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The Mediating Role of Customer Relationship Managment (CRM) in the Effect of Innovation on Perceived Service Quality: The Case of Airlines System

Serdar Okan[1*]

[1*] Gümüşhane University, Transportation Service, KADMYO, Kelkit, Gümüşhane, Türkiye. (sermuz07@gmail.com)

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Corresponding Author: *Serdar Okan*

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Abstract

Today, businesses apply the Customer Relationship Management approach to ensure customer satisfaction and sustain customer loyalty. In this approach, it is aimed to go beyond satisfaction by putting the customer at the center. This research conducted at Antalya Airport aims to examine the impact of technological innovations by airline companies on the perceived service quality of passengers and how this impact is shaped through customer relationship management practices. The results of the study provide strategic recommendations and guidance for companies in the aviation sector. This presents an innovation in facilitating companies to make direct inferences from the research findings, aiding them in deriving practical insights. Through face-to-face interviews with passengers arriving at Antalya Airport, a sample of 430 respondents was reached, and all completed surveys were utilized. The data obtained from these passengers were analyzed using IBM SPSS 21 and SmartPLS 4 programs within the framework of established hypotheses. The results of the Structural Equation Analysis indicate a direct partial impact of innovative activities implemented by airline companies on the perceived service quality. This direct effect is found to create a complete impact indirectly. Additionally, it has been determined how customer relationship management practices shape this impact by acting as a mediator. The findings provide guidance to airline companies in understanding the influence of technological innovations on customer satisfaction and optimizing strategic customer relationship management practices. This study recommends that companies in the aviation sector focus on technological innovations to gain a competitive advantage and enhance customer satisfaction.

1. Introduction

The airline transportation sector continues to grow both in terms of passenger numbers and industry expansion, driven not only by the advantages it offers to passengers but also by the satisfaction it provides (Sarılgan and Bakır, 2023: 159). In a globalized world with a rapidly growing population due to liberalization, aviation has surpassed other modes of transportation in terms of speed, comfort, safety and quality. Positioned as a sector where technological developments contributing to passenger satisfaction are closely monitored, the airline transportation industry stands out as one of the most technologically intensive areas among various sectors. This application ensures that airline operators make their passengers feel more valued (Meydan, 2023: 69). However, despite the use of the latest technological innovations by airline companies, there are instances where the perceived service quality by passengers remains unchanged. Therefore, in the highly competitive environment of the aviation sector, airlines must understand passengers' perceptions of the services they use and take corrective measures for problematic services to gain a competitive edge (Yomralıoğlu and Ük, 2023: 160). For example, perceptual maps of passengers based on the airline's flight periods can be created, similar to the study conducted by Koçak and Atalık (2019). Utilizing these maps, the perception of airline services can be measured through social media, and corrective actions for negative services can be instantly addressed While technological and political developments contribute to the growth of the air transportation sector, the service-oriented nature of air transportation highlights the concept of passenger satisfaction. Regardless of changes in the strategies pursued by airline companies, achieving the desired results is not always possible due to the different thoughts and desires of individuals consuming the service (Zengin and Erdal, 2000: 43). Like any commercial entity, airline companies also require loyal passengers to sustain their existence. Customer Relationship Management (CRM) applications play a crucial role in revealing passengers' loyalty to airline companies (Demir and Kırdar, 2007: 294). Especially with increased competition, decreasing market share, the growing significance of information, and passengers becoming more conscious,

passenger loyalty has become more crucial (Atalık and Arslan, 2009: 154). Among the factors mentioned above, the passenger is the most easily controllable. Therefore, considering the intensive use of technology in the global world and the importance of information, utilizing social media applications correctly, or more explicitly benefiting from social media, will enable businesses to engage in more intense communication with customers for passenger loyalty (Arslan and Atalık, 2016: 2). Because Customer Relationship Management is defined as a marketing strategy that aims to increase customer satisfaction by identifying and responding to customer needs and requests, increasing the total revenue of the business, and creating a customer base (Yereli, 2001: 30). In a world where change prevails, customer expectations and demands are constantly evolving. To avoid and address these challenges, Customer Relationship Management applications come into play. By enhancing the business's ability to respond promptly to customers, CRM not only increases business revenue but also provides a competitive advantage (Özilhan, 2010: 19). Innovation emerges as a fundamental element for gaining a competitive advantage in every sector. However, especially in the service industry, it is crucial for businesses to understand customers' demands and respond effectively to these demands to maintain customer satisfaction. In this context, evaluating the impact of innovation activities conducted by businesses on customer perceptions and using customer relationship management tools to rectify possible errors is of critical importance. The main problem addressed in this study is to determine the impact of technological innovations implemented by airline companies on the perceived service quality by customers and to understand the role of customer relationship management practices in this impact. The primary goal of the study is to fill the gap in the detailed examination of the mediating role of customer relationship management in the aviation sector. In this context, the contribution of the study is to provide a new perspective on customer relationship management research in the aviation sector by filling this gap in the literature. The first section of the study will provide basic information about technological innovations implemented by airline companies, customer relationship management, and the concept of perceived service quality. In the second section, existing studies on the impact of technological innovations through customer relationship management on perceived service quality in the aviation sector will be examined, and gaps in the literature will be identified. The third section will explain the methodology and analysis techniques of the study, detailing how data is collected and evaluated. In the final section, in light of the findings, the impact of technological innovations by airline companies on perceived service quality through customer relationship management will be assessed, and recommendations will be provided to businesses in this context.

2. Innovation, Perceived Service Quality and CRM

2.1. Innovation

Innovation is the creation and systematic application of new ideas, processes, benefits, and systems. It has been extensively debated and defined from various perspectives in academic literature, including as a process and product, incremental and radical, component and and other innovation. Traditional innovation approaches focused on closed innovation, resisting external ideas and technologies. However, the new paradigm emphasizes open innovation, displaying an open attitude toward all kinds of different ideas and technologies, in contrast to the traditional approach (Malodia et al., 2023: 3). Innovation extensively applied in airline transportation not only creates a competitive advantage for the airline business against its rivals (Bayar, 2023: 151) but also ensures passenger satisfaction through the use of new aircraft, in-flight entertainment systems, and ground services such as kiosks and similar self-check-in, boarding services (Demir and Taşer, 2020: 71). Businesses that adopt an open attitude towards technological change develop new solutions to satisfy their customers, making their businesses larger and more resilient to competition. Especially due to increased market competition, innovation has become an important necessity for businesses in creating customer satisfaction (Nwachukwu and Vu, 2022: 2). When it comes to creating customer satisfaction, businesses should place greater emphasis on innovation practices. Customer satisfaction is not only a success for businesses but also positively impacts business revenues by building customer loyalty (Amoaka, 2022: 147). Commercial innovation involves business activities carried out with the aim of ending the dominance of strong competitors in the market and improving the financial performance of a business. To achieve commercial innovation, a business can integrate its sectoral experience with the technology it uses, which can reduce the costs of products or services and increase business volume (Kline and Rosenberg, 2010: 173). Every business needs to incorporate innovation into its activities at a certain point; otherwise, it may struggle to sustain its existence. In past years, every business that implemented innovation experienced revenue growth, while those unable to carry out innovation practices or those implementing incorrect activities were unable to continue their operations in the long run (Afuah, 2003: 1).

2.2. Perceived Service Quality

Businesses desire the purchase of the services they offer; however, the purchase of a service is only possible when it provides benefits to the purchaser. In addition to the benefits they will receive, the purchaser also expects the service to be of higher quality compared to other services. Service quality encompasses meanings such as the nature of the service, its content, differentiation, whether it is old or new (İslamoğlu and Aydın, 2020: 199). When looking at a complete definition of service quality, Okumuş and Duygun (2008) describe it as the flawless performance offered to fully meet customer expectations when paying for a service. İslamoğlu and Aydın (2020) interpret service quality as not only understanding what the customer wants and satisfying those needs in every way but going beyond them. What needs to be emphasized here is not so much the quality of the service provided by the business but rather how the customer perceives the quality of that service. If a customer receives less benefit from the service used compared to the amount paid, this indicates poor quality. Conversely, if the benefit obtained matches or exceeds the amount paid, it signifies quality. This is because the concept of quality, especially in the service sector, is perceived differently by each customer, given factors like varying desires and needs (Okumuş and Duygun, 2008: 19). When considering aviation service quality, it signifies the level of satisfaction passengers experience while using the services provided by an airline during a flight (Etim et al., 2021:163). The quality of service in air transportation encompasses a process and various factors that extend from the pre-flight reservation stage until passengers reach their desired destination (Prentice et al., :213). Among these factors, the initial stage begins with the

ticket purchasing process, involving the ease of online or alternative methods for conducting the purchase, transparent pricing, and offering various fare options suitable for all types of passengers. In addition to these factors, other acceptable elements include the efficiency of pre-boarding and boarding procedures, aircraft cabin comfort and cleanliness, as well as in-flight entertainment services. All of these factors collectively influence the perceived quality of service by passengers throughout the flight (James et al., 2023:20). The most commonly used method for measuring service quality in air transportation is the SERVQUAL method, as observed in the literature by various authors (Ürgün and Ük, 2022; Uz, 2023 and Yurttakalan and Yıldız, 2023).

2.3. Customer Relationship Management (CRM)

Businesses that want to protect their consumer profile and, moreover, gain new customers by ensuring customer satisfaction, act within the framework of this sensitivity of society (Uz,2022: 28).Customer Relationship Management (CRM) is the collection of activities carried out by businesses to obtain all kinds of information about their customers and to increase customer loyalty to the business. It involves using a database to track customers and performing activities to retain them (Tek and Özgül, 2008: 23). CRM allows companies to effectively interact with various customers, whom they increasingly see as active creators of corporate programs. Potential customers value a company's good reputation because it reflects reliability and authenticity. Trust, reputation, and their association with each other are considered one of the main factors affecting trade. Trust, based on these concepts, always represents a reliable and reputable party. Properly implemented CRM contributes to the company being perceived as reliable and reputable in the eyes of customers (Kharraz and Seçim, 2023: 4). In a rapidly changing world, customer preferences and tastes change rapidly, posing significant challenges for companies. Changing customer behavior leads to quickly outdated products and services, requiring companies to adapt their processes and offer innovative products and services to satisfy customers. Therefore, companies need to improve their technological capabilities to adapt to this changing business environment and enhance their customer relationship management skills (Rahman et al., 2023: 2). With the right implementation, customer satisfaction increases, leading to repeat purchase behavior. This cyclical behavior results in a financial increase for the business. In this regard, both customer satisfaction and dissatisfaction are achieved through the implementation of customer relationship management practices. This underscores the importance of customer relationship management (Örnek and Şahbaz, 2022: 120). Due to the rapid impact of all kinds of negative events (such as war, pandemics, and economic crises) and intense competition, airline companies implement various marketing strategies to ensure customer satisfaction (Okan, 2023: 34). However, adopting different marketing strategies may prove insufficient in the highly competitive aviation sector. Therefore, establishing close relationships with passengers, quickly understanding passengers through relationship marketing, and providing the most effective solutions to passengers' problems are crucial. Customer Relationship Management (CRM) can help passengers in the aviation sector feel valued and develop trust towards the airline (Salah and Shouk, 2019: 12)

3. Literature Review

Developments worldwide are reshaping societal living standards, leading customers to choose among various service and product options. This trend has prompted businesses to focus on innovation activities. Airline managers have to strike a careful balance between cost savings, customer expectations and competitiveness (Ustaömer, 2023: 21). In their study, Yaşlıoğlu et al. (2013) aimed to examine the impact of innovation activities conducted by businesses on customer value and concluded that such activities positively influence customer value. Pribadi et al. (2022) aimed to determine the effects of service innovation on customer satisfaction, perceived service quality, and perceived value, finding a significant positive relationship between satisfaction, perceived value, and service quality with service innovation. In their study, Husin et al. (2023) aimed to measure the relationship between service quality, innovation, perceived value, and customer loyalty, discovering significant effects of service quality on perceived value, innovation on perceived value, and service quality on customer loyalty. Özbekler (2019) examined the relationship between service innovation in the retail sector and perceived value, customer satisfaction, and behavioral intention, concluding that any innovation activity undertaken by a business affects its relationship with customers. According to the results of the study conducted by Talebi and Yıldırım (2017) When the customer satisfaction system of TGS Yer Hizmetleri A.Ş., the company subject to the research, was examined, it was seen that the studies conducted partially provided the company's perceived customer satisfaction, but progress is needed to reach a level that will provide competitive advantage and be accepted by today's companies (Talebi and Yıldırım, 2017: 95). In Güreş, Arslan and Yılmaz (2015) study, “when the opinions of the passengers participating in the research on e-service quality, satisfaction and loyalty variables are examined, it is determined that the passengers are satisfied with the e-service quality of the airline companies they use for travel and are loyal to these companies, but their overall satisfaction level is moderate”, conclusion was reached (Güreş, Arslan, and Yılmaz, 2015; 53). Duygun and Yücel (2018) sought to measure the impact of innovative approaches implemented by an airline on customer preferences, finding that every innovative approach by the airline significantly influences customer preferences. Tarcan et al. (2018) aimed to measure the impact of innovation activities in a hospital on perceived service quality, indicating that these activities affect the perception of service quality among patients. In light of this information, the following hypotheses have been formulated.

- **h1:** Innovation activities conducted by airline companies significantly and positively influence customers' perceived service quality.
- **h1a:** In-flight innovation positively affects pre-flight and post-flight perceived service quality.
- **h1b:** In-flight innovation positively affects in-flight perceived service quality.
- **h1c:** Post-flight innovation positively affects pre-flight and post-flight perceived service quality.
- **h1d:** Post-flight innovation positively affects in-flight perceived service quality.

Wali and Wright (2016) focused on examining the effect of customer relationship management on service quality, determining a positive impact of effective customer

relationship management on enhancing service quality. Tseng and Wu (2014) aimed to measure the impact of customer relationship management on service quality through a survey of 117 customers of a health journal in Taiwan, revealing a relationship between customer relationship management and service quality. Customers are at the forefront of the business strategy, aiming to gain and retain them by offering superior value compared to competitors. This customer-centric approach serves as the cornerstone of customer relationship management (Buttle, 2004: 4). In this context, customer relationship management can be defined as the systematic implementation of each customer-focused activity throughout all units of the organization (Ovalı, 2005:3). As a long-term management philosophy focusing on cultivating customer relationships, customer relationship management emerges as one of the most pivotal strategies for business differentiation (Demir & Kırdar, 2000:293). The primary objective is to identify a customer profile that maximizes profitability and foster loyalty within the business. This entails determining customer preferences, ensuring product variety, and implementing price flexibility. The fundamental goal of customer relationship management is to formulate a strategy that is centered around the customer (Yereli, 2001: 30). In light of this information, the following hypotheses have been formulated.

- **h2:** Innovation activities conducted by airline companies significantly and positively influence customer relationship management practices.
- **h2a:** In-flight innovation positively affects customer relationship management.
- **h2b:** Post-flight innovation positively affects customer relationship management.

Easton and Pullman (2001) argued that the SERVQUAL theory alone is insufficient in service design, emphasizing the importance of technical specifications and presentation style. Picolli et al. (2004) asserted that the components of service quality are directly related to customer satisfaction and the performance of the service, particularly in the development of internet-based services. Additionally, Escrig-Tena and Bou-Llusar (2005) found a relationship between employee satisfaction, customer satisfaction, and innovation performance in their experiment. Research in the literature indicates a direct impact of innovation activities and customer relationship management on the perceived service quality of customers. In light of this information, the following hypotheses have been formulated.

- **h3:** Customer relationship management significantly and positively influences perceived service quality.
- **h3a:** Customer relationship management positively affects pre-flight and post-flight perceived service quality.
- **h3b:** Customer relationship management positively affects in-flight perceived service quality.

However, these studies have not explored the mediating role of customer relationship management in the impact of innovation on perceived service quality. Therefore, this study is considered to contribute a new perspective to the literature. This study aims to investigate the impact of innovation activities on customer value, perceived service quality, and customer satisfaction. The following hypotheses have been formulated.

- **h4:** There is a mediating effect of customer relationship management between innovation and perceived service quality.
- **h4a:** There is a mediating effect of customer relationship management between in-flight innovation and pre-flight and post-flight perceived service quality.
- **h4b:** There is a mediating effect of customer relationship management between in-flight innovation and in-flight perceived service quality.
- **h4c:** There is a mediating effect of customer relationship management between post-flight innovation and pre-flight and post-flight perceived service quality.
- **h4d:** There is a mediating effect of customer relationship management between post-flight innovation and in-flight perceived service quality.

Additionally, we want to analyze the mediating role of customer relationship management in the relationship between innovation and perceived service quality. For this purpose, a survey will be conducted, and the obtained data will be subjected to statistical analyses. The results of this study may help businesses understand the impact of their innovation activities on customer value and service quality, aiding in the improvement of customer relationship management strategies. Furthermore, this study is expected to contribute to a deeper understanding of the relationship between innovation and customer relationship management in the literature.

4. Methodology of the Research

4.1. Population, Sample, and Data Collection Tool of the Research

Surveys were conducted on adult passengers who took domestic flights to Antalya Airport. The research model was developed within these constraints. To determine the sample size, data obtained from the official website of the General Directorate of State Airports Authority were utilized. According to this data, an average of over 400,000 people fly to Antalya Airport for domestic flights every month. Based on this information, it was concluded that the sample size should be at least 384 with a 95% confidence level and a 5% sampling error. The total of 430 surveys collected during the summer season of 2022 exceeds these calculations for a larger sample size. This situation may support more reliable results by providing the opportunity for more data collection and analysis. The surveys consisted of 15 questions regarding passengers' perceptions of service quality, the airline company's innovation practices, and customer relationship management practices. These questions were prepared using a 5-point Likert scale. Based on this information, an overall understanding was established regarding the determination of the sample size, the data collection method for the survey, and the number of collected surveys.

4.2. Scales and Questions Used in the Research Model

The used scale consists of a total of 4 sections. The first section is divided into a total of 8 questions related to demographic variables. The second section was adapted from the doctoral thesis titled "A Research on the Effects of Travel Agencies' Customer Relationship Management Activities on Customers' Perceived Value, Satisfaction, and Loyalty," conducted by Saylan (2018), and contains questions adapted

for airline companies. This section consists of 3 questions. Although contact was made for permission from the author, no response was received. In the third section, the perceived service quality scale used by Yalçın (2020) is included. This section contains a total of 6 questions and consists of two sub-dimensions. The first sub-dimension consists of three questions related to pre-flight and post-flight experiences, while the second sub-dimension includes three questions related to in-flight experiences. The final section contains the innovation scale. For this scale, the scale used in the study "Relationship of Customer's Behavior and Service Innovation on Customer Satisfaction towards Low-Cost Airline Business: A Case of Thai Air-Asia" by Tiwasing et al. (2019) was utilized. Permissions were obtained from the authors, but no response was received. This section is divided into two sub-dimensions, namely pre-flight and in-flight, and consists of six questions in total. Initially, there were 20 questions in the research scale; however, through item eliminations, the number of questions in the research scale was reduced to 15.

4.3. Data Coding

For the purpose of facilitating the analysis, the data for the study has been coded as follows:

- Innovation: INV
- Innovation During the Flight: INVUE
- Pre-Flight Innovation: INVUÖ
- Customer Relationship Management: MİY
- Perceived Service Quality: AHK
- Pre and Post-Flight Perceived Service Quality: AHKUÖS
- In-Flight Perceived Service Quality: AHKUE

4.4. Research Analysis Method, Modeling

The obtained data was analyzed using IBM SPSS 21 and SmartPLS 4 software for structural equation modeling. The results of the analysis are presented in the analysis and findings section in the form of tables. This study is a quantitave study. The model for the study is shown in Figure 1.

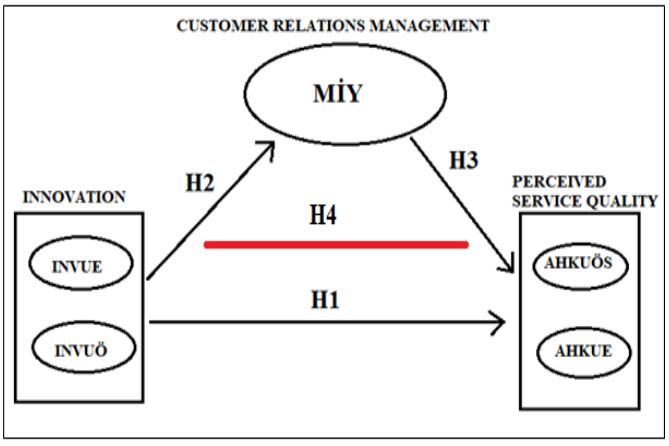

Figure 1. Model of Study

5. Analysis and Findings

5.1. Descriptive Statistics

The demographic information of the study data is presented in Table 1.

Table 1. Demographic Information

LOST DATA		
Valid	**430**	
Missing	**0**	
GENDER	**Frequency**	**Percentage**
Women	194	45.1
Men	236	54.9
Total	430	100
AGE		
18-24	105	24.4
25-44	208	50.7
45-64	80	18.6
65 and over	27	6.3
Total	430	100
INCOME		
0-4999TL	54	12.6
5000-9999TL	177	41.2
10000-14999TL	95	22.1
15000TL and more	104	24.2
Total	430	100
FLIGHT FREQUENCY		
A Week or More	14	3.3
A Month or More	66	15.3
Every 6 Months or More	178	41.4
A Year or More	172	40.0
Total	430	100
MARITAL STATUS		
Married	222	51.6
Single	208	48.4
Total	430	100
EDUCATION		
Primary	13	3.0
High	88	20.5
Associate Degree	114	26.5
Undergraduate	172	40.0
Postgraduate	43	10.0
Total	430	100
AIRLINE		
THY	233	54.2
PEGASUS	197	45.8
Total	430	100
AIM OF FLIGHT		
Commercial	52	12.1
Daily	20	4.7
Education	97	22.6
Others	2	5
Total	430	100

According to Table 1, it is observed that the gender distribution of the participants in the study is nearly equal between males and females. When looking at the age distribution, it can be observed that over 75% of the participants are below the age
of 44. The income level, considering that the data was obtained in 2022, generally indicates lower income levels. Regarding marital status, there appears to be a balance between single and married passengers. As for the educational status, it is understood that over 80% of the participants have at least an associate degree or higher education level. When examining the airline preference, Turkish Airlines has a usage rate of

54.2%. In terms of the purpose of the flight, it is understood that over 60% of the participants flew to Antalya for vacation.

5.2. Scale Reliability and Validity Analyses

Factor analysis, reliability analysis, and validity analysis were applied to understand the reliability and validity of the model created, and the results are provided in Table 2 and 3. According to Table 2, as a result of the applied factor analysis, it is seen that the items of the scales are grouped under 5 different factors, and each item has a factor loading above 0.50. This indicates that the items of the scales represent the measured concepts well (Harmandaroğlu and Altunışık, 2023: 258).

Table 2: Confirmatory Factor Analysis

	AHKUE	AHKUÖS	INVUE	INVUÖ	MİY
AHKUE1 (In-flight entertainment systems are sufficient)	0.922				
AHKUE2 (Flights always arrive on time)	0.903				
AHKUE3 (The seat pitch inside the plane is sufficient)	0.913				
AHKUÖS1 (Bagajımı teslim ettiğim gibi alırım)		0.937			
AHKUÖS2 (Check In procedures are carried out very quickly)		0.928			
AHKUÖS3 (Boarding procedures are carried out very quickly)		0.931			
INVUE1 (Flight personnel provide friendly assistance for the use of technological products)			0.847		
INVUE2 (Flight personnel provide live information regarding technology use)			0.878		
INVUE3 (Technological products inside the aircraft are placed in useful places)			0.864		
INVUÖ1 (E-boarding passes are an effective service)				0.894	
INVUÖ2 (Payments can be made online**)**				0.835	
INVUÖ3 (Airline business always uses new technologies)				0.856	
MİY1 (The airline always responds to my complaints**)**					0.852
MİY2 (The airline company provides a convenient reservation service for flight services)					0.789
MİY3 (The airline organizes flights to the destinations I want)					0.767

When looking at Table 3 for the results of the internal consistency test of the scales, it is observed that the Average Variance Extracted (AVE) values of each scale are above 0.50. This indicates that the variance of the concepts measured by the model is sufficiently explained, and the scales are acceptable in terms of internal consistency (Amarat and Güneş, 2023: 354). According to the results of the Cronbach's Alpha analysis conducted for the reliability of the scales, it is seen that the reliability level of each scale is above 0.70. This shows that the scales are reliable and acceptable in terms of internal consistency (Türkoğlu and Türk, 2023: 78).

Table 3. Reliability Results

	AVE	Cronbach's Alpha	rho_A	Composite Reliability (C/R)
AHKUE	0.833	0.900	0.909	0.937
AHKUÖS	0.868	0.924	0.925	0.952
INVUE	0.745	0.830	0.839	0.898
INVUÖ	0.744	0.828	0.836	0.897
MİY3	0.646	0.733	0.769	0.845

According to the results of the discriminant validity analysis presented in Table 4, based on the Formell and Larcker criteria, it can be seen that each factor group has the highest value within its own. For example, the AVE square root value for the factor of perceived in-flight service quality (AHKUE) is the highest at 0.913. Similarly, AVE square root values for other factors are also quite high (e.g., AVE square root value for perceived pre and post-flight service quality is 0.932). These results indicate that the scales used in the model represent the factors well and that these factors are valid (Bor and Özbağış, 2023: 11).

Table 4. Discriminant Validity Analysis Results (Formell)

	AHKUE	AHKUÖS	INVUE	INVUÖ	MİY
AHKUE	**0.913**				
AHKUÖS	0.103	**0.932**			
INVUE	0.017	0.188	**0.863**		
INVUÖ	0.109	0.130	0.243	**0.862**	
MİY	0.163	0.245	0.225	0.236	**0.804**

In addition, according to Table 5, the results of the Heterotrait-Monotrait Ratio (HTMT) analysis, the correlations between any two factors are below 0.85. This indicates that there is not a very high cross-relationship between the factors in the model (Bor and Özbağış, 2023: 12). Therefore, it can be said that the model is successful in terms of discriminant validity.

Table 5. Discriminant Validity Analysis Results (HTMT)

	AHKUE	AHKUÖS	INVUE	INVUÖ	MİY
AHKUE					
AHKUÖS	0.118				
INVUE	0.030	0.213			
INVUÖ	0.124	0.146	0.294		
MİY	0.194	0.281	0.283	0.292	

5.3. Collinearity and Model Fit

According to the results of the Variance Inflation Factor (VIF) analysis presented in Table 6, it can be seen that there is no multicollinearity among the independent variables in the model. Since the VIF values for all independent variables are below 5 (Doğan, 2019: 89-90), it can be said that there is no multicollinear relationship among these variables. This indicates that the model is statistically valid and that the independent variables are independent of each other. Variance Inflation Factor (VIF) is defined by the following equation, which is commonly used for diagnosing multicollinearity (Alin, 2010: 371);

$$VIF_i = \frac{1}{1 - R_i^2} = \text{for i} = 1, 2, \ldots, \text{k}$$

Additionally, VIF values should be greater than 0.10 and less than 1 for tolerance measurement (Bilgin, 2018: 240). The tolerance values for the study range between 0.885 and 0.905.

Table 6. VIF Values

	AHKUE	AHKUÖS	INVUE	INVUÖ	MİY
AHKUE					
AHKUÖS					
INVUE	1.097	1.097			1.063
INVUÖ	1.104	1.104			1.063
MİY	1.093	1.093			

In Table 7, the results of the model fit analysis for the applied model are presented. Goodness of fit in structural equation analysis indicates the correctness of the model. An SRMR value between 0 and 0.05 indicates excellent fit, between 0.05 and 0.08 indicates acceptable fit, and an NFI value between 0.95 and 1.00 indicates excellent fit as well. If the NFI value is between 0.90 and 0.95, it suggests acceptable fit (Çakmak, 2013: 40).

Table 7: Model Fit

	Good Fit	Moderate Fit	Model
X^2			212.165
NP			38.000
NO			430.000
DF			82.000
P value	0.05 ≤ **M/V**≤ 1.00	0.01 ≤ **M/V**≤ 0.05	0.000
X^2/df	0 ≤ **M/V**≤ 2	2 ≤ **M/V**≤ 3	2.587
***RMSEA**	0 ≤ **M/V**≤ 0.05	0.05 ≤ **M/V**≤ 0.08	0.061
***GFI**	0.95 ≤ **M/V**≤ 1.00	0.90 ≤ **M/V**≤ 0.95	0.940
***AGFI**	0.90 ≤ **M/V**≤ 1.00	0.85 ≤ **M/V**≤ 0.90	0.912
***SRMR**	0 ≤ **M/V**≤ 0,05	0,05 ≤ **M/V**≤ 0,10	0.064
***NFI**	0,95 ≤ **M/V**≤ 1,00	0,90 ≤ **M/V**≤ 0,95	0.936
***TLI**	0.95 ≤ **M/V**≤ 1.00	0.90 ≤ **M/V**≤ 0.95	0.948
***CFI**	0,97 ≤ **M/V**≤ 1,00	0,95 ≤ **M/V**≤ 0,97	0.960
***AIC**			288.165
***BIC**			442.589

(Anderson and Gerbing, 1984: 166-167), **NP: Number of Model Parameters, *NO: Number of Observations, *DF: Degrees of Freedom, *RMSEA: Root Mean Square Error of Approximation, *GFI: Goodness of Fit Index, *AGFI: Adjusted Goodness of Fit Index, *SRMR: Root Mean Square Residual, NFI: Normed Fit Index, *TLI: Tucker Lewis Index, *CFI: Comparative Fit Index, *AIC: Akaike Information Criterion, *BIC: Bayesian Information Criterion, M/V: Model Value.*

Additionally, the RMSEA value should be less than 0.08, and GFI and AGFI values should be greater than 0.90, or between 0.80 and 0.90 for acceptable model fit. Finally, the CFI value should be greater than 0.90 (Yücenur et al., 2011: 164). When looking at Table 5, it can be seen that the SRMR value for the model is 0.064, the NFI value is 0.936, the RMSEA value is 0.061, the GFI value is 0.940, the AGFI value is 0.912, and finally, the CFI value is 0.960. This indicates that the model fit is at an acceptable level. AIC is defined as an index developed for comparing variables with unobservable differences in numbers and AIC and BIC values in the research model should be smaller than both the independent and saturated models (Akaike, 1974: 719).

5.4. Hypothesis Results

The Partial Least Squares (PLS-SEM) method was used for the analysis of the study data, and the significance level of path coefficients (β) was determined using the Bootstrapping technique with 5000 resampling iterations. The Bootstrapping technique involves repeatedly resampling from the data used in structural equation modeling to make the standard error estimates between data more precise (Ringle et al., 2014: 68). The analysis results of path coefficients (β) should generally fall between -1 and +1. However, t-values are considered to determine the significance of the relationships between variables. In this context, let's assume that the relationship between variables is at a 90% level. In this case, the t-value should be 1.65 or greater. If the relationship is at a 95% level, the t-value should be 1.96 or greater, and if the relationship is at a 99% level, the t-value should be 2.57 or greater (Kurt, 202: 103).

According to the analysis results, the hypothesis data are presented in Table 8. Upon examining Table 8, it can be observed that almost all of the hypotheses directed at the research model are supported. Only two of the sub-hypotheses under H1 have been rejected, while all the remaining hypotheses are supported.

Table 8: Hypothesis Results

	β	t	p	
INVUE -> AHKUÖS	.129	2.487	.013**	**$H1_a$ ACK**
INVUE -> AHKUE	-.039	.808	.419	**$H1_b$ REJ**
INVUÖ -> AHKUÖS	.049	.991	.322	**H1c REJ**
INVUÖ -> AHKUE	.082	1.667	.096***	**$H1_d$ACK**
INVUE -> MİY	.177	3.439	.001*	**$H2_a$ ACK**
INVUÖ -> MİY	.193	3.994	.000*	**$H2_b$ ACK**
MİY -> AHKUÖS	.205	3.675	.000*	**$H3_a$ ACK**
MİY -> AHKUE	.153	2.922	.003*	**$H3_b$ ACK**
INVUE -> MİY -> AHKUÖS	.036	2.488	.013**	**$H4_a$ ACK**
INVUE -> MİY -> AHKUE	.027	2.087	.037**	**$H4_b$ ACK**
INVUÖ -> MİY -> AHKUÖS	.040	2.613	.009*	**$H4_c$ ACK**
INVUÖ -> MİY -> AHKUE	.030	2.453	.014**	**$H4_d$ ACK**

** Significant at 0.01 level, ** Significant at 0.05 level, *** Significant at 0.1 level, **ACK**: ACCEPT, **REJ:** REJECT.*

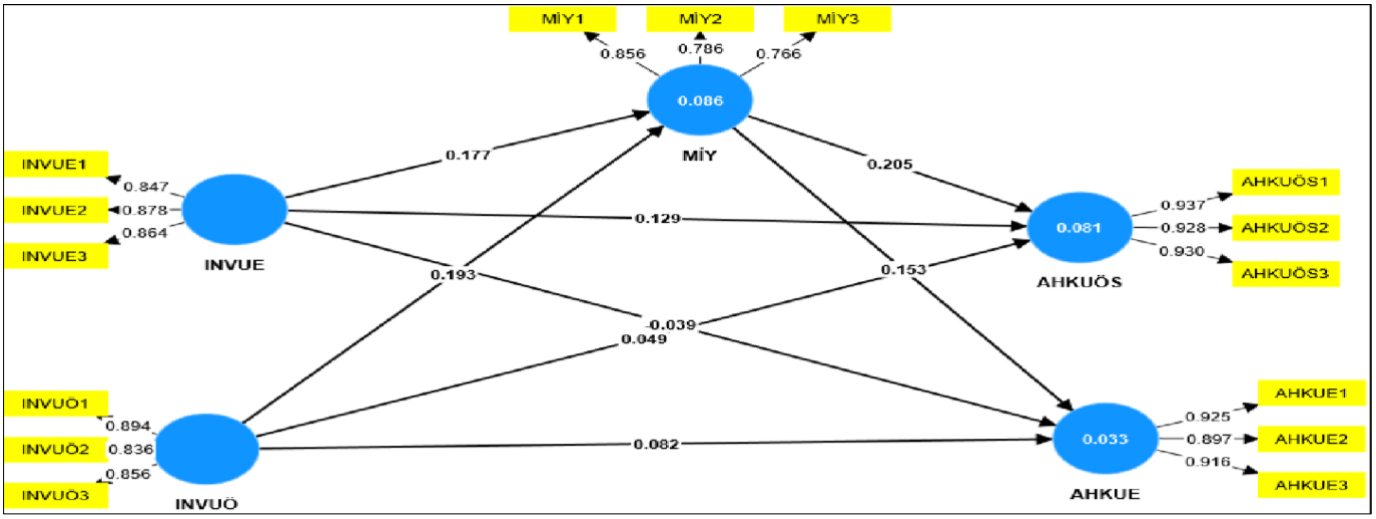

Figure 2: Structural Equation Modeling Results

These results indicate that in-flight innovation significantly and positively affects pre-flight and post-flight perceived service quality, pre-flight innovation positively influences in-flight perceived service quality, both in-flight and pre-flight innovation impact CRM, and customer relationship management significantly and positively influences pre-flight, post-flight, and in-flight perceived service quality. Furthermore, according to Table 8, it is evident that the hypotheses established for the mediating variable effects in the model are supported. Customer relationship management mediates the impact of pre-flight and in-flight innovation activities on perceived service quality before, after, and during the flight. According to Table 9, the innovative activities conducted by the airline before and during the flight directly affect the perceived service quality by passengers. In-flight innovative activities, on the other hand, are observed to indirectly affect in-flight perceived service quality, as shown in Table 9. The same applies to the impact of pre-flight innovative activities on perceived service quality before and after the flight.

Table 9. Indirect Effect

	β	t	p
INVUE -> AHKUE	0.027	2.087	0.037**
INVUE -> AHKUÖS	0.036	2.488	0.013**
INVUÖ -> AHKUE	0.030	2.453	0.014**
INVUÖ -> AHKUÖS	0.040	2.613	0.009*

** Significant at 0.01 level, ** Significant at 0.05 level, *** Significant at 0.1 level.*

6. Conclusion and Recommendations

This study aims to understand the impact of technological innovation carried out by airline companies through customer relationship management on customer satisfaction and aims to contribute to the literature in this field. The findings can guide businesses in the aviation sector to develop customer-focused innovation strategies and serve as inspiration for future research. Customer relationship management practices are a fundamental necessity for airline companies to increase their customer potentials. These practices are crucial for sustaining a competitive advantage for businesses due to their positive impact on customer satisfaction, loyalty, and overall experience. However, understanding that customer demands are constantly evolving in the face of changing world conditions is essential. The study partly supports the literature, paralleling findings by Chen et al. (2015), Bellingkrodt and Wallenburg (2015), Nwachukwu and Vu (2022), Cabral and Marques (2020), indicating that the innovation activities of the airline company partially affect the perceived service quality by customers. Potential differences in the interpretation of survey questions across various sectors discussed in the existing literature contribute to this partial support. The study observes that the innovation activities of the airline company enhance the perceived service quality during flights. The impact of innovation practices at the airport becomes more pronounced during flights, indicating that passengers positively evaluate the aircraft and technological devices used by the airline during the flight. Furthermore, it is determined that customer relationship management practices positively and significantly affect the perceived service quality by customers. These results, consistent with the literature, highlight the critical role of customer relationship management in shaping service quality (Yaşlıoğlu et al., 2013; Pribadi et al., 2022; Husin et al., 2023). When examining the impact of innovation on customer relationship management, it is evident that the airline company's innovation activities positively and significantly influence customer relationship management practices. This finding emphasizes the importance for the airline company to continue customer relationship management practices to foster positive relationships and avoid creating uncertainty and distrust.

In conclusion, recommendations for airline companies include directing investments towards increased innovation in various areas such as new aircraft, flight entertainment systems, and technological infrastructure at airports. Additionally, maintaining communication with customers, collecting feedback, and recommending prompt intervention in cases of incorrect or faulty innovation are also advised.
Policymakers are suggested to implement new policy regulations that encourage and support innovations in airline operations. Furthermore, initiating training and development programs for airline employees in the areas of customer relationships and innovation is recommended. A limitation of this study is that the survey was only conducted at Antalya Airport; therefore, future research may include more comprehensive regional studies.

Ethical approval

This study has obtained ethical approval from the Eurasia University Ethics Committee Meeting No. 2022-24, held on April 14, 2022, and documented in decision No. 07, to collect the research data.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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