Contents lists available at Science-Gate

International Journal of Advanced and Applied Sciences

Journal homepage: http://www.science-gate.com/IJAAS.html

A review of recent advances in Internet of Things-based customer relationship management to improve customer satisfaction and loyalty in the airline industry

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ARTICLE INFO

Article history:
Received 25 July 2023
Received in revised form
3 December 2023
Accepted 13 December 2023

Keywords:
Airlines industry
Customer satisfaction
Customer loyalty
Customer relationship management
Internet of Things

ABSTRACT

Airlines use strategies to build and keep profitable, loyal customers through customer relationship management (CRM). However, as customer needs change, CRM systems must also change. With the Internet of Things (IoT) offering new ways to improve how customers experience services, airlines are combining IoT with their CRM systems. The connections airlines have with partners, airports, hotels, and banks can help meet these changing customer needs. However, past studies have not fully looked into how IoT-enhanced CRM helps make customers more satisfied and loyal or how airlines' connections with others play a part. Therefore, this study looks into how IoT-enhanced CRM is improving customer satisfaction and loyalty in airlines. It also examines how airlines' connections with others can support the relationship between IoT-enhanced CRM and customer satisfaction and loyalty. The study suggests a model and makes suggestions about the importance of IoT-enhanced CRM in making customers more satisfied and loyal. It also outlines how to test these suggestions and suggests directions for future research.

1. Introduction

In today's competitive environment, Customer Relationship Management (CRM) is one of the most crucial techniques to enhance customer satisfaction and loyalty. Customer satisfaction measures the extent to which a customer's needs are met, whereas customer loyalty measures the likelihood that a customer will make repeat purchases and engage in relationship activities (Uncles et al., 2003). CRM entails managing the relationship between the customer and the business by understanding the customer's requirements and providing enhanced customer service and experience (Yerpude and Singhal, 2018).

With the emergence of CRM, marketing strategies for a product or service focused primarily on increasing client satisfaction and loyalty. This is because more satisfied and loyal clients would participate in more repeat transactions, have a greater tolerance for price rises, and be more profitable for the company (Mokha and Kumar, 2022). However, customer value can also be based on referrals, knowledge sharing, and influence over other customers via reviews and blogs (Kumar and Reinartz, 2018). The Internet of Things (IoT) (also known as the Internet of Everything) empowers firms to provide superior customer service and gain a competitive edge (Rejeb et al., 2019). Therefore, after social, mobile, big data, and cloud, Gartner Group identifies IoT as the recent CRM driver (Nguyen and Simkin, 2017).

The IoT is a worldwide network of interconnected objects and equipment that communicate with one another by exchanging data. Incorporating IoT into a business can offer value for the firm and the customer (Stergiou et al., 2018). IoT devices can generate a vast amount of data that can be communicated between users and objects in real-time, allowing for quick problem prevention and resolution. Real-time data is vital for increasing company analytics by enabling the identification of customer behavior changes and market trends. Considering the benefits of IoT, businesses are integrating it with CRM systems to improve customer experience and deliver customer value by

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https://doi.org/10.21833/ijaas.2024.01.002
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identifying customer demands (Abu Ghazaleh and Zabadi, 2020).

Similar to other businesses, the airline industry has experienced significant global rivalry. More than two decades ago, airlines understood the necessity of building customer connections to grow revenue and remain competitive. Therefore, they implemented CRM to reduce client turnover and transform them into profitable and loyal customers (Rapp, 2000). Considering the benefits of IoT, airlines have already implemented this technology for luggage tracking, cabin climate management, improving flight safety, optimizing aircraft utilization, automating check-in, and enhancing customer experience, among other applications (Lim, 2021). By leveraging real-time data analytics capabilities, IoT-based CRM provides airlines with a unique potential to enhance the customer experience significantly. Future CRM capabilities based on IoT will give airlines a competitive edge and serve as the guiding light for their digital transformation efforts (Burak and Küsbeci, 2023).

Prior research in the airline industry has shown several advantages of using IoT-based CRM technology. IoT-based CRM enables airlines to provide customized services to passengers at a reasonable cost (Hammoud et al., 2018; He, 2020; Tang and Zhang, 2022), improve the availability of services (Keivanpour and Kadi, 2019; Pillai and Devrakhyani, 2020) and customer experience (Bingemer, 2018; Sharma et al., 2021; Ordóñez et al., 2020). However, there is a shortage of research studies that portray the significance of IoT-based CRM in leading to customer satisfaction and loyalty in the airline industry. Previous research has also suggested that IoT-based CRM can enable airlines linkages with airports to facilitate customer experience (Zhang, 2020; Ushakov et al., 2022). However, previous research has not adequately considered the airlines' linkages with banks and hotels to enhance customer satisfaction and loyalty. Further, previous research has not indicated if airlines' linkages with network partners can complement the relationship between IoT-based CRM and customer satisfaction and loyalty. The current study aims to address these research gaps.

Transportation is the primary service provided by airlines. In addition to the primary service, customers expect in-flight entertainment, on-board meals, the quality of the cabin crew, special assistance, efficient baggage delivery, effective handling of baggage delays or damages, prompt claims processing, assistance in on-arrival visa processing, customized offerings (such as airport pickup, assistance in accommodation preferences), complimentary baggage, lounge access, credit, and payment facilities, self-boarding, providing self-service channels, etc. (Wang and Hsu, 2016; Lien et al., 2021). To meet these changing customers' expectations, airline companies' network linkages with alliance partners, airports, hotels, and banks can play a vital role. The current study proposes that these airline companies' network linkages can complement the relationship between IoT-based CRM and customer satisfaction and loyalty. Accordingly, this study examines the role of IoT-based CRM in enhancing customer satisfaction and loyalty within the airline industry. The study also explores the effect of airline firms' network linkages in complementing the relationship between IoT-based CRM and customer satisfaction and loyalty.

The rest of the paper is organized in the following manner. Section 2 provides a comprehensive review of the literature. In sub-section 2.1, first, we present the state of previous research on IoT-based CRM in the airline industry. Few studies have examined the role of IoT-based CRM in enhancing customer satisfaction and loyalty in the airline industry. Therefore, we reviewed the literature on IoT-based CRM to enhance customer satisfaction and loyalty in various industries, such as hotels, restaurants, small and medium enterprises (SMEs), banking, hospitality, and transportation (sub-section 2.2). This helped us to posit that IoT-based CRM could lead to customer satisfaction and loyalty in the airline industry. Next, we reviewed the role of airline linkages with partners (other airlines, airports, banks, and hotels) to enhance customer satisfaction and loyalty (sub-section 2.3). Section 3 is dedicated to developing a conceptual model that depicts IoT-based CRM's role in enhancing airline industry customer satisfaction and loyalty. Section 4 provides the methodology for testing the research propositions in future research. Section 5 concludes the study and provides direction for future research.

2. Review of literature

In this section, we examined the state of previous research on IoT-based CRM in the airline industry. Then, we conducted a review on using IoT-based CRM to increase customer satisfaction and loyalty. Finally, we investigated the IoT-based CRM implications of airline network linkages with partners (other airlines, airports, hotels, banks, etc.) to enhance customer satisfaction and loyalty.

2.1. Prior research on IoT-based CRM in the airline industry

Hammoud et al. (2018) conducted a conceptual study on technology's role in developing airline companies' distribution capabilities. According to the study, IoT-enabled CRM enables airlines to interact with and collect customer data from new touchpoints, such as kiosks, smart mobile devices, social media, etc. Furthermore, the study noted that the IoT-based CRM enhanced the analytic capabilities of airlines, enabled them to spot changes in consumer purchasing patterns, and allowed them to provide individualized services to customers to retain them.

Bingemer (2018) undertook a literature review-based study to investigate the historical evolution of airlines' distribution capabilities. The study reports IoT as the most influential technological driver of

airline companies' distribution capabilities in modern times. Furthermore, the study indicates that IoT could be a crucial enabler for airline firms to sharpen network linkages with other airline companies to manage virtualization and improve the customer experience.

Zhang and Yue (2019) examined the transformative value of IoT capability on pricing policies. The study noted that IoT facilitates CRM as it allows the collection of individual-specific consumer intelligence. According to the study, IoT-based CRM enables businesses to provide consumers with real-time marketing promotions and pricing on demand. In addition, the study implied that IoT-enabled CRM could provide airlines with the analytical capabilities necessary to profile passengers and produce accurate projections for ticket sales utilizing the optimal mix.

Keivanpour and Kadi (2019) conducted a conceptual study to examine the IoT deployment in aircraft spare parts inventory management. The study reports that IoT assists airline companies in developing real-time data monitoring and collaborative and data analytics capabilities. The study also revealed that IoT helps airlines to reduce inventory costs, improve fleet availability, and increase customer service accessibility. These measures could potentially increase customer satisfaction.

Sharma et al. (2021) did a conceptual study to investigate the significance of IoT in helping airlines promote smart tourism. The study indicates that IoT can assist airlines in collaborating with airports to reduce lost and misplaced baggage by identifying bags using tags and enabling consumers to follow their luggage using their cell phones. The study also suggests that IoT can assist airlines in working with airports to enhance the passengers' check-in process and provide directions to their boarding gates and flights, thereby saving passengers valuable time. In addition, IoT can capture passengers' important health information (stress level, heart rate, vital signs, etc.) and relay it to the cabin staff to ease the passengers' flight experience.

Pillai and Devrakhyani (2020) conducted a conceptual study to underscore the importance of IoT-based CRM for the airline industry. The study noted that several present CRM systems of airlines are unable to collect reliable data for constructing an efficient CRM system. The study suggested that IoT can gather, handle, and process huge amounts of data and enhance the efficiency of airline companies' CRM systems.

Ordóñez et al. (2020) conducted a conceptual study to examine the IoT technology applications in the travel and tourism industry. As per this study, IoT-enabled CRM can provide airline companies with analytics capabilities and improve customer experience. In addition, the study reveals that IoT enables airlines to discover the optimal balance between generating profits and preserving safety by allowing them to refill or replace parts at the right moment.

He (2020) undertook a conceptual study to investigate IoT applications in the airline industry. According to this study, IoT helps airline companies to improve their business value and management level. IoT enables CRM by enabling airlines to provide better and more customized services to their customers. IoT enables airlines to partner with airports to provide customers with real-time flight check-in and boarding information and advice for adjacent facilities where they can spend their free time.

Zhang (2020) undertook a conceptual study to examine IoT's role in providing customers with a streamlined air travel experience. According to this study, IoT enables airlines to partner with airports to automate passenger processing and flight management procedures, improve services, make airport agents' jobs easier, and give passengers a safe travel experience. Furthermore, the study reveals that IoT-enabled airline-airport collaboration capabilities provide a safer environment for both passengers and employees and instantly address any fault incidents.

Tang and Zhang (2022) conducted a conceptual study to examine the direction of IoT big data in the airline industry. According to this study, IoT-enabled analytics capabilities can enable airline companies to provide customized and humanized services to passengers (such as in-flight entertainment, meal preferences, baggage tracking, etc.). Thus, IoT can enable airlines to address the customers' real needs, entice new customers, retain existing customers, and enhance their satisfaction.

Ushakov et al. (2022) conducted a conceptual study to examine the impact of IoT on smart travel in the industry 4.0 age. According to this study, IoT-enabled CRM enables analytics capabilities for airline companies, which helps them to provide personalized services to customers. IoT enables airlines to develop collaboration capabilities with airports to manage, monitor, track, and compute the flow of passengers, luggage, etc. Airlines and airports can collaborate to deploy IoT innovations to enhance the passenger experience, such as luggage tracking services, real-time flight information, etc.

The literature review reveals that most of the earlier research on IoT-based CRM in the airline industry consisted of conceptual or review studies. In addition, these studies have not directly evaluated the influence of IoT-based CRM on customer satisfaction and loyalty in the airline industry. Therefore, we can state that a dearth of empirical research has examined the influence of IoT-based CRM to enhance customer satisfaction and loyalty in the airline industry. Table 1 depicts the summary of prior research on IoT-based CRM in the airline industry.

Prior research in the airline industry suggests that IoT-based CRM enhances the real-time data monitoring, collaborative, and data analytics capabilities of airlines (Keivanpour and Kadi, 2019; Pillai and Devrakhyani, 2020); sharpen network linkages with other airline companies (Bingemer,

2018) and airports (Zhang, 2020; Ushakov et al., 2022); reduces inventory cost (Keivanpour and Kadi, 2019); produces accurate traffic projections (Zhang and Yue, 2019), improves fleet availability and the availability of services (Keivanpour and Kadi, 2019). Such IoT-based CRM features allow airlines to provide customized services (He, 2020; Tang and Zhang, 2022) at a reasonable cost (Hammoud et al., 2018) and enhance customers' experience (Bingemer, 2018; Sharma et al., 2021; Ordóñez et al., 2020). These IoT-based CRM features could potentially allow airlines to improve customer satisfaction and loyalty; however, there is a dearth of research in the airline industry that could make this case. Consequently, in the next section, we will review IoT-based CRM's role in enhancing customer satisfaction and loyalty.

Table 1: Prior research on IoT-based CRM in the airline industry

Reference	Purpose	Methods/data	Findings
Hammoud et al. (2018)	Role of technology in the development of airline companies' distribution capabilities	Conceptual study	IoT-based CRM enhances the analytics capabilities of airlines to provide customized services to passengers at a reasonable cost
Bingemer (2018)	Investigate the historical evolution of airlines' distribution capabilities.	Literature review	IoT could enable airline firms to sharpen network linkages with other airline companies to manage virtualization and improve the customer experience
Zhang and Yue (2019)	Examine the transformative value of IoT capability on pricing policies	Maximum likelihood estimation modeling	IoT-based CRM can provide airlines with the analytical capabilities to profile passengers and produce accurate projections for increasing ticket sales
Keivanpour and Kadi (2019)	Examine the IoT deployment in aircraft spare parts inventory management	Conceptual assessment of airlines' workflow processes	IoT assists airlines in developing real-time data monitoring, collaboration, and data analytics capabilities, reducing inventory costs and improving fleet availability and the availability of services
Sharma et al. (2021)	Investigate the significance of the IoT in helping airlines to promote smart tourism	Conceptual study	IoT can assist airlines in enhancing customers' experience by determining their traveling preferences, enabling baggage tracking using customers' mobiles, streamlining customers' check-in and boarding, capturing passengers' vital health information, and sharing necessary information with cabin crew to ease the passengers' journey
Pillai and Devrakhyani (2020)	Underscore the importance of IoT-based CRM for the airline industry	Conceptual study	IoT can gather, handle, and process huge amounts of data and enhance the efficiency of airline companies' CRM systems
Ordóñez et al. (2020)	Examine the IoT technology applications in the travel and tourism industry	Conceptual study	IoT can enable CRM by improving the customers' experience. IoT allows airlines to find the optimal balance between maximizing earnings and maintaining safety by enabling them to refuel or repair parts at the right time
He (2020)	Examine applications of IoT in the airline industry	Conceptual study	IoT enables CRM by enabling airlines to provide better and more customized services to their customers
Zhang (2020)	Role of IoT in providing streamlined air travel experience to customers	Conceptual study	IoT enables airlines to collaborate with airports to automate passenger processing and flight management operations, enhance services, simplify airport agents' tasks, and provide passengers with a safe travel experience
Tang and Zhang (2022)	Examine the IoT big data direction in the airline industry	Conceptual study	IoT-enabled analytics capabilities can enable airline companies to provide customized and humanized services to passengers
Ushakov et al. (2022)	Examine the impact of IoT on smart travel	Conceptual study	IoT enables airlines to collaborate with airports to manage, monitor, track, and compute the movement of passengers, luggage, and other items

2.2. Review on using IoT-based CRM to increase customer satisfaction and loyalty

Customer satisfaction and loyalty are the key concepts of consumer research since they indicate a company's ability to attract and retain customers in a competitive market, including the transportation and logistics sectors (Steven et al., 2012). In this information era, IoT has emerged as a key enabler of CRM. The expansion of the IoT and the increasing use of various internet-connected devices by customers make it possible for companies to obtain real-time data and improve customer service (Bajaj et al., 2022). According to Bajaj et al. (2022), IoT enhances the banks' CRM system's value, helps them improve their core and supplementary services, and satisfies and retains customers. According to Yerpude and Singhal (2018), adopting IoT-based CRM enables an organization to attain higher customer satisfaction, increasing customer retention. According to Shoukry and Aldeek (2020), IoT can significantly improve customer satisfaction and increase hotel business revenues. According to Pappas et al. (2021), IoT could enable CRM in the accommodation industry, increasing customer satisfaction and business competitiveness. Pelet et al. (2021) asserted that IoT can increase customer satisfaction in the lodging business by providing unique ambiances and developing tailored multisensory experiences. Kim et al. (2022) suggested that IoT increases customer satisfaction in the hospitality business by fostering innovation.

IoT-based CRM increases customer satisfaction in the restaurant business by reducing food waste (Aytaç and Korçak, 2021) and improving food quality (Bhatia and Ahanger, 2021). Eskerod et al. (2019) claimed that by using IoT, hotels could generate revenue by cross-selling and enhancing selling prospects, as well as by leveraging guests' data and increasing guest satisfaction and, consequently, loyalty. According to Hao and Chon (2022), contactless hospitality services that employ IoT are crucial for preventing COVID-19 transmission by eliminating human touch with surfaces and other individuals. Moreover, these services may increase customer satisfaction. According to Haass et al. (2015), intelligent containers, as part of IoT technologies, reduce food waste and carbon emissions, improve sustainable operating procedures, and promote transparency to earn consumers' trust, hence boosting customer satisfaction. Tsang et al. (2021) stated that an IoT-based multitemperature delivery planning system efficiently manages perishable food e-orders, hence preserving food quality and ensuring customer satisfaction. In the logistics industry, Zidi et al. (2022) asserted that IoT ensures customer satisfaction by achieving the quality of services, efficient shipping, real-time tracking, and proper traceability, avoiding transport hazards, measuring product temperature, and monitoring the supply

chain process. Table 2 summarizes the role of IoT-based CRM in enhancing customer satisfaction and loyalty. It is clear from the review that empirical research indicates that IoT-based CRM can increase customer satisfaction and/or loyalty. This research has covered various service industries, such as banking (Bajaj et al., 2022), hotels (Eskerod et al., 2019; Shoukry and Aldeek, 2020), accommodation industry (Pappas et al., 2021), lodging business (Pelet et al., 2021), hospitality business (Hao and Chon, 2022; Kim et al., 2022), restaurant business (Aytaç and Korçak, 2021; Bhatia and Ahanger, 2021), food industry (Haass et al., 2015; Tsang et al., 2021), transportation industry (Zidi et al., 2022) etc. However, there is a dearth of prior empirical research that could suggest IoT-based CRM can enhance customer satisfaction and loyalty in the airline industry. According to previous studies, IoT-based CRM can increase customer satisfaction and loyalty in various service businesses, and airline is also a service industry. Therefore, it is reasonable to assume that IoT-based CRM could enhance customer satisfaction and loyalty in the airline industry.

2.3. Role of airlines linkages with Partners to enhance customer satisfaction and loyalty

The airlines' linkages with partners (other airlines, airports, hotels, banks, etc.) could enhance customer satisfaction and loyalty. Table 3 outlines the IoT-based CRM implications of airline linkages with partners to enhance consumer satisfaction and loyalty. Table 3 indicates important linkages between airline firms, airline companies and airports, airline companies and hotels, airline firms and banks, etc. They are briefly mentioned below in the context of IoT-based CRM for the airline industry:

- Alliances between airlines: In this age of globalization, airlines have formed alliances with other airlines to increase their market coverage and coordinate their capacity. Alliances between airlines have led to multi-lateral 'coopetitive' (cooperative, but competitive) ties and have impacted their pricing tactics, product offers, market power, operating efficiency, and overall success (Zou and Chen, 2017). The utilization of digital technologies and networking amongst airlines is vital for the creation of efficient alliances. Access to information in real-time by alliance partners significantly improves the effectiveness of their joint marketing agreements (Amankwah-Amoah and Debrah, 2011). IoT-based CRM can further boost these joint marketing partnerships among airline firms, which could enhance customer satisfaction and loyalty.
- Digital technologies are transforming the connection between airlines and airports. For example, IoT-based CRM offers airlines and airports options to collaborate and enhance the customer experience across multiple touchpoints (Khan and Efthymiou, 2021), which could increase customer satisfaction and loyalty.
- Connections between airlines and hotels: Airlines have created cross-industry agreements with hotels to strengthen their customer base and promote loyalty programs (Moro et al., 2020). These relationships provide airlines with cross-selling and up-selling options and allow them to tailor their products (Raynes and Tsui, 2019). Digital technologies like IoT-based CRM enable airlines and hotels to collect client information and provide customized services. In addition, it affords airlines chances for proactive customer engagement (Moro et al., 2020), which could boost customer satisfaction and loyalty.
- Linkages between airlines and banks: Banks and airlines have formed cross-industry alliances to promote frequent flyers and loyalty programs. Customers are handed gift cards and co-branded credit cards to increase spending and strengthen loyalty (Çiftçi and Özkır, 2020; Wang and Hsu, 2016). IoT-based CRM can provide airlines and banks with vast data and data-driven insights. IoT-based CRM can aid in gaining a deeper understanding of consumers' spending patterns, allowing for the creation of individualized reward and loyalty programs. It will also assist airlines in providing real-time, location-based discounts to customers (Çiftçi and Özkır, 2020). Thus, such linkages between airlines and banks could augment customer satisfaction and loyalty.

The review presented in this section suggests that network linkages of airlines with partners (other airlines, airports, hotels, banks, etc.) could complement the relationship between IoT-based CRM and customer satisfaction and loyalty. However, it should be noted that the role of airline linkages with partners in enhancing customer satisfaction and loyalty has only been investigated conceptually in the literature, not empirically.

3. Conceptual model depicting the role of IoT-based CRM in enhancing airline industry customers' satisfaction and loyalty

The literature review indicates that IoT-based CRM can contribute to customer satisfaction and loyalty in various service industries. IoT-based CRM could result in customer satisfaction and/or loyalty, as seen in a variety of service industries, including banking (Bajaj et al., 2022), hotels (Eskerod et al., 2019; Shoukry and Aldeek, 2020), the lodging industry (Pappas et al., 2021), the accommodation business (Pelet et al., 2021), the hospitality industry (Hao and Chon, 2022; Kim et al., 2022), restaurant business (Aytaç and Korçak, 2021; Bhatia and Ahanger, 2021), food industry (Haass et al., 2015; Tsang et al., 2021), transportation industry (Zidi et al., 2022), etc. Since the airline industry is also a service industry, we posit that IoT-based CRM can contribute to customer satisfaction and loyalty in the airline industry.

Table 2: IoT-based CRM and customer satisfaction and loyalty

Reference	Purpose	Methods/data	Findings
Haass et al. (2015)	Reducing food waste and carbon emissions	Conducted simulation of a fruit distribution network	IoT technologies reduce food waste and carbon emissions and enhance customer satisfaction
Yerpude and Singhal (2018)	Examine the impact of IoT on CRM process, customer satisfaction, and retention	An extensive literature review was conducted to evaluate the constructs of IoT and CRM	IoT improves an organization's control over CRM, customer satisfaction, and business profitability
Eskerod et al. (2019)	Motivations for achieving sustainability via IoT in luxury hotels	Exploratory research based on multiple case studies	IoT can enable CRM, streamline operations and hotel revenues, and enhance guests' satisfaction and loyalty
Shoukry and Aldeek (2020)	To predict attributes from IoT consumer reviews in the hotel sector	Classifiers like CNN-DL and support vector machine network-based deep learning are utilized to predict attributes	IoT can enable CRM, greatly increasing hotel customer satisfaction and revenue
Pappas et al. (2021)	IoT adoption in accommodation SMEs	Online survey containing 42 Likert statements of 528 Greek accommodation managers/owners Used fuzzy-set Qualitative Comparative Analysis	IoT could enable CRM in the accommodation industry and enhance customer satisfaction and competitiveness.
Pelet et al. (2021)	Determine how engaging the senses of European guests using IoT devices affected their emotions and behavior	An exploratory study consisting of interviews with hotel managers (Study 1) and an online survey of 357 hotel visitors (Study 2)	IoT can create tailored, multisensory hotel experiences for visitors and increase their satisfaction
Aytaç and Korçak (2021)	IoT-based proactive waste management intelligence for fast-service restaurants	An IoT-based, completely automated, and self-learning system model was proposed and created	IoT can enable CRM through waste reduction and service optimization
Bhatia and Ahanger (2021)	Developing an IoT-based smart framework for evaluating the food quality characteristics in restaurants and food outlets	On the fog-cloud platform, data is evaluated using the Bayesian modeling technique to create a consensus measure for the probability of food grade (PoFG)	IoT can facilitate CRM and boost restaurant customer satisfaction by enhancing food quality
Hao and Chon (2022)	Contactless service implementation in the hotel industry as an innovative service design	PLS modeling utilizing data from a large-scale survey of hotel customers in mainland China who have experienced contactless service	Contactless hospitality services that employ IoT can preserve human health and improve customer satisfaction
Tsang et al. (2021)	Integrating IoT and multi-temperature delivery planning for e-commerce logistics of perishable food	An IoT-based multi-temperature delivery planning system (IoT-MTDPS) was proposed, incorporating a two-phase multi-objective genetic algorithm optimizer (2PMGAO)	IoT can enhance customer satisfaction by providing efficient management of perishable food e-orders
Bajaj et al. (2022)	Examine the impact of IoT on the CRM in India's banking sector	A questionnaire was administered to 366 customers of public and private banks. CFA and SEM were employed for data analysis	The implementation of IoT had a significant impact on banks' CRM, resulting in enhanced customer service
Kim et al. (2022)	Examine the factors that influence attitudes toward IoT applications in the hospitality industry	Online consumer-generated reviews collected from YouTube	IoT increases customer satisfaction in the hospitality business by fostering innovation
Zidi et al. (2022)	Construct and simulate a digital platform for real-time transportation tracking	Modeled and designed reconfiguration methods using Unified Modelling Language	IoT ensures customer satisfaction by achieving quality services, efficient shipping, real-time tracking, and proper traceability

Table 3: Linkages of the airline industry and their IoT-based CRM implications

Parties	Nature of linkage	Linkage details	IoT-based CRM implications
Airline companies	Alliances	Alliances allow airlines to share risks, lower expenses, and obtain rare resources. Due to alliances between airline companies, the nature of competition has shifted from firm to group level. Star Alliance, SkyTeam, and Oneworld are the world's three largest airline alliance groupings (Amankwah-Amoah and Debrah, 2011)	Membership in alliances enables airlines to capture externalities through direct or indirect traffic flow from other airlines (Lazzarini, 2007). Alliances between airlines help airlines in code-sharing agreements. These code-sharing agreements permit airlines to sell seats on each other's flights, simplify passengers' lives, and increase airlines' profitability (Zou and Chen, 2017). Alliances help airline companies improve catering, sales, distribution, ticketing, and scheduling. Alliances also help airline companies improve their speed and capacity to reach a market. Alliances enable airlines to share airport resources such as terminals, check-in counters, and lounges. Alliances also help airlines in joint marketing cross-selling arrangements (Amankwah-Amoah and Debrah, 2011) Alliances between airline companies significantly affect brand equity, brand preference, and purchase intention of highly involved customers (Wang, 2014)
Airlines and airports	Vertical relationship	There is a vertical relationship between airlines and airports since airports supply the required infrastructure for airlines. The input price method illustrates the vertical interaction between airlines and airports. In the current competitive environment, airlines and airports have formed various types of contracts, such as long-term use contracts, negotiated input charges, airline ownership of airport facilities, concession revenue sharing agreements, airline issuance of revenue bonds, joint financing activities, sharing of business risks, and coordination of operating processes, among others (Khan and Efthymiou, 2021)	Customer-centric airlines distinguish the experience of first and business-class passengers at airports via special check-in counters, kiosks, security checks, lounge access, swift boarding and de-boarding, efficient baggage delivery, effective handling of baggage delays or damages, prompt processing of any claims, etc. Airports are crucial in boosting air travel and tourism in the competitive climate (Khan and Efthymiou, 2021). The airlines facilitate transit visas for travelers passing through tourist destinations en route to their final destinations. Examples include Emirates and Etihad's facilitation of Dubai transit visas
Airlines and hotels	Cross-industry partnership	Airlines build exclusive networks through cross-industry collaborations with hotels to promote their reward programs and improve consumer ties. Cross-industry agreements with hotels enable airlines to increase income (Moro et al., 2020)	The relationship between airlines and hotels across industries enables customers to use travel points for hotel stays. The connections with hotels provide airlines with numerous chances for cross-selling and up-selling. The airlines can customize their offers based on the customer's status, flyer profile, past behavior, etc. (Raynes and Tsui, 2019)
Airlines and banks	Cross-industry partnership	By establishing exclusive networks, airlines expand their revenue sources through cross-industry alliances with banks. In addition, the relationship with banks assists airlines with the promotion of their frequent-flier and loyalty programs (Çiftçi and Özkır, 2020)	In conjunction with airlines, banks give gift cards to clients. On credit card purchases, clients receive reward points from banks. Customers can use these reward points to purchase gift cards for travel on partner airlines (Çiftçi and Özkır, 2020). Additionally, banks are introducing co-branded credit cards with airlines. These co-branded credit cards allow clients to earn airline reward points and receive complimentary baggage, lounge access, and priority boarding, among other perks. These co-branded credit cards boost consumer loyalty and encourage increased spending (Wang and Hsu, 2016)

Prior research demonstrates that IoT-based CRM helps airlines strengthen their network linkages with other airlines (Bingemer, 2018), airports (Zhang, 2020; Ushakov et al., 2022), etc. Airlines can offer tailored services (He, 2020; Tang and Zhang, 2022) at affordable prices (Hammoud et al., 2018) and improve the consumer experience (Bingemer, 2018; Sharma et al., 2021; Ordóñez et al., 2020) because of these linkages.

The literature further underscores the role of airline linkages with partners in:

- Empowering joint marketing arrangements between airline companies of an alliance to enhance customer satisfaction and loyalty by enabling real-time access to customer information (Lazzarini, 2007; Zou and Chen, 2017; Amankwah-Amoah and Debrah, 2011; Wang, 2014).
- Enhancing collaboration capabilities of airlines and airports across various touch points to enhance customer satisfaction and loyalty (Khan and Efthymiou, 2021).
- Enabling cooperation between airlines and hotels to provide personalized services to customers to enhance their satisfaction and loyalty (Raynes and Tsui, 2019).
- Providing data-driven insights to airlines and banks to offer customers personalized reward and loyalty programs (Çiftçi and Özkır, 2020; Wang and Hsu, 2016).

Based on the comprehensive literature review and the arguments stated above, we present the following conceptual model for the study, as shown in Fig. 1.

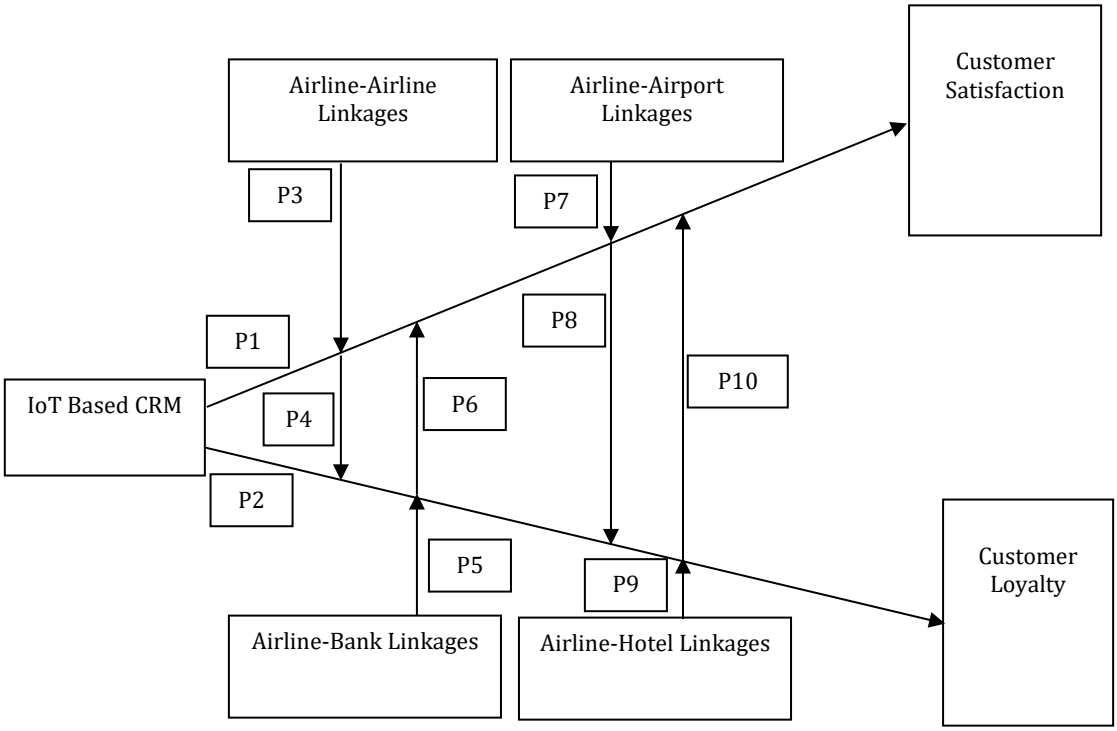

Fig. 1: Conceptual model depicting the role of IoT-based CRM in enhancing airline industry customer satisfaction and loyalty

The study propositions are as follows:

P1: IoT-based CRM has a positive impact on airline customer satisfaction.
P2: IoT-based CRM has a positive impact on airline customer loyalty.
P3: Airline-airline linkages moderate the relationship between IoT-based CRM and customer satisfaction.
P4: Airline-airline linkages moderate the relationship between IoT-based CRM and customer loyalty.
P5: Airline-bank linkages moderate the relationship between IoT-based CRM and customer loyalty.
P6: Airline-bank linkages moderate the relationship between IoT-based CRM and customer satisfaction.
P7: Airline-Airport linkages moderate the relationship between IoT-based CRM and customer satisfaction.
P8: Airline-Airport linkages moderate the relationship between IoT-based CRM and customer loyalty.
P9: Airline-hotel linkages moderate the relationship between IoT-based CRM and customer loyalty.
P10: Airline-hotel linkages moderate the relationship between IoT-based CRM and customer satisfaction.

4. Research methodology

This research is intended to be a review study. However, we present the research methodology that can be used to test the propositions presented in this study in future research. We propose that future research can employ triangulation research or mixed approaches strategy (Heale and Forbes, 2013). Using a mixed-methods approach, qualitative and

quantitative data can be gathered, analyzed, and combined in a single study.

For the quantitative study, surveys can be utilized (Singh and Alodaynan, 2023). The managerial staff, technical personnel, and customers of Saudi airline firms can be surveyed. Accordingly, quantitative information can be gathered and analyzed. The analysis can shed light on the predictive value of this research's constructs regarding the enhancement of airline customer satisfaction and loyalty. The survey can be designed and pilot-tested by the researcher. The survey items can employ a five-point Likert scale to measure the constructs or variables.

SMART PLS software can be used to conduct quantitative analysis. Partial Least Squares Structural Equation Modeling (PLS-SEM) can be employed in two phases. The initial step can involve an evaluation of the measurement (or outer) model. Internal consistency and reliability of a reflective measurement or outer model can be examined in the first phase (Sarstedt et al., 2014). The specific measures that can be examined include individual indicator reliability, internal consistency reliability (using composite reliability), convergent validity (using outer loadings of the indicators and/or average variance extracted (AVE)), and discriminant validity (using the Fornell-Larcker criterion and/or cross-loadings) (Henseler et al., 2015; Sarstedt et al., 2014). If the results of Phase 1 are satisfactory, the structural (or inner) model can be evaluated in Phase 2 (Singh et al., 2022). In the second phase, evaluating the structural model's prediction capabilities and the links between its constructs is possible. Consequently, it is possible to undertake the following evaluations: structural model collinearity concerns, relevance and significance of structural model relationships, degree of coefficient of determination (R^2), effect sizes f^2, and cross-validated redundancy (Stone- Geisser's Q^2)(Sarstedt et al., 2014; Singh and Alhamad, 2021).

Qualitative research can be conducted through interviews. This study could permit an in-depth examination of the research aims. Qualitative research permits questions and explanations that are more open-ended. These open-ended discussions provide solutions to research issues and contribute to generalizing the findings (Archer, 2007). In qualitative research, semi-structured in-depth interviews can be employed as they permit the researcher to concentrate on the research topic and the respondent to move organically in accordance with their own thoughts (Jamshed, 2014). Consequently, this approach can shed light on the influence of various constructs of this study on enhancing aviation customers' consumer satisfaction and loyalty.

5. Conclusion and future research

CRM is one of businesses' most important strategies to enhance customer satisfaction and loyalty. IoT has emerged as a CRM driver in recent years and can provide value for the company and the customers. Businesses are incorporating IoT into their CRM systems to improve customer experience and create value by understanding customer needs.

The current study suggests that IoT-based CRM has significant advantages for airline companies. Airline firms implemented CRM systems more than two decades ago in order to strengthen client relationships. Recently, they have included IoT in their CRM systems in order to better comprehend consumer wants, entice customers, and keep a competitive advantage. IoT-based CRM strengthens airlines' real-time data monitoring, collaborative, and data analytics capabilities, sharpens their network linkages, decreases inventory costs, generates accurate traffic estimates, and improves fleet and service availability. This enables airlines to offer competitively personalized services and improve customer experience.

IoT-based CRM could lead to customer satisfaction and loyalty. The current study found this in a range of service industries, such as banking, hotels, lodging, accommodation, hospitality, restaurant, food, transportation, etc. However, there is a shortage of empirical research that could portray the significance of IoT-based CRM in enhancing customer satisfaction and loyalty in the airline industry. Since the airline industry is also a service industry, the current research proposes that IoT-based CRM can contribute to customer satisfaction and loyalty in the airline industry.

Accordingly, this study develops knowledge to enhance the airline industry customers' satisfaction and loyalty, in general, using IoT-based CRM. The study also suggests that airline firms' network linkages (with other airlines, airports, hotels, and banks) can complement the relationship between IoT-based CRM and customer satisfaction and loyalty. This study provides a knowledge base for airline companies using IoT-based CRM to understand their customers' latent needs and better understand them in an increasingly competitive era. Finally, the study's conceptual model can shed light on the strategies and roadmap that airline companies can deploy to enhance customer satisfaction and loyalty by using IoT-based CRM.

The current study has significant implications for service industries, particularly the airline industry. This study creates knowledge to enhance, enrich, and modernize the airline sector, in general, using IoT-based CRM. Notably, the study would create significant knowledge for airline companies in leveraging IoT-based CRM to enhance customer satisfaction and loyalty. Airline companies can utilize the knowledge generated by this study to understand their customers' latent needs in an increasingly competitive era.

The current research presents a conceptual framework and develops ten propositions. These propositions can be converted into testable hypotheses in future research. Future research can collect and analyze data to test the conceptual model. The quantitative analysis of the research data can shed light on the predictive potential of this study's

constructs with respect to the improvement of airline customers' satisfaction and loyalty. This would enable the empirical validation of this study's conceptual model in future research. Future research can also use a qualitative approach to supplement the quantitative method. The qualitative method can provide further insights into the effect of this study's various constructs on enhancing satisfaction and customer loyalty among aviation customers.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Abu Ghazaleh M and Zabadi AM (2020). Promoting a revamped CRM through internet of things and big data: An AHP-based evaluation. International Journal of Organizational Analysis, 28(1): 66-91. https://doi.org/10.1108/IJOA-12-2018-1602

Amankwah-Amoah J and Debrah YA (2011). The evolution of alliances in the global airline industry: A review of the African experience. Thunderbird International Business Review, 53(1): 37-50. https://doi.org/10.1002/tie.20388

Archer S (2007). Financial and external reporting research: The broadening corporate governance challenge: A comment. Accounting and Business Research, 37(1): 55-58. https://doi.org/10.1080/00014788.2007.9730058

Aytaç K and Korçak Ö (2021). IoT based intelligence for proactive waste management in quick service restaurants. Journal of Cleaner Production, 284: 125401. https://doi.org/10.1016/j.jclepro.2020.125401

Bajaj P, Anwar I, and Saleem I (2022). An impact of adoption of Internet of Things (IoT) on customer relationship management (CRM) in banking sector of India. In: Gurinder S, Maurya A, and Goel R (Eds.), Integrating new technologies in international business: Opportunities and challenges. CRC Press, Taylor and Francis, Abingdon, UK. https://doi.org/10.1201/9781003130352-2

Bhatia M and Ahanger TA (2021). Intelligent decision-making in smart food industry: Quality perspective. Pervasive and Mobile Computing, 72: 101304. https://doi.org/10.1016/j.pmcj.2020.101304

Bingemer S (2018). Back to the future with IATA NDC? Critical turning points in the history of airline distribution. Journal of Tourism Futures, 4(3): 205-217. https://doi.org/10.1108/JTF-05-2018-0032

Burak MF and Küsbeci P (2023). Internet of things and aviation: A bibliometric and visualization analysis. Kybernetes. https://doi.org/10.1108/K-04-2023-0664

Çiftçi ME and Özkır V (2020). Optimising flight connection times in airline bank structure through Simulated Annealing and Tabu Search algorithms. Journal of Air Transport Management, 87: 101858. https://doi.org/10.1016/j.jairtraman.2020.101858

Eskerod P, Hollensen S, Morales-Contreras MF, and Arteaga-Ortiz J (2019). Drivers for pursuing sustainability through IoT technology within high-end hotels-An exploratory study. Sustainability, 11(19): 5372. https://doi.org/10.3390/su11195372

Haass R, Dittmer P, Veigt M, and Lütjen M (2015). Reducing food losses and carbon emission by using autonomous control–A simulation study of the intelligent container. International Journal of Production Economics, 164: 400-408. https://doi.org/10.1016/j.ijpe.2014.12.013

Hammoud GA, Tawfik HF, and Fahmy RS (2018). Development of airlines' distribution capabilities. Journal of Tourism and Hospitality Management, 6(1): 66-80. https://doi.org/10.15640/jthm.v6n1a7

Hao F and Chon KKS (2022). Contactless service in hospitality: Bridging customer equity, experience, delight, satisfaction, and trust. International Journal of Contemporary Hospitality Management, 34(1): 113-134. https://doi.org/10.1108/IJCHM-05-2021-0559

He Y (2020). Study on practical IoT applications in civil aviation industry. In the 6th International Conference on Artificial Intelligence and Security, Springer, Hohhot, China, Part II, 6: 160-169. https://doi.org/10.1007/978-981-15-8086-4_15

Heale R and Forbes D (2013). Understanding triangulation in research. Evidence-Based Nursing, 16(4): 98-98. https://doi.org/10.1136/eb-2013-101494 **PMid:23943076**

Henseler J, Ringle CM, and Sarstedt M (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science, 43: 115-135. https://doi.org/10.1007/s11747-014-0403-8

Jamshed S (2014). Qualitative research method-interviewing and observation. Journal of Basic and Clinical Pharmacy, 5(4): 87-88. https://doi.org/10.4103/0976-0105.141942 **PMid:25316987 PMCid:PMC4194943**

Keivanpour S and Kadi DA (2019). The effect of "Internet of Things" on aircraft spare parts inventory management. IFAC-Papers Online, 52(13): 2343-2347. https://doi.org/10.1016/j.ifacol.2019.11.556

Khan N and Efthymiou M (2021). The use of biometric technology at airports: The case of customs and border protection (CBP). International Journal of Information Management Data Insights, 1(2): 100049. https://doi.org/10.1016/j.jjimei.2021.100049

Kim T, Jo H, Yhee Y, and Koo C (2022). Robots, artificial intelligence, and service automation (RAISA) in hospitality: Sentiment analysis of YouTube streaming data. Electronic Markets, 32(1): 259-275. https://doi.org/10.1007/s12525-021-00514-y

Kumar V and Reinartz W (2018). Customer relationship management. Springer, Berlin, Germany. https://doi.org/10.1007/978-3-662-55381-7

Lazzarini SG (2007). The impact of membership in competing alliance constellations: Evidence on the operational performance of global airlines. Strategic Management Journal, 28(4): 345-367. https://doi.org/10.1002/smj.587

Lien CH, Hsu MK, Shang JZ, and Wang SW (2021). Self-service technology adoption by air passengers: A case study of fast air travel services in Taiwan. The Service Industries Journal, 41(9-10): 671-695. https://doi.org/10.1080/02642069.2019.1569634

Lim J (2021). How blockchain and IoT-based decentralized system solves ULD rental problem of airlines. Archives of Business Research, 9(10): 331-344. https://doi.org/10.14738/abr.910.11164

Mokha AK and Kumar P (2022). Examining the interconnections between E-CRM, customer experience, customer satisfaction and customer loyalty: A mediation approach. Journal of Electronic Commerce in Organizations, 20(1): 1-21. https://doi.org/10.4018/JECO.292474

Moro S, Lopes RJ, Esmerado J, and Botelho M (2020). Service quality in airport hotel chains through the lens of online reviewers. Journal of Retailing and Consumer Services, 56: 102193. https://doi.org/10.1016/j.jretconser.2020.102193

Nguyen B and Simkin L (2017). The internet of things (IoT) and marketing: The state of play, future trends and the implications for marketing. Journal of Marketing Management, 33(1-2): 1-6. https://doi.org/10.1080/0267257X.2016.1257542

Ordóñez MD, Gómez A, Ruiz M, Ortells JM, Niemi-Hugaerts H, Juiz C, and Butler TA (2020). IoT technologies and applications in tourism and travel industries. In: Vermesan O and Bacquet J (Eds.), Internet of things–The call of the edge: 341-360. 1st Edition, River Publishers, New York, USA. https://doi.org/10.1201/9781003338611-8

Pappas N, Caputo A, Pellegrini MM, Marzi G, and Michopoulou E (2021). The complexity of decision-making processes and IoT adoption in accommodation SMEs. Journal of Business Research, 131: 573-583. https://doi.org/10.1016/j.jbusres.2021.01.010

Pelet JÉ, Lick E, and Taieb B (2021). The internet of things in upscale hotels: Its impact on guests' sensory experiences and behavior. International Journal of Contemporary Hospitality Management, 33(11): 4035-4056. https://doi.org/10.1108/IJCHM-02-2021-0226

Pillai RG and Devrakhyani P (2020). A data driven approach for customer relationship management for airlines with Internet of Things and artificial intelligence. In: Sharma SK, Dwivedi YK, Metri B, and Rana NP (Eds.), The re-imagining diffusion and adoption of information technology and systems: A continuing conversation: IFIP WG 8.6 international conference on transfer and diffusion of IT: 657-672. Springer International Publishing, Tiruchirappalli, India. https://doi.org/10.1007/978-3-030-64849-7_58

Rapp R (2000). Customer relationship marketing in the airline industry. In: Hennig-Thurau T and Hansen U (Eds.), Relationship marketing: Gaining competitive advantage through customer satisfaction and customer retention: 317-331. Springer, Berlin, Germany. https://doi.org/10.1007/978-3-662-09745-8_18

Raynes C and Tsui KWH (2019). Review of airline-within-airline strategy: Case studies of the Singapore airlines group and Qantas group. Case Studies on Transport Policy, 7(1): 150-165. https://doi.org/10.1016/j.cstp.2018.12.008 **PMid:32501419 PMCid:PMC7148671**

Rejeb A, Keogh JG, and Treiblmaier H (2019). Leveraging the Internet of Things and blockchain technology in supply chain management. Future Internet, 11(7): 161. https://doi.org/10.3390/fi11070161

Sarstedt M, Ringle CM, Smith D, Reams R, and Hair JF (2014). Partial least squares structural equation modeling (PLS-SEM): A useful tool for family business researchers. Journal of Family Business Strategy, 5(1): 105-115. https://doi.org/10.1016/j.jfbs.2014.01.002

Sharma S, Rishi OP, and Sharma A (2021). IoTeST: IoT-enabled smart tourism-Shaping the future of tourism. In: Rathore VS, Dey N, Piuri V, Babo R, Polkowski Z, and Tavares JMRS (Eds.), Rising threats in expert applications and solutions: Advances in intelligent systems and computing: 569-576. Volume 1187, Springer, Singapore, Singapore. https://doi.org/10.1007/978-981-15-6014-9_67

Shoukry A and Aldeek F (2020). Attributes prediction from IoT consumer reviews in the hotel sectors using conventional neural network: Deep learning techniques. Electronic Commerce Research, 20: 223-240. https://doi.org/10.1007/s10660-019-09373-4

Singh A, Singh HP, Alam F, and Agrawal V (2022). Role of education, training, and e-learning in sustainable employment generation and social empowerment in Saudi Arabia. Sustainability, 14(14): 8822. https://doi.org/10.3390/su14148822

Singh HP and Alhamad IA (2021). Deciphering key factors impacting online hotel ratings through the lens of two-factor theory: A case of hotels in the Makkah city of Saudi Arabia. International Transaction Journal of Engineering, Management, and Applied Sciences and Technologies, 12(8): 1-12.

Singh HP and Alodaynan A (2023). The role of educational technology in developing the cognitive and communicative skills of university students: A Saudi Arabian case. International Journal of Advanced and Applied Sciences, 10(7): 157-164. https://doi.org/10.21833/ijaas.2023.07.017

Stergiou C, Psannis KE, Kim BG, and Gupta B (2018). Secure integration of IoT and cloud computing. Future Generation Computer Systems, 78: 964-975. https://doi.org/10.1016/j.future.2016.11.031

Steven AB, Dong Y, and Dresner M (2012). Linkages between customer service, customer satisfaction and performance in the airline industry: Investigation of non-linearities and moderating effects. Transportation Research Part E: Logistics and Transportation Review, 48(4): 743-754. https://doi.org/10.1016/j.tre.2011.12.006

Tang H and Zhang H (2022). Study on IoT big data direction in civil aviation. In the International Conference on Artificial Intelligence and Security, Springer International Publishing, Qinghai, China: 300-309. https://doi.org/10.1007/978-3-031-06788-4_26

Tsang YP, Wu CH, Lam HY, Choy KL, and Ho GT (2021). Integrating Internet of Things and multi-temperature delivery planning for perishable food e-commerce logistics: A model and application. International Journal of Production Research, 59(5): 1534-1556. https://doi.org/10.1080/00207543.2020.1841315

Uncles MD, Dowling GR, and Hammond K (2003). Customer loyalty and customer loyalty programs. Journal of Consumer Marketing, 20(4): 294-316. https://doi.org/10.1108/07363760310483676

Ushakov D, Dudukalov E, Kozlova E, and Shatila K (2022). The Internet of Things impact on smart public transportation. Transportation Research Procedia, 63: 2392-2400. https://doi.org/10.1016/j.trpro.2022.06.275

Wang SW (2014). Do global airline alliances influence the passenger's purchase decision? Journal of Air Transport Management, 37: 53-59. https://doi.org/10.1016/j.jairtraman.2014.02.003

Wang SW and Hsu MK (2016). Airline co-branded credit cards-An application of the theory of planned behavior. Journal of Air Transport Management, 55: 245-254. https://doi.org/10.1016/j.jairtraman.2016.06.007

Yerpude S and Singhal TK (2018). Internet of things based customer relationship management: A research perspective. International Journal of Engineering and Technology, 7(2.7): 444-450. https://doi.org/10.14419/ijet.v7i2.7.10860

Zhang H (2020). Study on IoT solutions in smart airports. In the 6th International Conference on Artificial Intelligence and Security, Springer, Hohhot, China, 6: 170-179. https://doi.org/10.1007/978-981-15-8086-4_16

Zhang X and Yue WT (2019). Transformative value of the Internet of Things and pricing decisions. Electronic Commerce Research and Applications, 34: 100825. https://doi.org/10.1016/j.elerap.2019.100825

Zidi H, Hamani N, Laajili C, and Benaissa M (2022). A reconfiguration approach for a supply chain tracking platform. International Journal of Shipping and Transport Logistics, 14(1-2): 94-113. https://doi.org/10.1504/IJSTL.2022.120675

Zou L and Chen X (2017). The effect of code-sharing alliances on airline profitability. Journal of Air Transport Management, 58: 50-57. https://doi.org/10.1016/j.jairtraman.2016.09.006