



Towards retention in airline industry using neutrosophic DEMATEL method: Does social media marketing activities affect passengers' retention

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Abstract

This study examines the effect of social media marketing activities on passenger retention through brand image in the airline industry in the case of Fly Emirates. The survey included a sample of his 758 passengers traveling to Dubai from destinations around the world. The questionnaire was randomly distributed, and data was collected and returned from his 455 passengers. The purpose of this study is to examine the effect of social media marketing activities (trendiness, entertainment, interaction, word of mouth, and customization) on passenger retention through mediated brand image. This study applies structural equation modeling (PLS-SEM) to investigate the relationship among the constructs in the proposed model. These aspects are modeled using the neutrosophic decision-making trial and evaluation laboratory (DEMATEL) approach. The DEMATEL models the fuzziness related to domain specialists generating judgments inside the DEMATEL as single-valued neutrosophic numbers, while also handling the causal linkages among elements of social media marketing activities. The study concludes that all dimensions of social media marketing activities (trendiness, entertainment, interaction, word of mouth, and customization) have a positive effect on brand image. The findings also confirmed that brand image plays a mediation role between social media and passenger retention, with a positive brand image being associated with increased passenger retention. The study found that without effective social media marketing, Fly Emirates loses passengers, and brand image is a key driver of passenger retention. The study recommends that Fly Emirates, looking to improve passenger retention, invest heavily in attractive social media marketing activities in the marketing innovation segment.

Keywords: social media; Passenger Retention; Airline, Brand Image; Marketing Activities; Fly Emirates; Single Valued Neutrosophic Sets; DEMATEL Method; Decision Making

1. Introduction

Social media is an important marketing tool for airlines, and the type of communications that they make about their services should be targeted. The airline industry is a complex one with different characteristics that need to be considered when trying to retain passengers. Some passengers are satisfied with the airline's services, while others may switch to another airline because of a different experience. Effective social media marketing is important for attracting and retaining passengers. [1] noted that social media may encourage passengers to try and purchase these services. [2] emphasized that passenger retention is a critical factor in airline companies' survival and that social media is an important means of retaining passengers. [3] explained that social media has a significant impact on passenger satisfaction and is regarded as the most influential factor in passenger retention in the airline industry. Airline companies' marketing approaches have shifted from growth to value-added and focused activities for passenger retention. According to [4] social media play a crucial role in informing passengers about the level of service price, service quality, degree of satisfaction, and airline company performance. Furthermore, they emphasized that social media marketing is the foundation and may not be sufficient for existence, but management should instead focus on acquiring and retaining passengers. The development of information technology and social media has affected people's lifestyles and reflected in their purchasing behaviour. As a result, passengers are more interested in receiving

information about the services offered by airlines than they are in the price they pay for those services. Therefore, this research attempts to understand how social media affects passenger retention. For this, we assess the impact of social media marketing activities on brand image and how these, in turn, lead to passenger retention. Moreover, this can provide an understanding of the effectiveness of social media marketing activities to attract passengers who are already using airlines. [5] points out that social media marketing activities can improve a brand's image by allowing users to see other people's opinions and provide more information. Moreover, as passengers reap the benefits of social media through faster communication tools, airlines are using social media to engage passengers, receive feedback, and measure service and business performance faster and more affordably than before. Social media helps airlines enhance passenger awareness and increase the success of their brand image to attract passengers [6] noted that communication with passengers will help them understand the new changes and may encourage them to return. Furthermore, studying the impact of social media marketing can increase our understanding of how different social media marketing activities help improve an airline's brand image. For airlines to better understand how social media marketing affects their brand image, they need to have a better understanding of technology.

By using a theoretical framework that incorporates unpredictability and complexity from an organized viewpoint, our study contributes to filling this void in the literature. Using a literature review, this study compiles a set of variables that are significantly associated with educator effectiveness. The DEMATEL method is used to give relationships between factors and give negative and positive effects [7], [8]. There have been several proposed enhancements to the DEMATEL technique for handling structural issues. Inherent ambiguity, especially in the judgments generated by specialists, is pervasive since the DEMATEL technique is expert oriented. Because they are reflective of the experts' skills and expertise, these assessments necessarily lack precision. Several scholars propose combining the DEMATEL method with Zadeh's fuzzy set concept to deal with this ambiguity and unpredictability. In contrast to other forms of ambiguity, however, fuzzy concepts can only introduce a single membership function [9]– [10].

Neutrosophy was first proposed by Smarandache. Within this framework, the neutrosophic set generalizes the intuitionistic fuzzy set to provide an accurate representation of real-world situations by considering all relevant factors in each decision-making scenario [11], [12]. The DEMATEL method and the neutrosophic set are increasingly being used together in research [13]– [14]. This paper used the neutrosophic DEMATEL method to give relationships between factors of social media marketing activities related to passengers. The neutrosophic sets used to deal with uncertain data.

2. Related Work

Social media: can be described as platforms used for building networks and sharing information, which have provided companies with a way to engage with their existing and potential customers in the digital marketplace [15] stated that social media is a technology that provides space for people to create and send content, link up, and connect with others. [5] noted that social media is a network of internet facilities that allow individuals, communities, and organizations to collaborate, communicate, interact, and build community by enabling them to create, co-create, edit, share, and interact with easily accessible user-generated content. According to [16] there are different ways to define social media, depending on the user's point of view. In practical terms, social media is defined as software and digital technologies that provide users and customers with a digital environment, often presented in the form of applications and websites. [17] stress that the broader term social media is used more broadly to refer to the many platforms available to consumers, each offering distinct features and types of use, often designed for different user communities. Another more practical definition of social media is defined as online applications, platforms, and media intended to facilitate interactions, collaboration, and content sharing [18]. Social media has become an increasingly important way to share information and connect with people around the world. [19] emphasized that social media allows people to connect with each other and share information, ideas, and messages, allowing for more efficient and effective communication. Recently, social media has become a way to connect with others and establish relationships. [20] have explained that, by creating a social media presence, firms can effectively enhance their influence and improve their engagement with their customers. Social media has therefore created opportunities for firms to be able to connect and manage customer needs and behaviours in a different way than before. According to [21] different types of social media that include such diverse genres as social networking, microblogging, media sharing, social news, collaborative authoring, and web conferencing include various well-known platforms such as Facebook, LinkedIn, Twitter, Tumblr, WordPress, Flickr, Pinterest, Zoom, etc that can be used to adapt and convey information. Some platforms, such as Twitter or YouTube, may be more one-way in terms of the flow of information, while social networking services such as Instagram or TikTok encourage greater user interaction. Private communication services, such as WhatsApp, Viber, or WeChat, are more proper messaging services than social media, and their inclusion here is considered only from the point of view of social connectivity among young people.

[22] described that social media platforms offer a variety of modes of engagement that allow users to create, share content, and interact with other users in different ways.

According to [23] social media was shown to have a huge impact on a brand's reputation and image. [24] are convinced that, even though social media platforms provide a great deal of interest among users, social media is an asset for companies to improve customer contact before, during, and after a purchase from a specific brand. It is also a tool for increasing brand image. Thus, social media is the best tool for building brand image in the modern marketplace and can be used as an asset for businesses. By means of the tools provided by social media, businesses have an opportunity to advertise their brand at a lower cost and can get direct feedback from their customers. [21] explained that social media as a marketing tool offers a new environment for marketers to raise awareness of their brand and facilitate brand marketing due to the speed at which information is shared and transferred on social networks.

Social Media Marketing Activities: Social media marketing is a way to communicate with customers and potential customers through social media platforms. According to [21], social media has become one of the most effective marketing methods in recent years because of its high transfer efficiency. [25] stated that social media also allows companies to reach new customers and help businesses learn what consumers think and feel about their products and brands, which can help them make better decisions [26] explained that social media tools make it easy for businesses to post information about product promotions and advertisements as well as feedback from their customers. [20] noted that social media influence purchasing behaviour by providing a way for consumers to share information and experiences with each other. Companies are using social media to gain attention from their target customer groups, which can have positive impacts on their brand recognition and customer loyalty. According to [24] marketers use social media to improve their businesses by implementing marketing activities. This way, businesses can save money and get feedback quickly. [27] is convinced that businesses use social media marketing activities to send out direct messages, which make customers feel close to the business. [28] emphasized that using social media to improve brand image is the most important marketing dimension by encouraging their customers to share their thoughts and experiences with each other. In recent studies, it has been found that social media can have a lot of different dimensions that can be used in different sectors. The study used by [29] was used in this study, and their five dimensions of social media marketing activities—trendiness, entertainment, interaction, word of mouth, and customization—were used. The dimensions of social media marketing activities are explained as follows:

Trendiness: Social media provides a constantly updated stream of information on topics of interest to consumers, making it a more reliable source of information than corporate-sponsored communication through traditional marketing activities. Trendiness is a way of knowing the latest information about a company's product. According to [30] trendiness refers to the degree of how new and up to date a brand's content and information are on social media platforms. [31] emphasized that it is important to provide customers with the newest information on products to keep them interested. [20] noted that trendiness is an important social media marketing activity that can help increase brand image. Therefore, because social media platforms provide trendy information, more trust is created between the brand and customers. According to [23], trendiness on social media focuses on four sub-motivations: surveillance, knowledge, repurchase of information, and inspiration. Surveillance involves watching and keeping up to date on one's social environment. Knowledge refers to information about brands gleaned from reading reviews and threads about those brands on community websites, in anticipation of making well-informed buying decisions. Pre-purchase information focuses on reading product descriptions and looking at brand images to get ideas. Finally, inspiration comes from following brand-related information and getting new ideas, as seen in the example of people looking at other people's experiences for inspiration. According to this background, the following hypothesis is developed:

H1: There is a positive effect of Trendiness on brand image.

Customization: Customization is the degree to which social media platforms provide customized information for customers. This can be done using filters and other tools, as well as the customization of content and services offered. [32] defines customization as the extent to which social media channels provide a customized information search and a customized service. [28] emphasized that customization refers to the way in which a message is intended for a specific audience. Customization describes the degree to which a service is adapted to meet the preferences of a particular individual. This can be done by personalizing the site, which shows that the brand is paying attention to the individual and respecting their preferences. [24] stated that customization builds a stronger brand image by allowing businesses to deliver the unique experience that their brands are known for while also increasing consumer preferences and creating a sense of satisfaction for those customers who receive personalized service. [5] noted that the importance of the customization component is to improve brand image through contact and communication between the

individual user and the firm. According to [23] there are two types of posts on social media: customized messages for specific people or a small audience, and broadcasts that are open to anyone who is interested. According to this background, the following hypothesis is developed:

H2: There is a positive effect of Customization on brand image.

Word of mouth: Word of mouth refers to the transmission of information between users. [24] defined word of mouth as the informal communication and exchange of opinions and recommendations between clients regarding the evaluation of services. [20] noted that word of mouth communication is a way of exchanging information between people who are not directly connected, such as friends, family, and acquaintances. It occurs when people talk about things they know about, either because they experienced them firsthand or learned about them from someone else. In other words, how willing users are to share information about a particular brand with others. [24] find this type of communication is often the most reliable form of information because it is not filtered through the media or official channels. [33] emphasized that word of mouth is referenced as the extent to which consumers of brands pass and share information and upload content on social media. [34] explained that word of mouth communication can have a positive or negative effect on consumers as it allows people to share information quickly and easily. [35] are convinced that word of mouth plays an increasingly important role with the development and broad practice of social media because social media makes it easier to spread or read than ever before.

Consequently, word of mouth is the most important information source for improving brand image and consumers' buying decisions when it comes to intangible products. [36] noted that word of mouth is widely regarded as one of the most influential factors affecting consumer behaviour when it comes to products that are difficult to evaluate prior to purchase. [37] added that word of mouth is believed to be a critical source of wealth for companies because positive word of mouth can improve brand image, gain more new customers, and increase profits, especially in service sectors, which are highly intangible and have a significant risk perception before and during the service encounter. [38] stated that social media are ideal for disseminating information about brands to consumers, as they generate and spread brand-related information without constraints. Furthermore, word of mouth has higher credibility, empathy, and relevance than marketer-created sources of information on the web about brands. According to [23], the use of word of mouth on social media about brands comes from three perspectives: brand opinion seeking, brand opinion giving, and brand opinion passing. Consumers with a high level of brand opinion seeking behaviour tend to search for information and advice from other consumers when making a purchase decision. Consumers with a high level of brand opinion-giving behaviour, also called brand opinion leaders, have a significant influence on consumers' attitudes and behaviours. Online forwarding is a feature of word of mouth that helps facilitate the flow of information. According to this background, the following hypothesis is developed:

H3: There is a positive effect of word of mouth on brand image.

Entertainment: Entertainment comes from the fun and games that come from using social media. Some consumers use it for entertainment, which means that the company's social media content is fun and enjoyable to look at. [5] noted that, even if consumers have different reasons for using social media, they all agree that something about it makes them enjoy it. In this respect, by providing entertaining experiences, businesses can encourage liking and sharing among many consumers, which can turn into an advantage. Various studies have shown that entertainment is one of the main reasons consumers use social media [26] explained that entertainment is an important part of social media and that it motivates consumers' attitudes and the desire to keep pursuing something. According to [23], marketers use social media to show entertaining and funny content, which attracts consumers' attention and satisfies their need for delight. This allows businesses to interact with their customers more easily and allows customers to share and collaborate on content, which makes the shopping experience more enjoyable for everyone. [20] noted that entertainment is important for encouraging users' behaviour and the continuity of follow-up on social media, which creates a positive brand image in their minds. This can create positive emotions in the minds of customers, which helps keep them engaged and encourages them to continue using it. [24] emphasized that when consumers like the entertaining content on social media, it creates a positive experience in their minds and might cause them to recognize and remember the brand. According to this background, the following hypothesis is developed:

H4: There is a positive effect of entertainment on brand image.

Interaction: Interaction in this study is defined as sharing information and exchanging opinions with others. [24] defined interaction on social media platforms as the amount of space given to consumers to talk to each other and share ideas about brands. Consumers can communicate with each other by sharing their thoughts about platforms and then engaging in discussions with others who share the same thoughts about a certain product or brand. [20] noted that social media interaction refers to the data that is being traded in various

structures, such as messages, recordings, pictures, and so on. This data can be used to identify a product or brand, and it can be used to engage and cooperate with consumers. By monitoring and collecting feedback on products and brands in real time, it is possible to understand customer needs and opinions quickly and efficiently. [5] noted that this can help promote companies since customers who have good experiences with a product or service are more likely to tell their friends and family about it. [33] emphasized that organizations have figured out a lot about how to make interpersonal interactions with customers work well. One way they do this is by using social media. Organizations are very protective of their customers' trust because if a customer trusts them enough to tell their story on social media, then that customer may also tell their friends and family about the company.

According to [23], businesses can improve consumer behavior by making it easier for them to get what they want from brands. Businesses can provide quick and easy ways for consumers to get what they need and make suggestions about how to improve brands. Interactive activities and communications will likely reach more consumers. This means that businesses should increase users' interactions to create and develop a customer's connection to the brand. To promote interaction, brands need to post interesting and unique content, be active and open in discussions, and be helpful with practical matters to build a strong relationship with their members. This will increase their trust and improve the brand's image. [24] emphasized that social interaction describes when users contribute to brand-related social media platforms to meet others with similar interests, interact, and talk about brands. According to this background, the following hypothesis is developed:

H5: There is a positive effect of interaction on brand image.

Brand image: Brand image is the current view of customers about a brand. It is a set of beliefs that people have about a specific brand. Brand image is defined as a unique set of associations that people have about a brand. According to [39] brand image is the overall impression in consumers' minds that is formed from all sources. It is closely related to attitudes and beliefs that form preferences for a brand. If someone has a positive attitude towards a certain brand, they may be more likely to choose it over another option. Conversely, if someone has a negative attitude toward a brand, they may be less likely to choose it. In simple terms, it can be said that brand image is what consumers think and feel about a brand after learning about it and seeing it. [40] continue to underline that the way people think of a brand can be affected by things like how well it performs in the market, how well its products meet people's needs, and the way its representatives present it. Brand image is the most important thing consumers think about when they're thinking about a brand in their minds. It includes all impressions that consumers have about the product's physical appearance, its functional benefits, and the user's emotions and associations. These impressions can be positive or negative, but they all play a role in how people view the brand. [38] stated that consumers develop various associations with the brand, and based on these associations, they form the brand's image. [41] emphasized that brand image can be assumed as a set of brand associations that collect in the minds of consumers.

According to [42] brand image is formed about the brand based on subjective perceptions of the associations that the consumers have about the brand. Companies use their brand image to generate interest in their products. [43] noted that everything that consumers say about a product, perceive it, and feel about it influences its perception. In addition, brand image is the sum of all the interpretations that consumers receive about a product. According to [23] companies can work to strengthen their products to have a good brand image and remain memorable to consumers. Based on consumer experiences, which include both functional and emotional aspects, brand image is determined. A strong brand can attract consumers to use it as one of the factors in their decision-making when purchasing products, while a strong condition is brand image. [44] stated that brand image is important because it affects how people think of a brand and how likely they are to use it. It can be thought of as the general impression that people have of a brand based on what they have heard and seen about it. Brand image is an important factor in successful business because it can affect how much customers are willing to pay for a product or how likely they are to recommend it to their friends. Furthermore, brand image is important because it can help companies decide whether to release a product.

Social media affects how people think of a brand and can make them emotionally attached to it. [5] have looked at how adapting to social media has affected brands and whether social media marketing activities have a positive impact on brand image and brand equity. [28] emphasized that social media marketing activities have a positive impact on brand image, as this can motivate users to continue using social media platforms. Therefore, today, using social media to share information is a superior way to spread a brand's image. Based on [5] research, social media has shown to be an important component because it provides excellent venues for brands to maintain client interactions and increase their chances of being discovered by new leads. According to [23], one way to measure a brand's image is by looking at how people feel about it or what kind of associations they make when they think about the brand. Social media can have a big impact

on how people view a brand, so it's important to study this relationship too. When people think of a brand, they may think of things like quality, style, or reliability. [43] have explained that dimensions such as entertainment, interaction, trendiness, customization, and word of mouth play an important role in a brand's image. [33] emphasized that this helps motivate customers to use social media platforms. According to this background, the following hypothesis is developed:

H6: Brand image mediates the effect of social media marketing activities and retention.

Customer Retention: Customer retention is the tendency of customers to continue using the same service provider and make repeated purchases. It refers to the ability of businesses to keep their existing customers, based on creating strong relationships with those who use the company's product. [21] explained that high customer retention levels mean that most of the company's customers continue to buy or do not defect to other companies or other products. [18] noted that customer retention is the process of creating loyalty by working to maintain good relationships with customers. To build a relationship with customers, companies need to understand the needs and experiences of their customers. This understanding can then be used to serve the customer with the company's brand image. [20] noted that customer retention can be affected by brand image. [45] described that creating a strong relationship with customers can also affect customer retention. Furthermore, this relationship may also affect brand image and, in turn, improve customer retention. Obviously, companies need to obtain a better understanding of customer needs and experiences with the brand. [46] stated that when the service meets customer expectations, the company's brand image will improve, which can affect customer retention. According to [21] to increase customer retention, companies can use social media to stay connected with their customers and provide them with updated information about their services. [20] emphasized that customers are often active on social media to make a buying decision. This means that social media can be an effective tool for companies to improve their brand image. Social media can help strengthen the relationship between businesses and their customers. For example, many companies have used social media to communicate with their customers more frequently. [47] point out that when customers turn to social media to make purchasing decisions, they are aware of brands through their company's website. This means that using tools of social media allows companies to spread and express themselves effectively, helping to increase customer retention. [48] explained that when social media and communication between users are more active, customer retention is more likely to increase. Especially, customers who have already used the company's services are more likely to keep in touch through social media, which allows companies to stay connected with their customers and update them on new services and changes. According to this background, the following hypothesis is developed:

H7: There is a positive effect brand image on customer retention.

Theoretical Background: The proposed research model is based on the social exchange theory and the customer retention theory. The social exchange theory explains how interaction between individuals is regarded as an exchange of resources. The theory assumes that, if the cost of the exchange is higher than the benefits which one may receive (and not compensated as expected), it can be considered as undesirable. Both parties of an exchange build relationships with the intention of getting rewards or benefits. When people receive benefits such as good service as well as convenient way of communication and information collection (through social media), they are more likely to compensate these benefits such as showing the retention. The customer retention theory of [49] posits that companies can retain customers by providing superior customer service, achieving high levels of customer satisfaction, and fostering long-term relationships. This theory has been widely accepted as an important factor in customer retention, as it can result in increased revenue. Rather, it is important for companies to focus on customer retention to strengthen and extend their relationships with customers.

3. Conceptual Framework

The study proposes a conceptual framework for guiding this study, which is presented in Figure 1. According to the literature on the effect of social media marketing activities on passenger retention, In mediating the role of airline brand image, the model incorporates seven constructs. Passenger retention has been investigated based on the customer retention management theory of [49] and [5] The social media marketing activities were operationalized by five dimensions stated by [29]; these are dimensions highly used by [23], [24], [26] and [28] and well known in the subject. The five dimensions included are: trendiness, customization, word of mouth, entertainment, and interaction. The mediating brand image has been investigated based on the customer-based brand equity model stated [50] and used by [41]. The researchers have generated seven hypotheses through empirical research associated with the model. These hypotheses focus on the effect of social media marketing activities on passenger retention through brand image. Arrows in the model indicate causal directions. The study suggests that social media marketing activities have a

significant effect on brand image and passenger retention. Trendiness, customization, word of mouth, entertainment, and interaction are all hypothesized to have a positive effect on brand image and passenger retention.

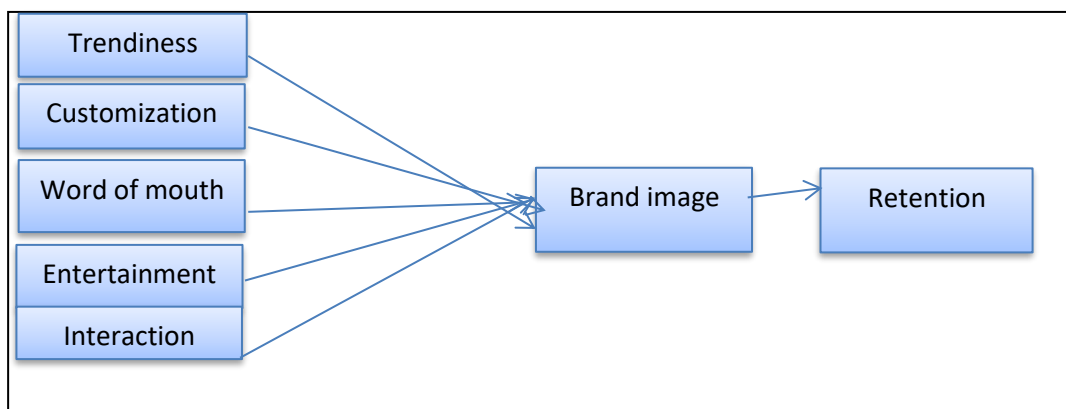


Figure1: Conceptual framework

4. Methodology

The current study investigates the effect of social media marketing activities on passengers' retention. Mediating role of brand image in the airline industry. In particular, the study looks at the potential effect of different social media marketing activities on brand image and passenger retention. A self-administered questionnaire was distributed electronically by scanning a QR code. This approach allowed for the collection of specific quantitative information to accept or reject the hypothesis. Descriptive statistics, multiple regression, and correlations were used to examine relationships among the constructs in the proposed model. (PLS-SEM) was then used to predict the structure and interactions between social media marketing activities, brand image and passenger retention.

5. The instrument

The survey instrument developed in this study consisted of a self-administered questionnaire used as a data collection instrument. The design of the questionnaire was based on previous studies. Passenger retention was measured using a modified scale developed by [5] considering [49] customer retention management theory. The dimensions of social media marketing activities defined by [29] are namely trendiness, customization, word of mouth, entertainment, and interaction. The measurement components for Trendiness were taken from [26] customization was adopted by [28] Word of mouth has been adopted by [24] Entertainment has been adopted by [23] Interaction has been adopted by [24]. The scale elements for evaluating the key constructs—social media marketing activities, brand image, and retention—were adapted from previous studies with validated measures. Respondents were asked to indicate the extent to which they agree or disagree, based on recent experience, by ticking relevant responses to questionnaire questions regarding key research constructs. All questions related to each dimension were measured using a 5-point Likert scale for each item, where 1 means strongly disagree and 5 means strongly agree, with 3 neutral points (neither agree nor disagree) as the midpoint.

Sample

This study aimed to operationalize seven variables (passenger retention, brand image, trendiness, customization, word of mouth, entertainment, and interaction) to test the hypothesized relationship. Quantitative data collection techniques were used because data should be quantifiable to facilitate the application of statistical analysis. A questionnaire was used as a primary data collection tool, and data was collected by scanning a QR code from passengers who had traveled to competing international destinations at different times and days in January 2023. The research was explanatory in nature because it sought to determine the cause-and-effect relationships among variables. A random sampling method was used to select respondents at a sampling. A total of 455 passengers were respondents during the study period; all passengers were contacted after their arrival for the purpose of the study. Of the 758 passengers contacted, 455 participated in the study, resulting in a response rate of 60.1%.

6. Data analysis

The present study applies partial least squares structural equation modeling (PLS-SEM) to test the hypotheses. PLS-SEM was used because the main objective of this research is to predict relationships. In addition, the PLS-SEM approach allows the examination of multiple constructs concurrently, which is

recommended for examining relationships. PLS-SEM includes a measurement model test and a structural model test. The measurement model test includes a verification of the constructs through assessing factor loadings, convergent and discriminant validity, as well as a calculation of the instruments' Cronbach's alpha and composite reliability. For the structural model test, in this stage of analysis, the structural model was assessed, and the hypotheses were tested. In general, we used the following criteria to assess the structural model: coefficient of determination (R2), and effect size (f2). R2 examines the explained variance of the constructs. R2 value greater than 0.10 are considered adequate.

7. Neutrosophic DEMATEL Method

In this part, we define some single valued neutrosophic equation [51] as:

Let $y = (T_y, I_y, F_y)$, and $z = (T_z, I_z, F_z)$ are two elements of single valued neutrosophic numbers.

$$y \oplus z = (T_y + T_z - T_y T_z, I_y I_z, F_y F_z) \tag{1}$$

$$y \otimes z = (T_y T_z, I_y + I_z - I_y I_z, F_y + F_z - F_y F_z) \tag{2}$$

$$\eta y = (1 - (1 - T_y)^\eta, I_y^\eta, F_y^\eta) \tag{3}$$

$$y^\eta = (T_y^\eta, 1 - (1 - I_y)^\eta, 1 - (1 - F_y)^\eta) \tag{4}$$



Figure 2: The steps of the neutrosophic DEMATEL method.

This subsection discusses the steps of the neutrosophic DEMATEL method. Figure 2 shows the steps of the neutrosophic DEMATEL method.

Step 1. Define the elements of the problem

This section gives the criteria, components of the system, experts, topic of domain by the review of the related work $i = 1, 2, 3, \dots, n$

Step 2. Build the matrix of direct relation

This step builds the pairwise comparison matrix between factors of social media affecting the activities of passengers. The experts build this matrix by using single valued neutrosophic scale [51].

$$A^D = (a_{ij}^d)_{n \times n} \tag{5}$$

Where d refers to the experts, n refers to the factors, and a refers to the element in the pairwise comparison matrix.

Step 3. Combine the matrices into one

This step combines the previous direct relation matrices into one matrix

$$A = (a_{ij})_{n \times n} = (\sum_D w_d a_{ij}^d)_{n \times n} \quad (6)$$

Step 4. Build the normalization direct relation matrix

This step computes the normalization direct relation matrix as:

$$T = t^{-1}A \quad (7)$$

$$t = \max \left(\max_{1 \leq i \leq n} \sum_{j=1}^n a_{ij}, \max_{1 \leq j \leq n} \sum_{i=1}^n a_{ij} \right) \quad (8)$$

Step 5. Compute the sum of relation matrix

This steps computes the total relation matrix as:

$$R = T(I - T)^{-1} \quad (9)$$

Step 6. Assign the components into the net effect and cause

$$U = (\sum_{j=1}^n r_{ij})_{n \times 1} = (r_i)_{n \times 1} \quad (10)$$

$$O = (\sum_{i=1}^n r_{ij})_{n \times 1} = (r_j)_{n \times 1} \quad (11)$$

Where $U + O^T$ refers to the vector of prominence and $U - O^T$ refers to the vector of relation

8. Results

8.1 Measurement Model

The structural model evaluates the links between constructs, while the measurement model evaluates validity and reliability. When evaluating the constructs in the current study, construct reliability and reliability coefficients are considered. Table 1 reveals that the construct reliability for all latent variables was greater than 0.70. As a result, the measurement model is accurate and internally consistent. Table 1 also illustrates that according to the convergent validity measurement; all standardized loading values were greater than the cut-off value of 0.5. At this stage of analysis, the measurement scales were assessed by factor loadings, reliability, and construct validity (convergent and discriminant validity). As shown in Table 1, all item loadings of the scales were above the threshold of 0.60, thus contributing significantly to their respective constructs. Convergent validity was established by referring to the three criteria of factor loadings, composite reliability (CR) and average variance extracted (AVE). Table 1 shows these values demonstrating that each construct has a satisfactory level of convergent validity.

Table 1: Results of the measurement model Factor loadings, AVE and reliability

Construct	Factor Loading Range	Cronbach's alpha	Average variance extracted (AVE ^a)	Composite Reliability (CR ^b)
Retention	0.878-0.924	0.936	0.839	0.954
Brand image	0.897-0.875	0.921	0.809	0.944
Trendiness	0.746-0.917	0.831	0.754	0.901
Customization	0.802-0.879	0.969	0.941	0.980
Word of mouth	0.849-0.940	0.859	0.782	0.915
Entertainment	0.892-0.876	0.892	0.823	0.933
Interaction	0.866-0.818	0.834	0.752	0.901

Reflective models are convergent and discriminant. The AVE of model constructs should be above 0.5 for adequate convergent validity. Table 1 shows AVE values for model constructs. To examine the discriminant validity, it is necessary to compare two measurements. Each construct's AVE should exceed its highest squared correlation with every other construct in the model. Furthermore, an indicator's loading with its associated construct should be bigger than its loading with other constructs. Table 2 displays the square root of the AVE for each build with the correlation with the other construct. Regarding the discriminant validity, we followed the Fornell–Larcker criterion and the Heterotrait-monotrait ratio of correlations (HTMT).

Considering the Fornell–Larcker criterion, the square root of the AVE values should be more than the correlation values between the variables. The results in Table 2 indicate that the square roots of the AVE values are higher than the correlation values with other variables; hence discriminant validity was confirmed. Moving to the HTMT ratio, the results in Table 3 show all HTMT values are less than 0.90, indicating that discriminant validity was established.

Table 2: Discriminant Validity- Fornell-Larcker criterion

<i>Constru</i>	<i>Retention</i>	<i>Brand image</i>	<i>Trendiness</i>	<i>Customization</i>	<i>Word of mouth</i>	<i>Entertainment</i>	<i>Interaction</i>
<i>Retention</i>	0.916						
<i>Brand image</i>	0.844	0.899					
<i>Trendiness</i>	0.099	0.119	0.868				
<i>Customization</i>	0.112	0.139	0.867	0.970			
<i>Word of mouth</i>	0.210	0.223	0.517	0.341	0.884		
<i>Entertainment</i>	0.258	0.288	0.395	0.296	0.845	0.907	
<i>Interaction</i>	0.125	0.185	0.801	0.592	0.700	0.521	0.867

Table 3: Heterotrait-monotrait ratio (HTMT)

<i>Constru</i>	<i>Retention</i>	<i>Brand image</i>	<i>Trendiness</i>	<i>Customization</i>	<i>Word of mout</i>	<i>Entertainmen</i>	<i>Interaction</i>
<i>Retention</i>							
<i>Brand image</i>	0.107						
<i>Trendiness</i>	0.123	0.151					
<i>Customization</i>	0.117	0.146	0.462				
<i>Word of mouth</i>	0.234	0.249	0.615	0.371			
<i>Entertainment</i>	0.284	0.316	0.457	0.312	0.756		
<i>Interaction</i>	0.151	0.211	0.563	0.659	0.822	0.596	

8.2 Structural Model

In this stage of analysis, the structural model was assessed, and the hypotheses were tested. In general, we used the coefficient of determination (R^2) and effect size (f^2) to assess the structural model and path coefficient. The results show that the explained variance (R^2) was 0.55 for retention and 0.71 for brand image, exceeding the threshold value of 0.10. Therefore, the worth is realistic as well as substantial. In relation to the effect size (f^2), the results in Table 4 show that the effect sizes exceeded the recommended value of 0.02 for a small effect. Several path coefficients are likewise marginally significant, with the exception of the 0.80 path coefficient for the physical construct. Table 4 demonstrates that the majority of model correlations have a substantial link.

Table 4: Results of the PLS Regression of the structural mode

Relationships	Path coefficients	t-value	p-value	f2	
<i>Direct and interaction effect</i>					
Trendiness → Brand image	0.236	3.374	0.000	0.046	
Customization → Brand image	0.257	2.548	0.000	0.112	
Word of mouth → Brand image	0.245	2.551	0.000	0.054	
Entertainment → Brand image	0.242	5.084	0.000	0.072	
Interaction → Brand image	0.243	2.020	0.000	0.120	
Brand image → Retention	0.234	4.729	0.000	0.101	
		Beta	t-value	CL	
<i>Indirect effect</i>				LL	UI
Trendiness → Brand image → Retention		0.048	2.995	0.040	0.146
Customization → Brand image → Retention		0.055	3.859	0.012	0.125
Word of mouth → Brand image → Retention		0.000	5.142	0.033	0.136
Entertainment → Brand image → Retention		0.000	4.853	0.017	0.211
Interaction → Brand image → Retention		0.047	3.874	0.031	0.117
SMMA → Brand image → Retention		0.066	2.754	0.020	0.125

After verifying the structural model, the hypotheses were tested by drawing bootstrapping samples. The findings in Table 4 indicated that there is a positive and significant relationship between social media marketing activities and brand image and there is a positive and significant relationship and effect between brand image and retention. In relation to H1, the results show a positive and significant relationship between Trendiness and Brand image ($\beta = 0.236, t = 3.374, p < 0.000$), providing support for the hypothesis. Moving to H2, the results show a positive and significant relationship between Customization and Brand image ($\beta = 0.257, t = 2.548, p < 0.000$); hence H2 was supported. In relation to H3, the results show a significant and positive relationship between Word of mouth and Brand image ($\beta = -0.245, t = 2.551, p < 0.000$). Moving to H4, the results show a positive and significant relationship between Entertainment → Brand image ($\beta = 0.242, t = 5.048, p < 0.000$). In relation to H5, the results show a significant and positive relationship between Interaction → Brand image ($\beta = 0.243, t = 2.020, p < 0.000$). Moving to H6, the results show a positive and significant relationship between Brand image and retention ($\beta = 0.234, t = 4.729, p < 0.000$); hence H6 was supported. In relation to H7, the results of bootstrapping suggest that brand image mediated the social media marketing activities – retention significant and positive relationship ($\beta = 0.066, t = 2.754, CI: 0.020 0.125$), supporting H7 (see table 4)

9. Results of Neutrosophic DEMATEL Method

First we defined the problem of this paper, which analysis factors of social media marketing activities according to passengers. Three experts are used to evaluate these factors. There are seven factors are collected as shown in Figure 1. The experts evaluated these factors by using single valued neutrosophic scale as shown in Table 5.

Table 5: Direct relation matrix

	SMMA ₁	SMMA ₂	SMMA ₃	SMMA ₄	SMMA ₅	SMMA ₆	SMMA ₇
SMM A1	1	(0.80,0.20,0.15)	(0.35,0.60,0.70)	(0.90,0.10,0.10)	(0.1,0.8,0.9)	(0.80,0.20,0.15)	(0.1,0.8,0.9)
SMM A2	1/(0.80,0.20,0.15)	1	(0.1,0.8,0.9)	(0.80,0.20,0.15)	(0.90,0.10,0.10)	(0.90,0.10,0.10)	(0.80,0.20,0.15)
SMM A3	1/(0.35,0.60,0.70)	1/(0.1,0.8,0.9)	1	(0.90,0.10,0.10)	(0.1,0.8,0.9)	(0.90,0.10,0.10)	(0.1,0.8,0.9)
SMM A4	1/(0.90,0.10,0.10)	1/(0.80,0.20,0.15)	1/(0.90,0.10,0.10)	1	(0.35,0.60,0.70)	(0.1,0.8,0.9)	(0.80,0.20,0.15)
SMM A5	1/(0.1,0.8,0.9)	1/(0.90,0.10,0.10)	1/(0.1,0.8,0.9)	1/(0.35,0.60,0.70)	1	(0.80,0.20,0.15)	(0.90,0.10,0.10)
SMM A6	1/(0.80,0.20,0.15)	1/(0.90,0.10,0.10)	1/(0.90,0.10,0.10)	1/(0.1,0.8,0.9)	1/(0.80,0.20,0.15)	1	(0.1,0.8,0.9)
SMM A7	1/(0.1,0.8,0.9)	1/(0.80,0.20,0.15)	1/(0.1,0.8,0.9)	1/(0.80,0.20,0.15)	1/(0.90,0.10,0.10)	1/(0.1,0.8,0.9)	1

Then replace the opinions of experts by the single valued neutrosophic numbers. Then combine the opinions of experts into one matrix by using Eq. (6). Then normalize the direct relation matrix by using Eqs. (7 and 8) as shown in Table 6.

Table 6. Normalization direct relation matrix

	SMMA ₁	SMMA ₂	SMMA ₃	SMMA ₄	SMMA ₅	SMMA ₆	SMMA ₇
SMMA ₁	0.13333	0.088146	0.067406	0.119997	0.017777	0.11259	0.06148
SMMA ₂	0.235822	0.13333	0.05185	0.108886	0.119997	0.119997	0.108886
SMMA ₃	0.308382	0.716048	0.13333	0.095553	0.027406	0.119997	0.017777
SMMA ₄	0.148144	0.163261	0.225744	0.13333	0.046666	0.017777	0.088146
SMMA ₅	1	0.148144	0.793648	0.380943	0.13333	0.088146	0.119997
SMMA ₆	0.158222	0.148144	0.148144	1	0.235822	0.13333	0.057776
SMMA ₇	0.509696	0.163261	1	0.235822	0.148144	0.514735	0.13333

Then compute the total relation matrix by using Eq. (9). Then assign the elements into net effect and net cause by using Eq. (10 and 11). Figure 3 shows the relation between seven factors.

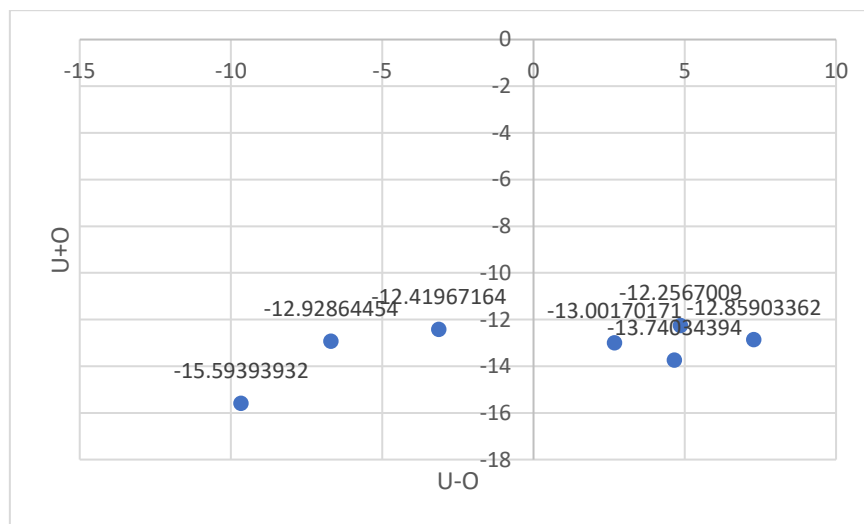


Figure 3: The relations between seven factors.

From figure 3, factors 1-4 have positive effects in social media marketing in activities of passengers, and others have negative effects. The first factor has the greatest positive effect, followed by fourth factor, then second factor, then third factor.

10. Discussion

This study aims to contribute to the existing literature on airline passenger retention and social media marketing activities by exploring the impact of social media marketing activities on passenger retention through brand image. Our research also aims to investigate how the dimensions of social media marketing activities affect brand image. Findings show that social media marketing activities have a positive impact on passenger retention. This is consistent with previous studies [23],[21],[18] that support a positive relationship between social media marketing activities and retention. Furthermore, this finding is in line with the theory of customer retention management [49] which states that by identifying customers' expectations and then meeting and exceeding those expectations, customers will be less likely to seek the services of competitors. Passenger retention is increasingly seen as an important management issue, especially in situations of market saturation or slowing growth in new passenger numbers. It is also considered a key goal of relationship marketing, mainly because it has the potential to provide better relationships since the cost of retaining a passenger is lower than the cost of acquiring a new one. The purpose of social media marketing is to engage and interact with passengers to increase sales, build brand image, and enhance awareness of their services, thereby attracting target consumers and convincing them to buy what they have to offer. According to [52],

social media is a way to increase passenger retention for airline services. This shows that the airline can improve passenger retention through social media marketing.

This study also found that retention is the process of ensuring that a motivated passenger continues to use an airline's services and does not defect to a competitor. Therefore, airlines have adopted passenger motivation to retain passengers for a longer period, which is influenced by brand image. Moreover, the findings indicate that social media marketing activities such as trendiness, customization, word of mouth, entertainment, and interaction have a positive and significant effect on brand image. This is consistent with previous literature [5] [16] which found a positive relationship and effect of social media marketing activities on brand image. Our findings are also consistent with results by [28], who found that entertainment, customization, interaction, and eWOM significantly affected brand image.

This study also found an indicator that had the biggest contribution to airline brand image was passenger experiences, as determined from their personal interactions with airline services. The brand image of the airline influences passengers' decisions to buy the airline's services and determines their retention. The brand image impacts passenger retention directly because retention tends to occur when passengers try the airline's services and are satisfied. This is in line with [23], [28], which state that brand image is defined as how a company describes itself to customers on social media and how customers really understand the brand.

Our study also aimed to examine the effect of Fly Emirates Airline's social media marketing activities, including entertainment, customization, interaction, word-of-mouth, and trendiness, on passenger retention. The results indicate that there is an effect of social media marketing activities on retention through brand image. This agrees with the reviewed literature, which stated a positive relationship between social media marketing activities and brand image and between brand image and retention. Study results revealed that brand image was significantly predicted in the model by entertainment, customization, interaction, word of mouth, and trendiness. According to the analysis results, all dimensions had a significant positive influence and a correlated relation on brand image. As mentioned in the study by [5], which provides the importance of social media marketing activities, businesses are progressively using social media marketing activities to deliver key messages associated with the brand to create a solid and favorable brand image in the minds of passengers. Moreover, it was advised to increase users' interaction and sharing of certain content on social media platforms to create and develop the passenger's connection to the brand. Furthermore, [28] have illustrated the importance of entertainment in motivating participants' attitudes and creating favorable perceptions regarding the brand. Additionally, the results match our study regarding the effect of social media marketing activities, as it has been found in recent studies that all dimensions can have a huge impact on brand image and affect retention.

11. Conclusions

The airline industry is experiencing a difficult time, and to increase profits, it is important that social media marketing activities and its dimensions help airlines understand what factors are important to their passengers when making service purchases. Each activity of the social media marketing may have a different effect on brand image and passenger retention, and what makes passengers satisfied with airline companies. Passenger retention is a critical factor for airline companies, and social media is an important way of retaining passengers. This research aims to evaluate the effect of social media marketing activities on passenger retention in the airline industry and to determine how brand image mediates this association. After pretesting the questionnaire, data from passengers was collected. Findings of this research indicated that social media marketing activities (trendiness, entertainment, interaction, word of mouth, and customization) improve brand image. Furthermore, brand image is also a precursor to passenger retention. Findings also confirmed that brand image plays the mediating role between social media and passenger retention. The findings of this study showed that social media marketing activities have a positive effect on passenger retention. The social media marketing activities that had the overall highest impact were interaction, entertainment, and word of mouth. Furthermore, the findings of this study concluded that increased brand image has a positive effect on retention. This research provides important managerial and practical implications for the airline industry. The findings of this study show that the social media marketing activity components are a significant factor affecting passenger retention and brand image. This result is in line with those obtained by [4] Our findings show that all social media marketing activities have a positive impact on passenger retention and brand image. The findings further indicate that airline marketing practices are efficient in attracting current passengers, implying that passengers are motivated. In other words, the satisfactory effect of these activities can lead to the fact that Fly Emirates social media marketing activities are successful and efficient, but more focus is needed to enhance the dimensions of the social media marketing activities used so that they can strengthen the effect on brand image and consequently passenger retention. Additionally, it is of high importance to encourage platform users to post their ratings and opinions to encourage the circulation of their experience

and feedback. More specifically, when social media marketing practices are not activated, passengers are more inclined to switch to another competitor. This study applied the neutrosophic sets with the DEMAEL method for analysis effects of factors social media in activities of passengers. The neutrosophic sets was used to deal with uncertain data. The single valued neutrosophic sets was used, which contain three function truth, indeterminacy, and falsity membership degrees. This study worked with seven factors as shown in Figure 1. The results of this research showed that social media is an important way to achieve better passenger outcomes and encourage passenger to repurchase. These findings can be important management and practical implications for the airline industry.

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