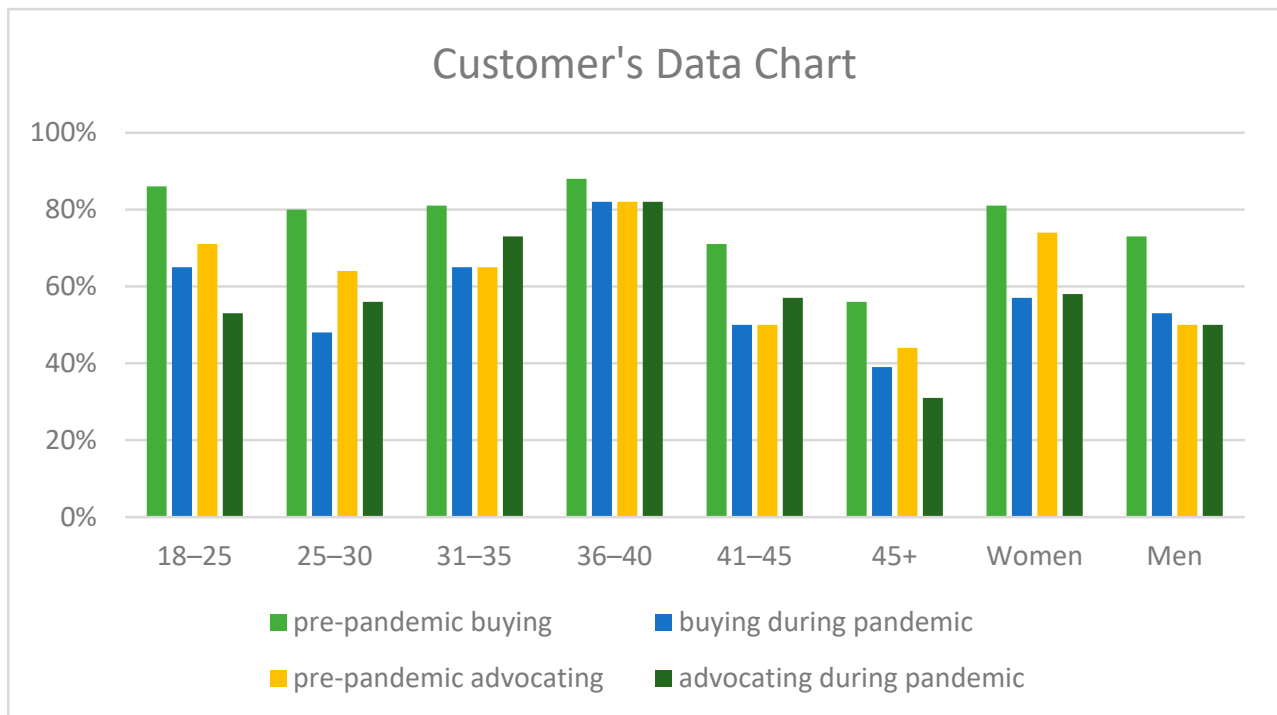


Figure 5. Customers' data chart (age and gender).

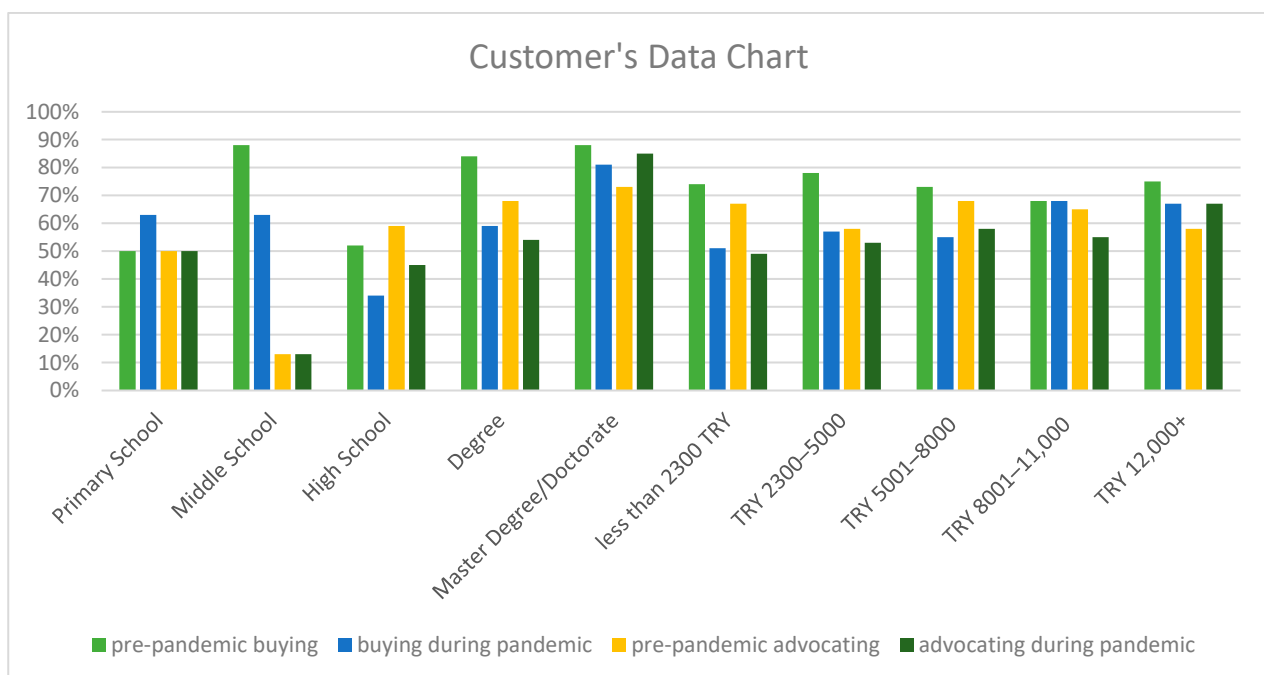


Figure 6. Customers' data chart (education level and income rate).

Figure 6 shows the purchasing and brand advocacy rates before and during the pandemic process according to the education and income level categories. Highlights in the chart are that the advocacy rate remained the same. Furthermore, the purchasing rate of those with a primary school education level remained the same, the advocacy rate remained the same for those educated to secondary school level, and the advocacy rate in customers with master's and doctorate degrees increased. There was no change in the purchasing rate for customers with an income level of TRY 8001–11,000, and the advocacy rate in customers earning above TRY 12,500 showed an increase of 9% (exchange rate for the questionnaire period: EUR 1 = TRY 10.46).

4.2. Calculation of PAR and BAR Values

In line with the data obtained from the questionnaire, the answers given by each customer were evaluated. The brand's status before and during the pandemic was examined in terms of PAR and BAR values, which are essential in marketing. The PAR and BAR values of the brand were calculated with Equations (1) and (2), respectively, (due to the many data in the questionnaire, the Excel program was used for calculations to obtain accurate results). Since some of the questionnaire answers contained linguistic variables, the answers were transformed into mathematical values when performing Excel calculations (for example, 5 for always, 4 for usually, 3 for sometimes, 2 for rarely, and 1 for never). The PAR and BAR values obtained are shown in Table 1.

Table 1. PAR and BAR variables.

	Pre-Pandemic	During Pandemic
PAR	0.96	0.79
BAR	0.78	0.71

The PAR value before the pandemic was 0.96. This shows that customers bought from the brand even if they did not find it attractive. Since the brand is well known in the sector and is known to be high-quality, it is not surprising to observe that every customer had purchased from it at least once according to the questionnaire. The BAR value of the same brand in the same period was 0.78. This shows that the brand lacks emotional bonding with the customer, as specified in the “Goldfish” model. As to the “reasons for not choosing the brand”, for one of the questions evaluating the pre-pandemic period, customers gave answers such as the fact that the brand is more expensive than rival companies, they experienced problems in accessing the product, and the product is a general need. During the pandemic, the PAR value was calculated as 0.79 and the BAR value as 0.71. The decrease in PAR was more significant during the pandemic because even the customers who cannot buy a product can be the brand's defenders, which is reflected in the BAR value. According to the questionnaire results, customers' reasons not to buy and defend the brand before the pandemic were also valid during the pandemic. Based on the calculations, the industry archetype of the brand during the pandemic was determined to follow the “Doorknob” model. This shows that the brand's attractiveness and purchasing touchpoints that had problems before the pandemic were improved with the studies carried out, but the defect in the advocacy point continued. During the pandemic, the world's economic problems and the depletion of product stocks caused customers to move away from the brands they always bought; instead, they preferred the first brand they could reach, thus reducing brand purchase and advocacy rates.

4.3. 5A Customer Path Determination

In the third part of the application, the 5A customer path touchpoints of the brand considered weak were determined. The rule-based fuzzy logic approach was used to make this determination. In the model created by using five inputs (aware, appeal, ask, act, and advocate) and one output (5A customer path) variable, linguistic variables expressing five different situations for each of the input variables (i.e., always, usually, sometimes,

rarely, and never) were defined, and 3137 rules containing all possibilities were determined. Rule-based fuzzy logic applications created with many linguistic variables and rules are not typical in the literature. This study differs from other studies because it has many rules and is the first fuzzy logic application in this field. This study used the Fuzzy Logic Toolbox (FLT) of the MATLAB program, the preferred software of fuzzy logic applications. First, the answers to the 5A customer path questions obtained through the questionnaire were added to the FLT database. For fuzzy logic application, triangular membership function, the MFIS, “and” conjunctions for rule generation, and a value range of 0–5 were determined. In Figure 7, the interface prepared in the FLT is shown.

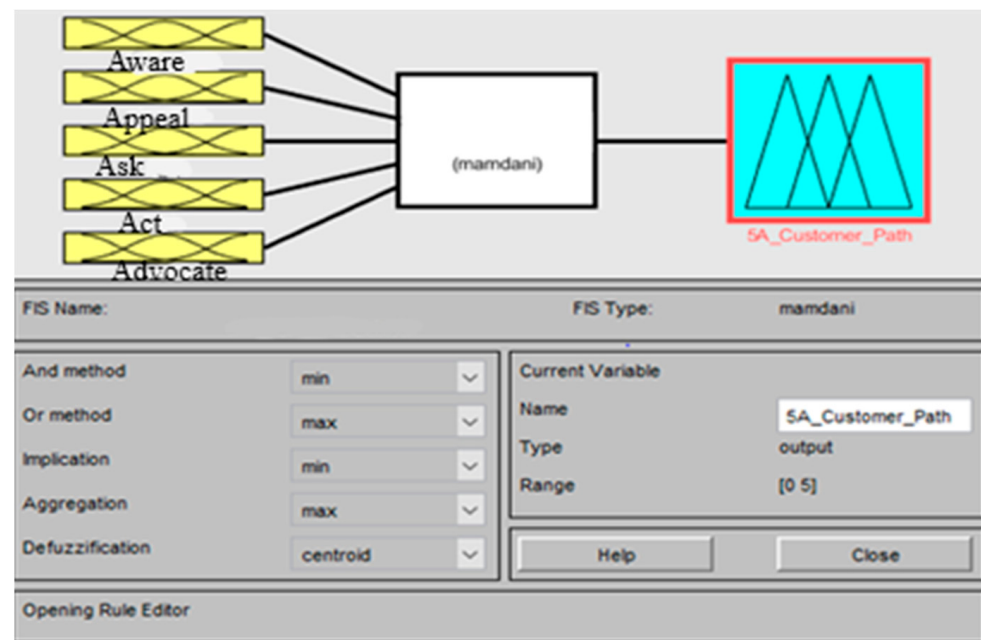


Figure 7. FLT interface.

Table 2 shows the fuzzy numbers corresponding to the linguistic variables. Since the triangle membership function was used in the application, there are three variables for each linguistic variable.

Table 2. Linguistic variables converted to fuzzy numbers.

Linguistic Variables	Fuzzy Numbers
Never	(0 0.5 1)
Rarely	(1 1.5 2)
Sometimes	(2 2.5 3)
Usually	(3 3.5 4)
Always	(4 4.5 5)

Figure 8 shows the linguistic variables with the five value ranges we determined when we looked at the awareness input. These variables are never, rarely, sometimes, usually, and always—i.e., the possible answers to our questions in our questionnaire. Our triangular membership function was determined as “trimf” for our awareness input. The input parameter values were determined after a few trials so that each linguistic variable corresponds to its range.

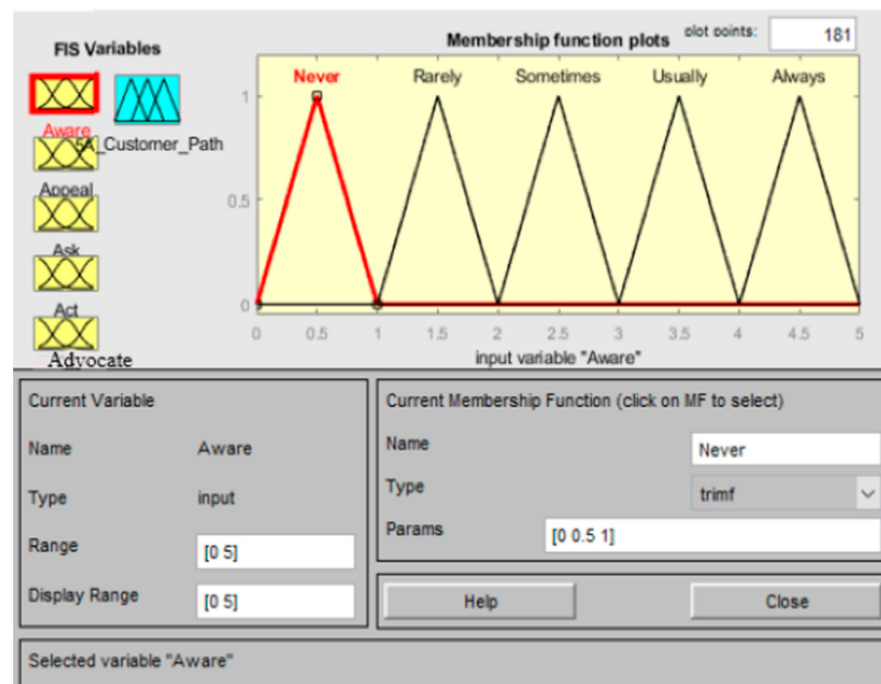


Figure 8. Linguistic variables.

After the awareness input value, the attractiveness, curiosity, purchasing, and advocacy input values were added. As with the awareness entry, the value ranges for the other four inputs were between 0 and 5. The outcome of the problem is shown in Figure 9. The 5A concept was added to our program as a customer path. The output values ranged from 0 to 5, as with the input values. The membership function of the output was determined as the triangular membership function “trimf”, the membership function in the input. The output parameters consisted of the 5A customer path touchpoints. According to the study results, the weak point of the brand among these parameters could be determined, and the most suitable parameters for awareness, attractiveness, curiosity, purchasing, and advocacy were determined.

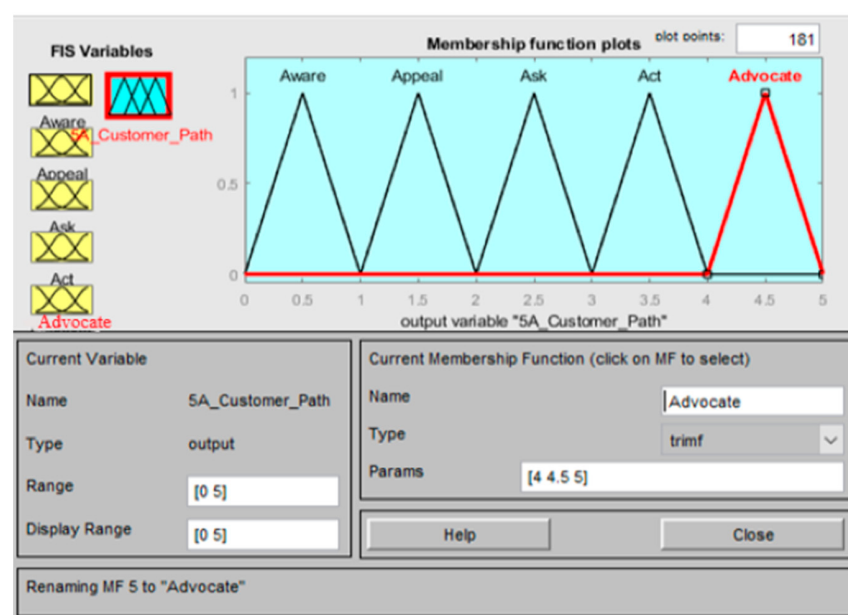


Figure 9. The 5A output variable.

The rule preparation process aimed to find the weak point of the brand to create the “Bow Tie” model. The rules were created using the “If-Then” rule structure with the “and” connector. In this study, 3137 rules were created using the FLT system. For example, the following rule was created: If (Awareness is Always) and (Charming is Always) and (Curiosity is Always) and (Action is Usually) and (Advocacy is Sometimes), then (5A_Customer_Path is advocacy). For this rule, it is understood that, although the action touchpoint is tolerable, the advocacy touchpoint must be worked on first to resemble the “Bow Tie” model.

If the model obtained with the customer data already followed the “Bow Tie” model, “note” was selected, as this implies no need to work on the brand’s touchpoints, and the outputs would be shown not to reflect that result. This rule can be interpreted as the linguistic equivalent of the awareness, attractiveness, curiosity, action, and advocacy inputs not always acting to serve the customer. For example: If (Awareness is Always) and (Charm is Always) and (Curiosity is Always) and (Action is Always) and (Advocacy is Always), then (5A_Customer_Path is not action).

After creating 3137 rules, the rule viewer was used for the roadmap showing the fuzzy inference process of the problem. When input values are entered in the rule viewer, the outputs of those values are shown following the determined rules. Figure 10 shows a section of the rule base. Each column represents one of the input or output variables. The yellow shapes in the columns show the inputs’ membership function, and the blue shapes represent the outputs. Each line represents a rule.

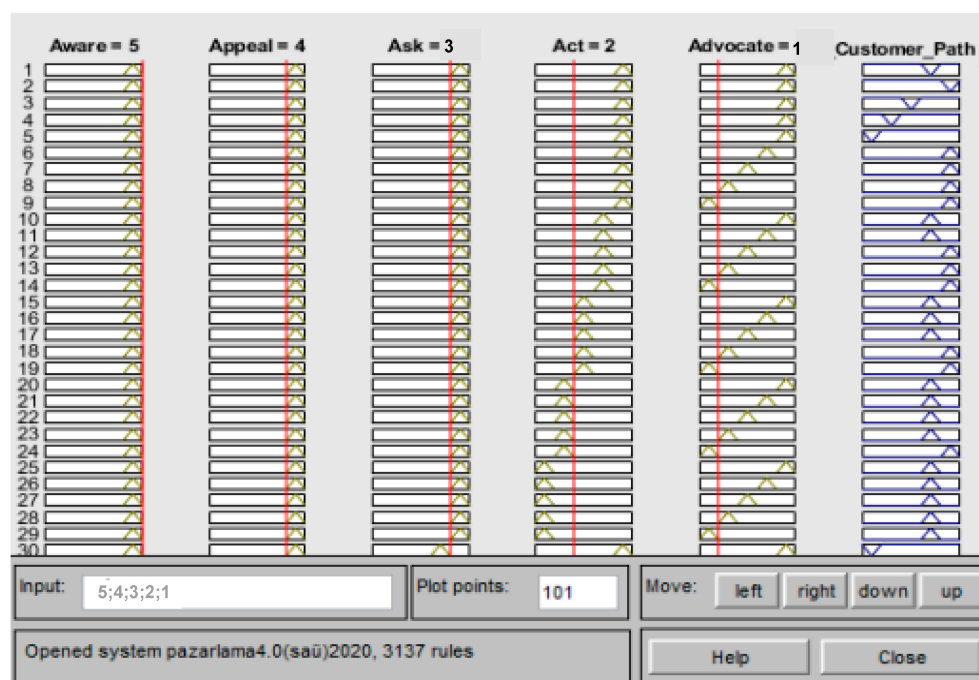


Figure 10. Rule viewer.

5. Conclusions

To have good competitiveness in the digital world, businesses need to determine marketing strategies by considering the 5A customer path and directing their digital customers. There may be touchpoints on the 5A customer path where brands can intervene. In this study, the data obtained from the customer questionnaire were analyzed, and the brand’s sector archetype and PAR and BAR values were determined before and during the pandemic. The values before and during the pandemic were compared. In the third stage of the application, with the fuzzy logic-based 5A customer path model proposed within the scope of the study, weak points in the 5A customer path of the brand were found for customer profiles.

According to the analysis of the results obtained, since the brand is a well-known local brand with plenty of advertisements, awareness among customers was high both before and during the pandemic.

While evaluating the pre-pandemic situation in the questionnaire, it was found that customers do not prefer the brand due to the brand being more expensive than other competing companies, problems experienced in accessing the product, and because the product is a simple need. The industry archetype, essential in evaluating the 5A customer path, was determined to be the “Goldfish” for the brand before the pandemic. The “Goldfish” model is the most challenging archetype model for marketing professionals during conversion to the “Bow Tie” model. In the “Goldfish” model, sales and brand advocacy rates are low, and the level of curiosity is well above what it should be. Improvement efforts should bring customer curiosity to the optimum point with the right strategies and lead the customer to buy and become a brand advocate. According to the results, the “Goldfish” model found before the pandemic shows that the brand lacks an emotional connection with its customers. This shows that the brand has problems at the purchasing and advocacy touchpoints, especially in attractiveness. In order to approach the “Bow Tie” model, which is one of the goals of Marketing 4.0, the brand needs to increase both its attractiveness and emotional ties with customers in the post-pandemic era.

When the pandemic was evaluated in the questionnaire, the industry archetype belonging to the brand was determined to be the “Doorknob”. This shows that the attractiveness and purchasing touchpoints where the brand experienced disruption before the pandemic were improved with the studies carried out, while disruption continued at the point of advocacy. The “Doorknob” model also shows that competing brands are high, and the customers prefer more affordable competitor brands. The brand should increase customers’ emotional affinity to transform the “Doorknob” model into a “Bow Tie” model. For this, customer engagement programs can be developed, and brand affinity levels can be increased.

During the pandemic, the economic problems experienced in the world caused product stocks to run out and customers to stay away from the brands they always buy, instead preferring the first brand they can access. This situation also reduced brand purchase and advocacy rates. The questionnaire study proves this (while the PAR value was 0.96 before the pandemic, it became 0.79 during the pandemic; the BAR value was 0.78 before and 0.71 during the pandemic). The decrease in the PAR value is more remarkable than that in the BAR value. Even customers who cannot buy a product can advocate for that brand, and this situation is reflected in the BAR value, which shows that the reasons for not buying and defending the brand before the pandemic continued in the same way during the pandemic.

The study’s main objective was to investigate how brand loyalty and advocacy were affected by the pandemic and to develop a rule-based fuzzy logic-based 5A customer path model to identify weak touchpoints in the customer path. Since the data used in the research were obtained from the residents of Yalova, they have limited generalizability for the relevant brand in the whole country. In addition, the difficulty of reaching people due to the pandemic limited the research. While some participants could be questioned face-to-face, about two-thirds of the participants had to complete the questionnaire online due to the pandemic conditions. It would be helpful to consider the generalizability of the study by addressing this situation. The research can, however, be applied to larger datasets from different regions in future studies. Similar studies with people living in other regions may provide valuable contributions to a better evaluation of the results obtained from this research. In addition, the 5A customer path model, which was prepared using the rule-based fuzzy logic approach in this study, can be developed by using hybrid methods, such as neuro-fuzzy techniques, in future studies.

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Appendix A

MARKETING 4.0—QUESTIONNAIRE

PART 1

The COVID-19 disease, which emerged in Wuhan, China, in December 2019, has been affecting the whole world for about one year. However, innovations and changes have emerged in every aspect of our lives. We will examine the effects of these changes in our questionnaire study in the field of marketing.

PART 2

NAME:

AGE:

- 18–28
- 26–30
- 31–35
- 36–40
- 41–45
- Over 45 years old

GENDER:

- Woman
- Man

EDUCATION LEVEL:

- Primary school graduate
- Middle school graduate
- High school graduate
- Vocational School or Graduate Degree (or student)
- Master's Degree/Doctorate's Degree (or student)

MONTHLY INCOME LEVEL:

- Less than TRY 2300
- TRY 2300–3000
- TRY 3001–4000
- TRY 4001–5000
- TRY 5001–6500
- TRY 6501–8000
- TRY 8001–9500
- TRY 9501–11,000
- TRY 11,001–12,500
- More than TRY 12,500

PART 3

1. I knew the products of the “SELPK” brand before COVID-19

- 1 (never)
 - 2 (rarely)
 - 3 (sometimes)
 - 4 (usually)
 - 5 (always)
2. Before COVID-19, there were works (advertising, sponsorship, social assistance, etc.) of the brand “SELPAK” that caught my attention
- 1 (never)
 - 2 (rarely)
 - 3 (sometimes)
 - 4 (usually)
 - 5 (always)
3. Before COVID-19, I was doing price research and quality research when buying the products of the brand “SELPAK”.
- 1 (never)
 - 2 (rarely)
 - 3 (sometimes)
 - 4 (usually)
 - 5 (always)
4. I was buying the “SELPAK” brand before COVID-19
- 1 (never)
 - 2 (rarely)
 - 3 (sometimes)
 - 4 (usually)
 - 5 (always)
5. Before COVID-19, I would recommend the brand “SELPAK” to my friends
- 1 (never)
 - 2 (rarely)
 - 3 (sometimes)
 - 4 (usually)
 - 5 (always)

PART 4

6. I know the products of the “SELPAK” brand during the COVID-19 process
- 1 (never)
 - 2 (rarely)
 - 3 (sometimes)
 - 4 (usually)
 - 5 (always)
7. I do price research and quality research while buying the “SELPAK” brand during the COVID-19 process
- 1 (never)
 - 2 (rarely)
 - 3 (sometimes)
 - 4 (usually)
 - 5 (always)
8. I buy the brand “SELPAK” during the COVID-19 process
- 1 (never)
 - 2 (rarely)
 - 3 (sometimes)

- 4 (usually)
 - 5 (always)
9. I would recommend the “SELPAC” brand to my friends during the COVID-19 process
- 1 (never)
 - 2 (rarely)
 - 3 (sometimes)
 - 4 (usually)
 - 5 (always)
10. During the COVID-19 process, there are works (advertising, sponsorship, social assistance, etc.) of the brand “SELPAC” that caught my attention
- 1 (never)
 - 2 (rarely)
 - 3 (sometimes)
 - 4 (usually)
 - 5 (always)

https://docs.google.com/forms/d/1_SBkwYfS5k6Tkszh_b2yravb-8RwQX6k7D9MXjlt-XM/edit?ts=62c56796 (accessed on 31 July 2022).

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