Research Article/Araştırma Makalesi

The Effect of Product Personalization on Consumer Purchasing Intention, Customer Satisfaction, Brand Loyalty and Artificial Intelligence Applications with Machine Learning

Ürün Kişiselleştirmenin Tüketici Satın Alma Niyeti, Müşteri Tatmini, Marka Sadakati Üzerine Etkisi ve Makine Öğrenmesi ile Yapay Zekâ Uygulamaları

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Abstract

Personalization is the ability of a company to evaluate its customer base as individual entities and achieve customized interactions and transactions based on this evaluation. Advances in information and communication technologies offer new opportunities in collecting and analyzing customer data and carrying out personalized marketing activities. In this context, the use of strategies such as special messages, targeted advertising campaigns, and special offers based on individual customer profiles allows companies to manage customer relations in a more effective and customized way. These developments play an important role in increasing customer satisfaction and loyalty of businesses, optimizing marketing strategies and gaining competitive advantage. The most important of these applications are machine learning and artificial intelligence. Therefore, within the scope of the study, it is aimed to measure the effect of product personalization on consumer purchasing intention, customer satisfaction and the resulting brand loyalty and to present an approach for processing the obtained information with machine learning and artificial intelligence applications. Within the scope of the research, data obtained from questions asked to consumers through digital survey forms with product personalization, purchase intention, customer satisfaction and brand loyalty scales are used. Data were analyzed using IBM SPSS 25.0 and IBM AMOS 26.0 software packages. As a result of the research, it was seen that product personalization has a positive and significant effect on consumer purchase intention and customer satisfaction, and purchase intention and customer satisfaction also have a positive and significant effect on brand loyalty. According to the findings, it was aimed to propose an artificial intelligence-based model that could be useful on consumer behavior and decision-making processes.

Jel Codes: *M30, M31, C81*
Keywords: *Product Personalization, Purchase Intention, Customer Satisfaction, Brand Loyalty, Artificial Intelligence*

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Öz

Kişiselleştirme, bir şirketin müşteri tabanını bireysel varlıklar olarak değerlendirebilme ve bu değerlendirmeye dayalı olarak özelleştirilmiş etkileşim ve işlemleri başarabilme yeteneğidir. Bilgi ve iletişim teknolojilerindeki ilerlemeler, müşteri verilerinin toplanması, analiz edilmesi ve kişiselleştirilmiş pazarlama faaliyetlerinin icra edilmesi konularında yeni olanaklar sunmaktadır. Bu bağlamda, bireysel müşteri profillerine dayalı olarak özel mesajlar, hedefe yönelik reklam kampanyaları, özel teklifler gibi stratejilerin kullanımı, şirketlerin müşteri ilişkilerini daha etkili ve özelleştirilmiş bir biçimde yönetmelerine olanak sağlamaktadır. Bu gelişmeler, işletmelerin müşteri memnuniyetini ve sadakatini artırmak, pazarlama stratejilerini optimize etmek ve rekabet avantajı elde etmek açısından önemli bir rol oynamaktadır. Bu uygulamaların başında makine öğrenmesi ve yapay zekâ gelmektedir. Bu nedenle çalışma kapsamında ürün kişiselleştirmenin tüketici satın alma niyeti, müşteri tatmini ve bunun sonucunda ortaya çıkan marka sadakati üzerindeki etkisinin ölçümlenmesi ve elde edilen bilgilerin makine öğrenmesi ve yapay zekâ uygulamaları ile işlenmesine yönelik bir yaklaşım sunulması amaçlanmaktadır. Araştırma kapsamında tüketicilere dijital anket formlarıyla ürün kişiselleştirme, satın alma niyeti, müşteri tatmini ve marka sadakati ölçekleriyle sorulan sorulardan elde edilen veriler kullanılmaktadır. Veriler IBM SPSS 25.0 ve IBM AMOS 26.0 paket programları kullanılarak analizler yapılmıştır. Araştırma sonucunda ürün kişiselleştirmenin tüketici satın alma niyeti ve müşteri tatmini üzerinde pozitif ve anlamlı bir etkiye sahip olduğu ve satın alma niyeti ve müşteri tatmininin de marka sadakati üzerinde pozitif ve anlamlı bir etkiye sahip olduğu görülmüştür. Elde edilen bulgulara göre tüketici davranış ve karar verme süreçleri üzerinde faydalı olabilecek yapay zekâ temelli bir model önerisinde bulunulması amaçlanmıştır.

Jel Kodları: *M30, M31, C81*
Anahtar Kelimeler: *Ürün Kişiselleştirme, Satın Alma Niyeti, Müşteri Memnuniyeti, Marka Sadakati, Yapay Zekâ*

1. Introduction

Personalization is a concept that refers to an organization's capacity to take a unique approach to customer relations. This capacity stands out with the ability to recognize the individual customer as a whole while interacting with the customer and to apply customized communication strategies in line with this recognition. Personalization typically involves marketing practices that include customer-specific messages, targeted advertising, special offers, and other personalized actions. Advances in information and communication technologies have increased the capacity to collect and analyze large amounts of customer data. These developments allow businesses to understand customer behavior more comprehensively and use this understanding to offer customers personalized experiences. In this context, personalization has gained importance as a strategic tool to increase customer satisfaction and loyalty, optimize marketing effectiveness and provide competitive advantage. Technological possibilities make it possible to effectively process customer data and develop personalized marketing strategies. For example, with the use of algorithms, customer preferences and behavior can be better analyzed, thus more effective personalized marketing campaigns can be created. At this point, it is critical for businesses to adopt technology-based personalization strategies to improve customer experience and maintain competitive advantage.

How a company that was an award-winning worldwide retailer in 2013 could evolve into a position that cannot make sales in 2019 can be examined, for example, through Shoes of Prey, a company founded in 2009 to produce personalized shoes. However, the fact that Shoes of Prey entered the liquidation process in 2019 reflects a remarkable situation. Co-founder Jodie Fox's social media declaration underscored the hurdles encountered by the brand, accentuating the formidable expenses linked with the personalized approach and the conundrum of failing to captivate the broad consumer base (Pallant et al., 2020). Historically, the domain of product design has served as a paramount bastion of competitive edge for brands. Nevertheless, there exists a burgeoning inclination among brands to consign a segment of the design process to consumers, thereby permitting them to tailor products to their idiosyncratic preferences. Despite the burgeoning ubiquity of this paradigm in contemporary retail, instances such as the non-attainment of mass market penetration akin to the plight of Shoes of Prey have surfaced. The apprehension of consumer predilections regarding personalization proffers a substantial prospect for retailers to formulate and dispense bespoke offerings. Recommendation systems play an indispensable role in this venture, efficaciously enlightening and swaying consumer selections toward personalized products while bolstering brand allegiance (Adomavicius et al., 2018; Hennig-Thurau et al., 2012; Senecal & Nantel, 2004; Xiao & Benbasat, 2007). In the extant marketplace milieu, myriad brands proffer consumers the latitude to customize products via computer-simulated environments. For instance, Nike extends personalized sneakers, and Lancôme offers personalized foundation tailored to individual skin tones. Furthermore, Amazon is prospecting the domain of personalized clothing sales online, tailoring products to the measurements of individual patrons (Dawson, 2018). These instances underscore the burgeoning strategic gravitas of personalization in contemporary retail paradigms.

A survey conducted by Evergage and Researchscape International reveals that 98% of marketers agree that personalization improves customer relationships, but many think companies' efforts in this area are inadequate. According to the survey results, 70% of the participants think that personalization has "strong" and "very strong" effects on building customer relationships, and 85% state that existing customers want personalized experiences (Zeng, 2019). A recent study showed that 91% of consumers are more likely to purchase from brands that remember them and provide relevant offers and recommendations (Accenture, 2023). In another study, 90% of participants stated that personalization efforts had a measurable positive impact. 58% of participants stated that there was an improvement of more than 10%, and 15% of participants reported that personalization efforts had an impact of more than 30%. However, according to the same report, only 32% of marketers believe they are using personalization correctly, and only 18% said they are "very" or "extremely" confident they have a successful personalization strategy (Evergage and Researchscape International, 2019).

Personalization is the capacity of a business to know its customer base as individuals and develop tailored interactions based on that recognition. This capability includes personal actions such as personal messages, targeted ads, special offers and aims to make the customer experience more individual and customized. Comprehending the dynamics of online shopping experiences and the underlying motivations is crucial for understanding customers' behavior in the realm of online purchasing. These factors can be amalgamated in diverse configurations to elucidate the behavior exhibited by various consumer segments. For this reason, within the scope of the research, it was aimed to propose an approach model with artificial intelligence-based approaches by measuring the consumer purchasing and product satisfaction processes of product personalization and the impact of these processes on brand loyalty.

2. Conceptual Framework

Personalization is a production system that offers individuals a wide range of variety without moving away from mass production costs, responds to the needs of consumers, and accelerates and flexes design, production and distribution processes (Pine, 1992: 155; Thirumalai and Sinha, 2009: 8). Product personalization and efforts to offer consumers a special and individual shopping experience play a prominent role in today's marketing strategies. In this context, the effect of product personalization on basic criteria such as consumers' purchase intention, customer satisfaction and brand loyalty is examined. In particular, the use of advanced technologies such as machine learning (ML) and artificial intelligence (AI) in the analysis and processing of this information constitutes an important research area in academic circles. Machine learning and artificial intelligence enrich and optimize the product personalization process with the ability to perform complex analyzes on large data sets. These technological approaches enable gaining deeper insights into consumers' shopping habits, preferences and trends. In addition, it aims to provide special suggestions and personalized experiences by using this data obtained. In this context, academic studies in the field of product personalization focus on understanding and evaluating the effects of machine learning and artificial intelligence techniques on consumers' purchasing behavior. It represents a scientific research basis aiming to explore the potential

of these technological applications to shape marketing strategies more effectively, increase customer satisfaction and strengthen brand loyalty.
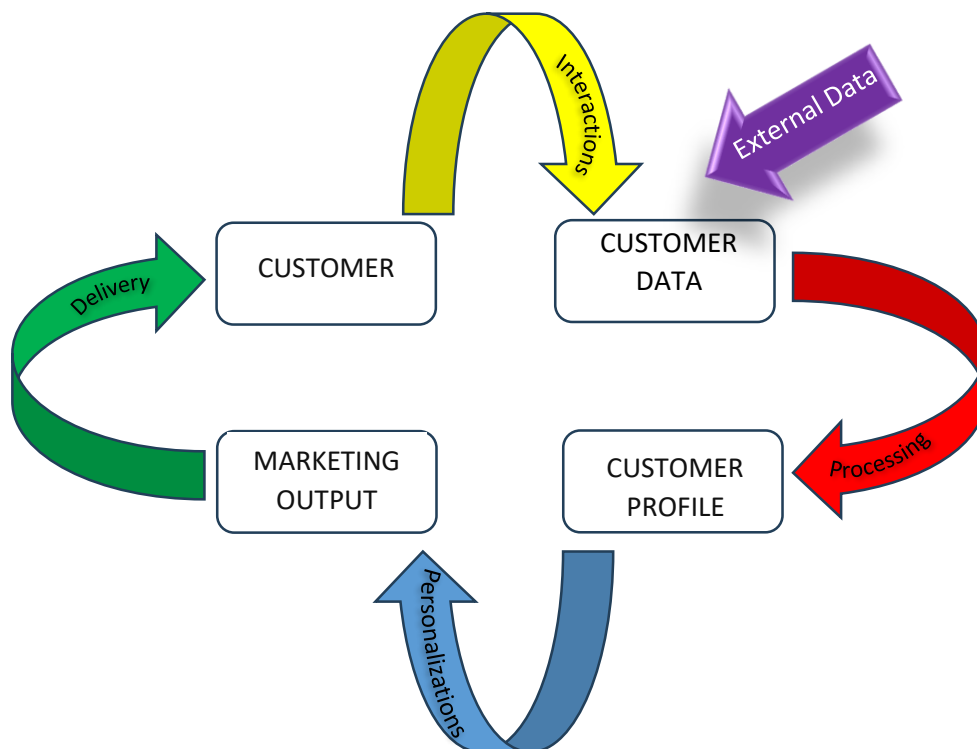
2.1. Personalization and Product Personalization

There are many definitions of personalization in the literature. The Personalization Consortium, in its technology-based definition, considers personalization as the adaptation of interactions between the business and each customer in electronic commerce by using technology and customer information. In another definition, personalization is defined as the process of proposing a solution targeting the customer by using customer information (Versanen, 2007). The concept of personalization is widely used today and contains a wide range of meanings. In this context, personalization covers a variety of applications, from simply using the customer's name on a company's website to customizing the product according to consumer wishes and needs. Likewise, personalization technologies range from the use of common databases to creating a dynamic web page, identifying personalized patterns through machines and algorithms, and data mining (Kramer et al., 2000). Personalization refers to the way a company adapts its business interactions with each customer online using technology and customer information. This is the practice of responding accurately to customer requests and needs by utilizing historical data or instant customer information (Vesanen, 2007). Product personalization and product customization are considered two separate concepts within the framework of one-to-one marketing strategies. Personalization is the process of determining appropriate marketing decisions by a company for each customer. On the other hand, customization means that the customer takes a proactive role and personalizes one or more components of marketing decisions (Arora et al., 2008). Customization can be characterized as a system that integrates information technology, adaptable processes, and organizational frameworks to provide individual customers with a diverse array of products and services tailored precisely to their unique requirements (Da Silveira et al., 2001). This approach generally does not have a significant difference in cost from customization processes. However, the active participation and demands of the customer in the customization process is a distinguishing feature from personalization. On the other hand, personalization is a process that involves specific adaptation to a particular customer, usually without the customer's knowledge or extra effort on the part of the customer (Churchill, 2013). In this context, it involves catering to the individual's particular preferences, for example by filtering content.

Personalization is a process that can be initiated by the interaction between the customer and the company. While the customer initiates this process by personalizing a website, the company can initiate personalization by offering the customer special offers or addressing them by name (Wind & Rangaswamy, 2001). This process is based on the seller's desire to obtain customer information and use the customer's personalization services (Chellappa & Sin, 2005). Businesses frequently use personalization to increase performance in marketing activities. However, this process is complex and marketers strive to avoid the perception of spam while trying to meet customer expectations. Developments in information and communication technologies offer new opportunities to collect and analyze customer data and implement personalized marketing activities (Vesanen, 2007). Personalization is based on

the basic assumption that products that suit the individual's preferences provide higher satisfaction and better fit with consumer preferences (Franke et al., 2009).

Product customization refers to the process of making a product more suitable for individual preferences by modifying its aesthetic features or functionality. This strategy offers consumers the ability to personalize the product by providing a certain degree of design control. For example, Nike offers a platform that allows customers to create their own custom shoe designs. This customization process provides consumers with the opportunity to adapt the aesthetic and functional features of the product to their own preferences and expectations (Mugge et al., 2007). Consumers' individual preferences give rise to many situations where standard products are unsatisfactory. One of the promising future strategies for companies in this context is to offer different options to consumers through product personalization. With the 3D sneaker customization platform it developed, Nike offers its customers the opportunity to obtain a real-time and shareable image of a completed shoe (Lindecrantz et al., 2020). According to Vesanen & Raulas, (2006), the model in which four personalization components consisting of customer, customer information, customer profile and marketing output are interconnected is given in Figure 1.

Figure 1: Personalization Process

Source: Vesanen & Raulas (2006)

By giving customers the opportunity to participate in the product design process and create their own products, personalization contributes to customers' greater satisfaction with the overall product performance and, as a result, to customer loyalty (Bardakci & Whitelock, 2003). According to Peppers & Rogers (1993), product customization is part of the ultimate differentiation strategy to be built in the future. Vesanen (2007) divides personalization into five main categories: segment marketing, tailored personalization, aesthetic personalization, transparent personalization, and collaborative individualization. Product customization and product diversification are strategic approaches that companies frequently use to match products with customer preferences. A company that implements a personalization strategy first determines each customer's preferences and develops special products in accordance with these preferences and offers them to the customer. On the other hand, the product diversification strategy involves an approach that does not require direct interaction with consumers by offering a wide range of products. A company's application of marketing decisions to an individual customer forms the basis of a one-to-one marketing strategy. However, there is no clear distinction made between the concepts of personalization and customization in the literature. While some academic studies define personalization as the company's process of determining appropriate marketing decisions for the customer, they consider customization as the customer proactively determining their own marketing decisions.

2.2. Machine Learning and Artificial Intelligence

The emergence of Industry 4.0 has exhibited a parallel evolution as the concept of machine learning has begun to exist more effectively in daily life. Scientists' discovery of the morphology of artificial neural networks has enabled the construction of artificial neural networks that internalize the learning algorithms of certain machines. This enabled machines to imitate human nervous system capabilities, and this process formed the basis for the emergence of machine learning terminology (Pradeep et al., 2019: 50). In other words, machine learning involves the practice of performing the learning process by creating a relatively simple neural network that does not have any prior knowledge about the physical world and its content, and by intensively interacting this network with large-scale data sets (Tegmark, 2019: 108). Applications such as predicting a customer's purchasing tendency and automating individual targeting of digital advertisements in shopping processes in internet-based commerce are among the frequently observed examples of practices that have emerged with the evolution of machine learning (Davenport & Ronanki, 2019: 13). Such applications may be virtual support applications such as Apple's Siri, or may include physical entities such as Alexa or Jibo (Ciechanowski et al., 2019: 540). Today, the widespread use of machine learning in the marketing sector attracts attention. Some businesses plan to delegate regular communication tasks to automated machine systems, while directing more complex tasks, such as dealing with increasing customer demands, maintaining long unstructured dialogues, or detecting potential problems before reaching customers, to customer support units (Davenport & Ronanki, 2019: 16).

The term artificial intelligence, coined by John McCarthy at the conference held at Darmouth College in 1956, was defined as the science and engineering of the development of intellectual machines and intelligent computer programs (Arslan, 2020: 76). The article titled "Programs with Common Sense", written under the leadership of McCarthy in 1959, gave great impetus to artificial intelligence research. Modeling the perception style of the human mind, such as providing individual-specific information, visual perception, perception processes, decision-making, through intelligent computer programs, and transferring these qualities to smart technologies and robotic systems is referred to as brain modeling in the field of science, and the whole process is referred to as artificial intelligence (Shabbir & Answer, 2015: 1-2). Nadimpalli (2017) defined artificial intelligence as special technological mechanisms that process complex processes such as machine learning, natural language processing, perception and reasoning. Sterne (2017: 9) defines artificial intelligence in general, with the aim of achieving the ability of a computer to exhibit human-like behavior. According to the research report of IBM and NRF (2019: 2), artificial intelligence is a data discovery process characterized by the ability of machines to think logically, discover information, remember information, learn and identify new information. Artificial Intelligence (AI) creates unique opportunities for businesses to improve customer interaction by enabling machines to gain visual, auditory, taste, smell, touch, speaking, walking, flying and learning abilities. This provides an environment where businesses can develop completely new strategies to engage customers, deliver smarter product and service experiences, automate processes and optimize business performance (Marr & Ward, 2019: 1). The training process of artificial intelligence (AI) systems is carried out on large data sets. In this context, the retail sales environment offers an extremely suitable ground for the use and evolution of artificial intelligence technologies. In order to make the most of rapidly evolving big data resources, retailers are investing in various artificial intelligence applications. Data obtained from various sources such as purchase data, online search data, social media data, mobile usage data and customer satisfaction data is of critical importance for businesses today. For example, Walmart, a giant in the retail industry, collects data related to approximately 1 million transactions per hour and accumulates 2.5 terabytes of data in total (Shankar, 2018: 6).

Simple observations and manipulations, although often devoid of mathematical formalizations, can comprehensively influence people's decision-making processes and contribute significantly to their ability to cope with unpredictable situations. Such behavioral observations have an extremely valuable potential to be used in automatic agent design (Rosenfeld & Kraus, 2018: 28). With an increasing trend, consumers have turned to searching for solutions via the internet or telephone to carry out various transactions. In response to this need, artificial intelligence-supported solutions in the field of customer services have begun to replace traditional customer representatives (Duran, 2021: 42). Personalization of web interfaces has become standard in the electronic retail industry. New consumers expect personalization not only to be limited to online shopping but also to be enhanced in physical store experiences. In this context, it is very important for businesses and marketers to focus on big data analyzes and investments (Deloitte, 2015).

3. Method

Within the scope of the research, data were obtained by convenience sampling. Convenience sampling is a non-random sampling method in which the sample to be selected from the main mass is determined by the judgment of the researcher. In convenience sampling, data is collected from the main mass in the easiest, fastest and most economical way (Malhotra, 2004: 321, Aaker et al., 2007: 394, Zikmund, 1997: 428). Data was collected with a survey, which is one of the most frequently used quantitative research methods in measuring consumer behavior and attitudes. In this context, consumers' attitudes towards product personalization and the impact of these attitudes on purchase intention and customer satisfaction were examined. Purchasing intention and customer satisfaction, as well as loyalty and commitment to the brand, were tested within the scope of the study.

3.1. Purpose and Importance of the Research

Product customization and product diversification are two popular strategies used by companies to match products with customer preferences. A company that implements a product customization strategy first determines each customer's preference, then produces and delivers the product closest to that preference to the customer. In this way, the consumer indirectly takes a more active and decisive role in the production process (Arora et al., 2008). Consumers now prefer to produce and buy products that directly meet their own wishes, needs and demands, rather than buying products that are assumed to have hypothetically predicted wants, needs and demands. Therefore, it is very important to measure consumer attitudes towards product customization and personalized products. It is assumed that as consumers move towards the product that meets their expectations and desires, their purchasing intention and satisfaction level with the product they purchase increases. It is thought that the frequency of purchasing behavior and the increase in the level of satisfaction with the product purchased have an impact on brand loyalty. Therefore, within the scope of the research, it is aimed to measure the consumer attitude towards product personalization and to understand the relationship between purchasing and satisfaction level as a result of this attitude, and as a result to measure the consumer's loyalty to that product or brand. The approach, which will reveal the necessity of processing the findings with machine learning and artificial intelligence (business-specific applications and computer-based interfaces) technologies, will contribute to businesses and marketing researchers in better understanding consumer behavior. This assumption shows that the study will contribute to the literature.

### 3.2. Population and Sample of the Research

The research sample consists of 458 participants from Ankara, Istanbul, Izmir, Antalya, Kırıkkale and Malatya. The population of the research consists of individuals aged 18 and over who express their opinions about personalized product preference, prefer them, and use mobile and digital marketing tools. In the study where convenience sampling method was used, data was obtained using digital survey forms (Google Forms). Within the scope of the

research, data could only be obtained from consumers residing in certain provinces (Ankara, İstanbul, İzmir, Antalya, Kırıkkale and Malatya). 386 out of 458 participants gave appropriate answers and analyzes were made based on these surveys. However, the limitations of the research are that the participants who did not express their opinions about product personalization at the point of using digital vehicles and the fact that only participants living in certain provinces answered the surveys. In addition, people who do not have any experience in product customization are another limitation of the study.

3.3. Research Model and Hypotheses

The research model and hypotheses were created using studies in the literature. Within the scope of the research, consumers' attitudes towards personalized products, whether or not they prefer personalized products, and the effect of this attitude on consumers' purchasing intention and customer satisfaction were examined, and the effect of this situation on brand loyalty was examined. Consumers' attitude towards personalized products, purchase intention, customer satisfaction and brand loyalty constitute the variables of the research model.

Figure 2: Research Model
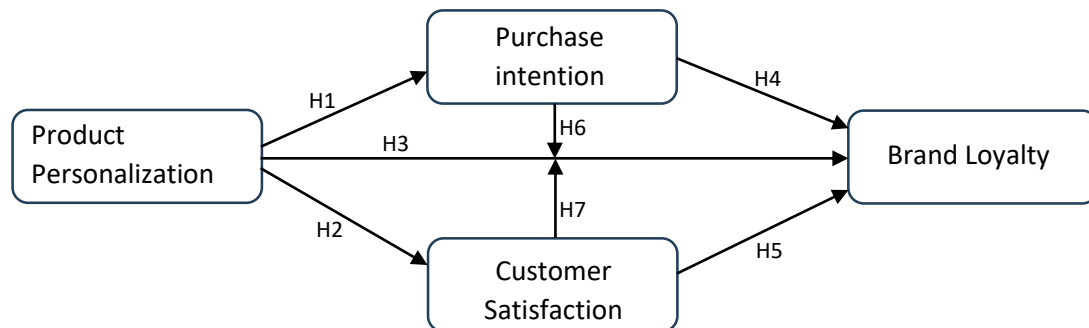
There are a number of insights and academic evaluations that analyze the potential demand for personalization. According to statistics in the USA, 62% of online shoppers stated that they tend to prefer, recommend or purchase a brand that offers a personalized experience or service (Walker, 2017). Additionally, there are a number of studies showing that customers are willing to charge price premiums for personalized products and accept longer waiting times for these products (Deloitte, 2015; Franke & Piller, 2004; Piller & Müller, 2004). One-to-one marketing and personalized offers are strategies for surfing online platforms, in-depth content discovery, and ultimately increasing purchasing tendencies. Personalization is a critical strategic tool to deliver effective and personalized experiences to customers. Research reveals that personalization has an impact on five important criteria such as business quality, service quality, overall satisfaction, intention to recommend and tendency to switch brands (Tam & Ho, 2005). Additionally, there are other studies indicating that personalized products provide cognitive, financial and experiential benefits for web visitors (de Pechpeyrou, 2009).

A study conducted by Epsilon and GBH Insights shows that 80% of 1,000 American adult respondents expect personalization from retailers (Lindecrantz et al., 2020). This finding highlights that consumers demand an individual approach to their retail experiences and that personalized products and services can be a significant competitive advantage for businesses. Research suggests that the influence of high-quality products on customer attitudes, particularly in the realm of personalization, has been underscored (Ho & Bodoff, 2014). However, the impact of products on eliciting positive emotions among customers can unveil nuanced purchase intentions (Pappas et al., 2014). Customers ascribe distinct value to varied facets of personalization, thereby engendering fluctuations in purchase intentions. Personalization, interlinked with price and promotion sensitivity, endeavors to strategically mold customer behavior (Montgomery & Smith, 2009). Nonetheless, there exists a probability that personalization may not directly affect customers' perception of product or service quality, consequently positively influencing their purchase intentions (Lee & Park, 2009). Service quality intricately intertwines with goal-oriented online shopping behavior and hedonic aspects (Bauer et al., 2006). Pappas et al., (2014) discerned that positive emotions such as enjoyment and the perceived quality of personalization can significantly sway customers' purchase intentions. Brand loyalty epitomizes the robustness of the bond between a consumer's relative attitude and their likelihood of becoming repeat patrons (Dick & Basu, 1994). It also includes consumers' constant positive attitude and repurchase behavior towards the business (Yoo & Chang, 2005). This concept also includes the consumer's feelings about purchasing the same product again, being satisfied with the product he purchased and the service offered by the brand (Chang & Chieng, 2006). Considering the studies conducted in the above-mentioned literature, the following hypotheses were created within the scope of the research.

H_1: Product personalization significantly and positively affects consumers' purchasing intention.

H_2: Product personalization affects customer satisfaction significantly and positively.

H_3: Product personalization significantly and positively affects consumers' brand loyalty.

H_4: Purchasing intention affects brand loyalty significantly and positively.

H_5: Customer satisfaction affects brand loyalty significantly and positively.

H_6: Purchase intention has a role in moderating the relationship between product personalization and brand loyalty.

H_7: Customer satisfaction has a role in moderating the relationship between product personalization and brand loyalty.

3.4. Data Collection Tool

The research conducted based on data obtained from an online survey comprises two principal sections. Initially, participants were queried regarding demographic particulars encompassing age, gender, educational background, income level, marital status, and their

city of residence. Subsequently, the second segment of the survey delved into gauging consumers' perspectives concerning product personalization, purchase inclination, customer contentment, and brand allegiance. The survey instrument, fashioned using Google Forms, was disseminated to respondents via email, various social media channels, and WhatsApp, employing an access link for participation. Chellappa & Sin (2005) was used as the consumer attitude scale towards product personalization. Barber et al. (2012) was used as the purchase intention scale, Klaus & Maklan (2013) was used as the customer satisfaction scale, and Chaudhuri & Holbrook (2001) and Busser & Shulga (2019) scales were used as the brand loyalty scale.

Permission numbered E-96274976-100-28689 was obtained from the OSTİM Technical University Ethics Committee for the scales used within the scope of the research.

3.5. Analysis of Data

Within the scope of the research, questions were asked to the participants using the 5-point Likert method on the scales used other than demographic characteristics. The product personalization scale consists of 6 questions, the purchase intention scale consists of 4 questions, the customer satisfaction scale consists of 5 questions, and the brand loyalty scale consists of 5 questions. Before starting the analyses, normality tests were performed on the data set. When Kurtosis and Skewness values are -1.5 to +1.5, it is considered to be a normal distribution (Tabachnick & Fidell, 2013). The fact that the kurtosis values of the Shapiro-Wilk and Kolomogorov-Smirnow test results of the factors are between -0.149 and 1.086, and the skewness values are between -0.113 and 0.998 show that the data is normally distributed. The generally accepted lower value of KMO in the literature is 0.50. As the KMO value approaches 1, the suitability of the data set for analysis increases. Bartlett's Sphericity test yielding significant (p<0.05) results means that the relationship between variables is sufficient (Durmuş et al., 2022). In order to determine the suitability of the data collected from 386 participants, Kaiser Meyer Olkin (KMO) test values and their relationships in the correlation matrix were examined. When the Bartlett sphericity test results and KMO values are examined, it is seen that it is quite high as 0.922. According to the Bartlett Test results regarding the factors, it was determined to be statistically significant (p<0.000). The results show that the data set is suitable for factor analysis. Construct reliability (CR) and average explained variance (AVE) values of the scales show whether convergent validity and composite reliability are achieved. An AVE value greater than 0.50 indicates that the scales provide convergent validity (Bagozzi & Yi, 2012). Achieving discriminant validity is possible with CR values above 0.70 (Fornell & Larcker, 1981). The fact that AVE values for all scales are above 0.50 and CR values are above 0.70 shows that the scales provide convergent validity and composite reliability (See Table 1). If Cronbach's Alpha value is 0.70 and above, the factor is considered reliable and consistent (Durmuş et al., 2022). Cronbach's Alpha values of the scales are between 0.744 and 0.922, indicating that the scales are reliable and consistent.

Table 1: Factor Load, Cronbach's Alpha, AVE and CR Values of Scales

Scales	Factor Item	Factor Load	Cronbach's Alpha	AVE	CR
Product Personalization	I value products that are personalized based on user experience	0.651	0.853	0.631	0.894
	I value businesses that keep my personal preferences and personalize products according to these preferences	0.513	0.909		
	In the past, I value products that are personalized based on information that has been collected automatically but does not identify me	0.701	0.848		
	I value personalized products based on information I voluntarily provide but which cannot be personally identified	0.654	0.922		
	I value personalized products based on personally identifiable information that I voluntarily share.	0.537	0.825		
	I value products that are personalized according to the devices I use (phone, computer, etc.), internet browser and operating system	0.519	0.796		
Purchase Intention	I would consider purchasing this product	0.567	0.911	0.695	0.909
	I intend to purchase this product	0.633	0.819		
	I plan to buy this product	0.740	0.794		
	I would be interested in trying this product	0.694	0.851		
Customer Satisfaction	My feelings about business X are positive.	0.651	0.890	0.598	0.852
	It feels good to look at business X for the offers I'm looking for	0.766	0.744		
	In general, X business and the services it offers are satisfactory.	0.592	0.870		
	I feel satisfied that business X will deliver the best results for me	0.811	0.917		
	I feel satisfied that business X will deliver the best possible outcome for me	0.709	0.804		
Brand Loyalty	I will recommend this brand to anyone who asks my opinion	0.606	0.905	0.639	0.813
	I will continue to shop from this brand	0.814	0.842		
	I will continue my relationship with this brand	0.704	0.745		
	I am willing to pay more for this brand than other brands	0.577	0.909		
	I will come back to this brand in the future	0.693	0.808		

Confirmatory factor analyzes were performed to evaluate the compatibility of the scales with the model. These analyzes include fit indices used to determine how compatible the proposed model is with the data set and to evaluate whether the model is acceptable. Fit index values generally accepted in the literature are presented in Table 2.

Table 2: Table of Fit Index Values

Fit Indices	Acceptable Fit	Perfect Fit
$\chi 2sd/$ (CMIN/df)	$3 \leq \chi 2/sd \leq 5$	$0 \leq \chi 2/sd \leq 3$
NFI	$0.90 \leq NFI \leq 0.95$	$0.95 \leq NFI < 1$
TLI	$0.90 \leq TLI \leq 0.95$	$0.95 \leq TLI < 1$
CFI	$0.90 \leq CFI \leq 0.95$	$0.95 \leq CFI < 1$
IFI	$0.90 \leq IFI \leq 0.95$	$0.95 \leq IFI < 1$
RMSEA	$0.05 \leq RMSEA \leq 0.08$	$0.00 \leq RMSEA \leq 0.05$
GFI	$0.90 \leq GFI \leq 0.95$	$0.95 \leq GFI < 1$

Source: Tabachnick & Fidell (2007)

According to the results of the confirmatory factor analysis conducted for the four scales, first an analysis was made on the consumers' attitude scale towards product personalization. The χ^2/sd (standard chi-square) value, which evaluates the general fit of the model, was calculated as 3.011 and was found to have a very good fit. The fact that this value is between 0 and 3 indicates that there is a good fit, and that this value approaches 0 indicates that there is a very high fit between the data and the theoretical structure. Accordingly: χ^2 (98) =295.127 p<,001; χ^2/df= 3.011; NFI=0.955; CFI=0.964; TLI=0.967; IFI=0.958 RMSEA=0.051. While the fit indices NFI, CFI, TLI and IFI show excellent fit, χ^2/df and RMSEA indices were also found to be quite good. According to the confirmatory factor analysis results of consumers' purchasing intention (χ^2 (59) =247.076 p<.001; χ^2/df= 4.187; NFI=0.922; CFI=0.951; TLI=0.946; IFI=0.960 RMSEA=0.062) the CFI and IFI values While it showed high fit, NFI, TLI, χ^2/df and RMSEA indices were found to be within acceptable limits. According to the customer satisfaction confirmatory factor analysis results (χ^2 (83) =260.042 p<.001; χ^2/df= 3.133; NFI=0.952; CFI=0.966; TLI=0.957; IFI=0.949 RMSEA=0.059) the NFI, CFI, TLI values While it showed high fit, IFI, χ^2/df and RMSEA indices were found to be within acceptable limits. According to the brand loyalty confirmatory factor analysis results (χ^2 (79) =220.221 p<.001; χ^2/df= 3.040; NFI=0.967; CFI=0.953; TLI=0.955; IFI=0.959 RMSEA=0.051) NFI, CFI, TLI and It is understood that IFI values show high fit and χ^2/df and RMSEA indices are very close to perfect fit.

4. Findings

Confirmatory factor analysis is a methodology that evaluates the relationship between the designed constructs of the measurement model. Structural equation modeling is used to determine causal relationships between latent variables. In this study, the concepts approved as a result of the confirmatory factor analysis and validity and reliability tests performed on

the measurement model were subjected to hypothesis tests in the structural model. The fit values of the created structural model were χ^2 (356) =1063.119 p<.001; χ^2/df=2.986; CFI=0.950; TLI=0.938; IFI=0.961 RMSEA=0.055 was determined and these results show that the model is acceptable. Other findings obtained within the scope of the research are the role of purchase intention in regulating the relationship between product personalization and brand loyalty and the results of the regression analysis conducted to determine the role of customer satisfaction in regulating the relationship between product personalization and brand loyalty. Since determining the role of moderating variables (purchase intention and customer satisfaction) between the dependent variable (brand loyalty) and the independent variable (product personalization) in structural equation modeling requires more processing, these tests were carried out with regression analyzes with the help of SPSS. The high relationship between the independent variable (product personalization) and the moderating variables (purchase intention, customer satisfaction) caused the problem of multicollinearity. Therefore, the standardized coefficients of all variables were included in the regression analyses. The product of the standardized coefficients of the independent and moderating variables was used to create the interaction term. Accordingly, in the first model created to measure the moderating effect of purchase intention between product personalization and brand loyalty (the effect of product personalization and purchase intention on brand loyalty), R^2=0.725, while in the second model (the effect of product personalization, purchase intention and interaction term on brand loyalty). R^2=0.753 and p<0.005 indicate that purchase intention has a positive moderating effect between product personalization and brand loyalty. In another regression analysis, R^2=0.744 was found in the first model created to measure the moderating effect of customer satisfaction between product personalization and brand loyalty (the effect of product personalization and customer satisfaction on brand loyalty). However, in the second model (the effect of product personalization, customer satisfaction and interaction terms on brand loyalty), R^2=0.791 and p<0.005, indicating that customer satisfaction has a positive moderating effect between product personalization and brand loyalty. The regression results of the analyzes are given in Table 3 and Table 4.

Table 3: The Moderating Role of Purchase Intention on the Relationship Between Product Personalization and Brand Loyalty

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	5.414	0.322		16.835	0.000
Product Personalization (PP)	0.657	0.322	0.424	8.778	0.000
Purchase Intention (PI)	0.583	0.322	0.371	2.930	0.004
Interaction	0.344	0.317	0.246	2.118	0.008

a. Dependent Variable: Brand Loyalty

Within the confines of the study, it was discerned that customer satisfaction played a pivotal and statistically significant intermediary role between product personalization and brand loyalty, as elucidated in Table 4.

Table 4: The Moderating Role of Customer Satisfaction on the Relationship Between Product Personalization and Brand Loyalty

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	5.126	0.309		16.720	0.000
Product Personalization (PP)	0.594	0.309	0.402	7.894	0.000
Customer Satisfaction (CS)	0.695	0.309	0.393	2.440	0.002
Interaction	0.467	0.286	0.305	1.697	0.011

Dependent Variable: Brand Loyalty

The results of the tests carried out for the purpose of testing the hypotheses are given together. The structural equation modeling analysis results of the model created within the scope of the research are shown in Figure 3, and the results of the hypotheses are shown in Table 5. As a result of the tests, all of the hypotheses stated within the scope of the research were supported. Evaluations and suggestions regarding the findings are explained in the next section.

Figure 3: Research Structural Model Test
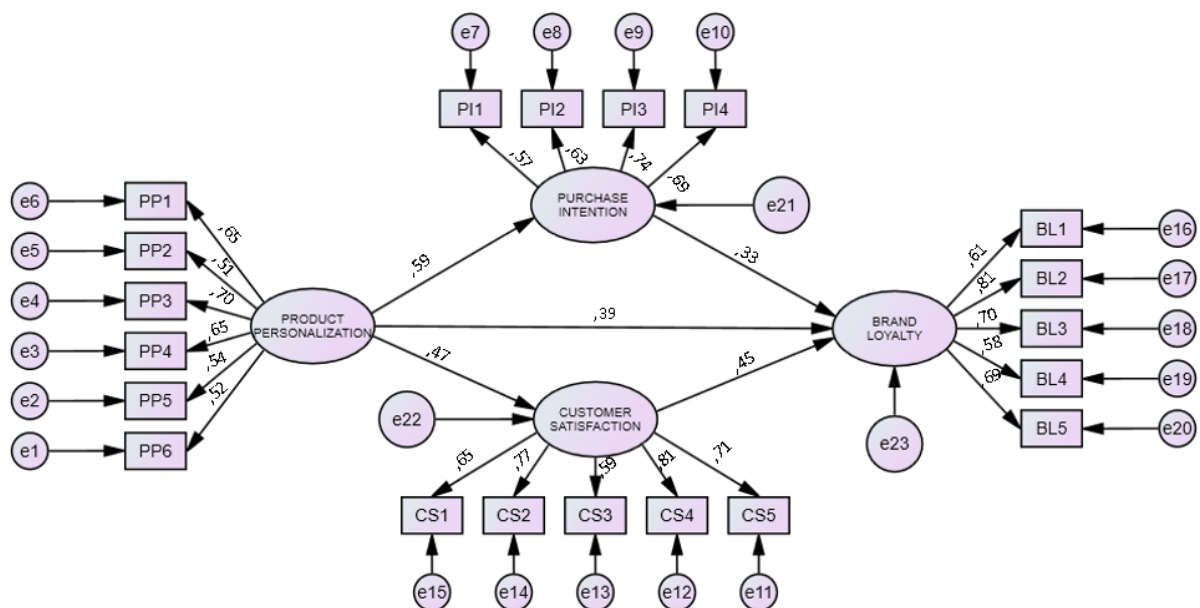
χ^2 (356) =1063.119 p<.001; χ^2/df=2.986; CFI=0.950; TLI=0.938; IFI=0.961 RMSEA=0.055

As a result of the hypothesis tests, product personalization has a positive effect on purchase intention (β=0.593; t=7.695, p<0.001), on customer satisfaction (β=0.466; t=5.346, p< 0.001), and on brand loyalty (β=0.390; t=4.709; p<0.001) has a positive and significant effect. Additionally, purchase intention (β=0.334; 3.964, p<0.001) and customer satisfaction (β=0.447; 6.755, p<0.001) have a positive and significant effect on brand loyalty. Another

finding obtained in the research is that purchase intention (β=0.419; 3.182, p<0.001) and customer satisfaction (β=0.492; 3.691, p<0.001) have a moderating effect between product personalization and brand loyalty.

Table: 5 Structural Model Hypothesis Test Results

Hypothesis	β	t-value	Std. β	p	Result
H$_1$: Product personalization significantly and positively affects consumers' purchasing intention.	0.634	7.695	0.593	**	Supported
H$_2$: Product personalization affects customer satisfaction significantly and positively.	0.575	5.346	0.466	**	Supported
H$_3$: Product personalization significantly and positively affects consumers' brand loyalty.	0.498	4.709	0.390	**	Supported
H$_4$: Purchasing intention affects brand loyalty significantly and positively.	0.456	3.964	0.334	**	Supported
H$_5$: Customer satisfaction affects brand loyalty significantly and positively.	0.601	6.755	0.447	**	Supported
H$_6$: Purchase intention has a role in moderating the relationship between product personalization and brand loyalty.	0.344	2.118	0.246	**	Supported
H$_7$: Customer satisfaction has a role in moderating the relationship between product personalization and brand loyalty.	0.467	1.697	0.305	**	Supported

** p< 0.001

5. Conclusion and Recommendations

Personalization refers to a company's capacity to comprehend its customers as unique individuals and subsequently make decisions informed by this knowledge. This may entail crafting customized messages, delivering targeted advertisements, extending personalized offers, and implementing other specialized initiatives tailored to individual preferences and characteristics. Personalization basically emerges from individual-oriented marketing strategies and customer relationship management principles. In this context, marketers strive to accurately determine customer expectations and avoid spam reactions. These efforts aim to establish deeper and more meaningful interaction with customers. Today, rapid advances in information and communication technologies offer new and advanced opportunities for collecting and analyzing customer data. In this context, the ability to understand customer behavior, determine preferences and process personal data effectively offers marketers the opportunity to create a more effective and personalized marketing strategy. Personalized marketing activities have become an important tool to increase customer satisfaction, strengthen loyalty and gain competitive advantage. Analyzing customer data and obtaining meaningful insights enables product and service recommendations to suit individuals' unique needs. This allows marketers to reach their target audiences more effectively and establish long-term customer relationships. In short, product personalization combines with customer-

focused strategies, technological developments and data analytics integration to offer marketers a more effective, customized and value-creating approach. At this point, it is critical for companies that want to meet customer expectations and gain a sustainable competitive advantage to strategically adopt the concept of personalization. The findings obtained as a result of the research are in line with previous studies (Lindecrantz et al., 2020; Arora et al., 2008; Pappas et al., 2014; Rosenfeld & Kraus, 2018; Montgomery & Smith, 2009; Ho & Bodoff, 2014; Vesanen & Raulas, 2006; Wind & Rangaswamy, 2001) overlap. However, it is interesting that as a result of the study, purchase intention and customer satisfaction have a regulatory role between product personalization and brand loyalty. Although purchasing intention has a minor role, the fact that customer satisfaction has a relative impact shows that much more successful results can be achieved thanks to machine learning, artificial intelligence applications and interfaces. As a matter of fact, according to Thornhill (2018), analysis of the 2012-2016 period shows that the USA's expenditures in the field of artificial intelligence are approximately 18.2 billion dollars, while China's is 2.6 billion dollars. The economic impact of artificial intelligence is constantly increasing, and it is predicted to contribute 13 trillion dollars to the global economy by 2030, growing the economies of countries by 16% (Bughin et al., 2018: 13). According to another study, the global artificial intelligence market was at the level of 1.8 billion dollars in 2016 and is expected to reach 190.11 billion dollars with a significant increase by 2025 (Servoz, 2019). In 2025, artificial intelligence-derived revenues from e-commerce worldwide are expected to reach 36.8 billion dollars (ICT Media, 2021). Additionally, it has been observed that Amazon's sales increased by 35% thanks to AI-based recommendation systems and by 75% with Netflix's content recommendations based on viewer preferences (McKinsey, 2019). Coca-Cola evaluates customer reactions using sentiment analytics on social media and adapts its campaign strategies accordingly. This approach increased the effectiveness of the brand's social media campaigns by 18% (Forbes, 2023). Starbucks' AI-powered loyalty program increased customer spending by 15% by providing personalized recommendations through the app (Harvard Business Review, 2020). By 2020, 85% of companies report reducing costs and increasing customer satisfaction by 25% by using AI-based chatbots in customer service. Using an AI-based demand forecasting model, Procter & Gamble reduced inventory costs by 15% and reduced waste by producing according to demand (Exposebox.com, 2022). These examples show how AI applications are effective in optimizing marketing strategies and increasing customer loyalty.

Machine learning and artificial intelligence have been an important area of research to evaluate the effects of product personalization in increasing brand loyalty and purchase intention. Studies in the scientific literature highlight the abilities of these technologies to understand, analyze and predict individual consumer preferences. Machine learning's ability to perform complex analyzes on large data sets demonstrates its ability to effectively process comprehensive data sets that include a variety of data points, such as consumers' past shopping behavior, style preferences, and demographics. These analyzes can be used to create personalized product recommendations and offer special promotions to customers. Artificial intelligence plays an important role in making interactions more personal and meaningful to increase customer loyalty. Intelligent virtual assistants or dedicated customer services interact with customers, understand their needs and use this information to offer

special experiences. This can increase customer satisfaction and strengthen brand loyalty. To increase purchase intention, machine learning is used to develop recommendation systems. It has the potential to influence consumers' purchasing decisions by providing them with personalized product recommendations based on their past shopping history and preferences. These systems can more effectively promote products that interest consumers and facilitate the purchasing process. Findings in the literature confirm that machine learning and artificial intelligence are effective tools for increasing product personalization, brand loyalty, and purchase intention. Correct and effective application of these technologies can increase the competitive advantage of businesses and strengthen customer relationships. According to Campbell et al. (2020), advancements in big data, machine learning, and artificial intelligence have facilitated marketers in personalizing content more effectively by harnessing information gathered from customers to segment and target them with greater precision.

Utilizing personalization tools to actively engage customers can encounter obstacles in transitioning them into buyers of authentically tailored products. Consequently, there arises a critical necessity to comprehensively grasp the diverse spectrum of personalization demands inherent within consumer cohorts. Understanding consumer configurations enables companies to serve different market configurations more effectively by optimizing their internal resources. This requires the existence of various consumer segments in the field of personalization. Understanding consumer demand for personalization is a critical factor in strengthening brands' competitive advantage. The ability of customers to express their preferences is important to the expected benefit of personalization. However, it has been observed that even customers with similar abilities are affected by personalization at different levels. For example, one customer with high product involvement may positively influence the output, while another customer's low involvement may negatively affect the results expected from personalization. To be successful, brands need to invest in customer data, data analytics, advanced technology capabilities, flexible and fast capabilities, and at the same time be careful about protecting customer privacy. Additionally, businesses can determine product personalization strategies thanks to artificial intelligence-based applications such as chatbots, enhanced advertising technology, customer behavior-focused marketing, automatic content creation, image recognition, social media monitoring. In addition to all these, businesses need to be prepared for technologies such as Lightning Network (mobile and cold wallets, etc.) that, on the one hand, adopt a personalization-oriented approach according to consumer demands and needs, and on the other hand, offer the opportunity to shop with cryptocurrencies. For example, Starbucks has been offering the opportunity to shop with cryptocurrency (Bitcoin, Ethereum) since 2020. Thanks to QR technology, it is possible to make fast, economical and easy payments. Because in the near future, consumers' demands for personalized products will not only vary, but their demand for safe, simple and cost-free payment applications will also increase. Therefore, businesses and marketers need to be prepared for this scenario today. In conclusion, in order for product personalization and consumer preferences to be more realistic and predictable for businesses and marketing researchers, the data obtained through digital tools and social media platforms must be stored with big data and cloud technologies and analyzed with machine learning, deep learning and artificial intelligence-

based applications. Otherwise, businesses and researchers will be doomed to be lost in such a large ocean of information.

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