Chapter 5
Mobile Technology Application in Aviation: Chatbot for Airline Customer Experience

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Abstract Effective communication between customers and businesses is crucial. Enhancing the communication between customer and company are non-ending efforts that require continuous improvement and approach. In the emergence of new technologies, the transmission of information through technology as a platform adds to more challenging initiatives performed. More enterprises adopt artificial intelligence (AI) to increase operational efficiency, eliminate costly errors, and increase customer satisfaction. Time spent by passengers interacting with airlines is minimized through the use of a practical application that supports their needs, integrated with the natural language processing, conversational agents, or Chatbot's serving as virtual assistants. Artificial intelligence shall assist airline customers in acquiring more accurate related information such as flight booking, schedules, and updates. This chapter offers a multi-focus discussion on initiatives for applying Chatbot systems in the aviation sector, a debate on artificial intelligence technology used in improving communication, enhancing natural language interactions, and the usability response from selected airlines passengers' feedback on the improved systems.

Keywords Airlines · User satisfaction · Automation · Business performance · System interface · Chatbot · Usability

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Introduction

Business entities are gradually enhancing their services and product delivery by continuously investigating the roles of technologies in meeting the growing passengers' needs by improving operational efficiency, product delivery, effective processes, and supporting the interaction between companies and their customers. Similarly, industry players in the aviation sector constantly formulate strategies, approaches, and initiatives to provide effective and better customer services through information technologies (IT). Airlines can adopt various IT technologies for their passengers by enhancing security and safety, improving communication between passengers, ensuring fast information delivery and accuracy, improving flight operations and planning, and many others. The use of technologies allows airlines or airports to operate and manage their businesses through effective communication with their customers and personalising their experience; the advent of digitalised communication helps companies quickly spread information to their large audience.

In order to assist the operations and business of the airlines as well as the aviation sector as a whole, artificial intelligence (AI) has attracted the attention of the industry's key participants. One of the widely popular applications of AI is the Chatbot application developed to support and allow interactive communication between passengers and airlines. In addition to keeping communication between customers and the airlines, the system developed typically acts as a knowledge repository that collects all customers' information and queries useful for future references among existing and potential customers.

The overall goal of this project is to look at how the GPT-3 language model is applied to improve the passenger experience with airlines. In reaching the outcome of the GPT-3 model application, this study emphasises the discussion of three areas; the benefit of AI in the industry, the introduction of GPT-3 models, the development of the prototype, and the usability test among users (who have prior experiences of using existing customer knowledge-based system).

Chatbot Application for Supporting Customer Interactions

AI is a branch of computer science aiming to produce robots behaving like human brains in solving issues or problems that may not be solved using typical conventional approaches (Abduljabbar et al., 2019) or devices that mimic human performance. It can be categorized into strong and weak AI (Dehouche, 2021; Pérez-Campuzano et al., 2021). AI technologies like Chatbots, Recommenders, and Virtual Assistance (VA) can boost companies' branding, build better customer interactions & satisfaction, and tailor the products to the passenger's needs (Rana et al., 2021). The outcome of AI implementation advances the industry, automating processes, analysing data, and engaging engaged employees with customers (Davenport & Ronanki, 2018).

The use of Chatbots in supporting a knowledge-based system assists airlines in rendering effective delivery to customers and improves companies' actual performance in providing fast and quick customer service. Commonly, customers may visit the company's website to search for information or submit questions related to the service or products they obtained from the company. In some instances, airlines may already have developed a knowledge-based system that captures and acquire past customers' inquiries and stores them in the database for the reference of other customers. Availability of this feature or systems' capabilities to search for similar types of past questions for the new customers can improve the company's delivery time to their customers. This capability indirectly enhances customer satisfaction by enabling them to get the answer they are looking for quickly and instantly. However, there could be situations where the customer will be redirected to the customer service officer when they are not getting the answer they are looking for (after communicating and texting with the Chatbot agent through the system). Nonetheless, it helps both sides utilise more productive time in managing time and resources to acquire the solution for the questions faced by the customers.

Implementation of AI in aviation may impact several areas in the industry, such as aircraft design and operations, aircraft production and maintenance, air traffic management, drones, urban air mobility and U-space, safety risk management, cybersecurity, environment, and regulations (European Union Aviation Safety Agency, 2000). In addition, the use of AI may positively affect companies such as minimising higher costs of cancellation (Abduljabbar et al., 2019), enhancing the efficiency and efficacy of businesses and operations (by minimising potential risks errors) (Mat Rahim et al., 2018), and improving customer/passenger satisfaction (Adam et al., 2021; Følstad & Skjuve, 2019; Nordheim et al., 2019).

Minimising Costs

Managing costs effectively is vital to ensuring the efficient utilisation of investments made by the organisation. Adopting AI has long-term labour costs reduction, production time, and optimum utilisation of resources. However, AI implementation might require higher initial physical investment (acquisition of tools, equipment, and devices) and non-physical investment (human resources, training, intellectual development). As an indicative measure, implementing AI tools helps reduce healthcare costs in the health industry and optimise the available system for effective productivity of businesses. The relationship between AI investment and its implications for operational costs of the company portrays the strength of its influence in assisting the companies in managing their expenses. Adopting AI could minimise the organisation's costs without affecting their quality, or both costs and quality are increasing simultaneously (Golding & Nicola, 2019).

Enhancement of Business Operations

The performance of businesses relies heavily upon the interaction among employees, managers, and decision-makers supported by IT systems. AI and IoT-enabled technologies could contribute as an essential technology in supporting airline operations and procedures. For example, AI technology could overcome the recovery issues of airline operations (involving agents, crew and passengers) with less time and cost (Castro & Oliveira, 2007). Hence, airlines should investigate new ways to boost passenger experience (using cutting-edge creative technology) (Chakraborty et al., 2021). Moreover, AI has its advantages that can support the human decision-making process (Robinson et al., 2005), integrate data with business tools (Gupta et al., 2022), and support complex airline operations by eliminating human error-causing factors (Mat Rahim et al., 2018). The human-computer interaction improves inspection efficiency and reliability in aviation, decreases risk and uncertainty, and self-adapts to various aircraft, services, investigation contexts, and operational situations (Donadio et al., 2018). Since enabling communication between customers and companies through Chatbots may be inconvenient; thus, more investigation into using AI to provide accurate and closely imitating human-like conversations is crucial and needed.

In another experiment, agent-based modelling simulation (ABMS) successfully supported the involved company to compare and coordinate the organisation's policies to enhance the coordinating mechanisms of a highly complicated socio-technical air transportation system (Bouarfa et al., 2016). The use of AI is significant as facilitating tools commonly embedded within existing applications and as a tool used to manage and coordinate the right policies used by the organisation. Despite the advantage of AI to business operations, the lack of academic research to integrate AI with business operations increases the chance of project failure and undesirable outcomes (Reim et al., 2020). Therefore, it is paramount that more diverse research investigates the efficiencies of AI implementation in the organisation (specifically in the aviation sector). Moreover, the GPT-3 model is just newly introduced in the industry; therefore, the outcome of more research and experiment in would derive and elaborate on its benefit and advantage to the industry.

Improvement of Customer Satisfaction

Today, technologies have gone beyond enabling businesses and driving businesses to be more competitive within the robust and dynamic markets. Companies directly interact with customers' needs to ensure that the communication between customers and the company is effective and efficiently performed. Moreover, the use of technologies in supporting business operations and processes somehow has minimised the direct interaction among humans through the use of technologies platform. The

use of technologies to facilitate business processes, special communication between company and customers, is gradually attracting attention.

Interaction of customers with companies through the use of technological platform facilitates the customer in getting information and with utmost attention (Adam et al., 2021; Følstad & Skjuve, 2019), whereby the use of Chatbots have a significant role in optimising customer service operations (Nordheim et al., 2019). Customers are using Chatbots to seek information and assistance; hence, Adam et al. (2021) suggested that customers should be aware that they are communicating and liaising with the automated agent but not directly with the customer service officer. The situation whereby customers are aware that they are liaising with agents but not with humans allows them to interact more naturally with the system. Although customer trusts the system as a replacement to communicate with the company, Følstad and Skjuve (2019) stated that they would use it to use straightforward and straightforward transactions. In elevating the customer trusts in using the system, factors such as Chatbot-related (expertise, responsiveness), environment-related (risk, brand), and user-related (propensity to trust technology) are needed to enhance the trust in using Chatbots for customer service applications (Nordheim et al., 2019). Given the benefits and advantages of using Chatbots for customer satisfaction, there should be more opportunities for future studies to investigate the outcome and benefits of using the system.

Generative Pre-Trained Transformer 3 (GPT-3) Algorithm

What is GPT-3?

Most business entities work continuously and effortlessly to develop a system that can interact with customers who understand language naturally. The ability to establish a system that can understand the common language and standard language used by customers helps to minimise additional traffic volume of the transaction; reduce human-computer interaction with a customer service officer, and improve the response time performance by the airlines. As such, limited technology capabilities able to support these goals may humidify companies' intention to provide excellent service while satisfying the needs and expectations of their customers. As a result of recent developments in Natural Language Processing (NLP), such as OpenAI's GPT-3 language model, expectations for both parties (companies and customers) are now attainable.

GPT-3 is a predictive language model that produces human-like text (such as responding to questions, composing essays, interpreting language, capturing notes, summarising lengthy texts, and even creating computer coding) than the earlier version (Ibrokhim & Ugli, 2020). Again, Ibrokhim and Ugli (2020) highlights that GPT-3 involves 175 billion parameters as opposed to 1.5 billion machine language parameters (artificial neural networks (ANNs) in the earlier version. It works well

by transforming texts into other forms such as numerical or representations while processing millions of readers. Subsequently, GPT-3 decomposes the texts into more easily and readable words and sentences by humans. The language model works by picking up and learning the other languages through continuous exposure to various scales. Although several developments indicate its ability to understand and learn the different languages better intelligently, studies also suggested that some improvements should be needed to accommodate its achievement. For example, it might sometimes fail at the most basic linguistic tasks without specific rules, yet it can thrive at more challenging ones like copying an author or waxing philosophical (Elkins & Chun, 2020). The critical challenge for any artificially intelligent conversation model is to account for a speaker's communicational objectives and motivations via shared attention (Montemayor, 2021). Arising from the critical criteria of the model and studies highlighting the requirement for additional consideration for improvement, the outcome of this study can shed light on some of the capabilities and limitations of the system developed based on the GPT-3 model for enhancing the airline customer experience.

Prototype Development

The prototyping approach uses an AI Chatbot powered by GPT-3 language model to construct the system. Prototyping is a technique for developing strategies that are well-suited to resolve issues between users and system developers that may cause the user's inability to appropriately communicate their expectations or system developers' failure to understand the users' requirements. Therefore, the researcher has built a GPT-3 powered Chatbot in a smaller-scale model (that does not need to suit all users). The model is available to a specific group of consumers, so they may try it out and understand the requirements; before developing the whole system. After creating the system's prototype, the next development cycle to improve and rectify any additional requirements for the existing system is done based on the users' input during the prototype development stage. In developing the Chatbot programs applying GPT-3 as one of the components, the researchers have formulated the component structures (see Fig. 5.1).

The prototype model developed requires a developer interface (Python 3.9), an OpenAI API key, a database (a GitHub account), messaging service (a Twilio account), and cloud application hosting (a Render account), and a user interface (WhatsApp account). The researcher uses Python and Flask frameworks to build the system, and the Visual Studio Code editor is used to write the system's code. An API key from OpenAI uses to access GPT-3. Meanwhile, Twilio handled the message service by Twilio, and the implementation of the Chatbot was using Render as a cloud hosting for the application. GPT-3 and users communicate using the WhatsApp application.

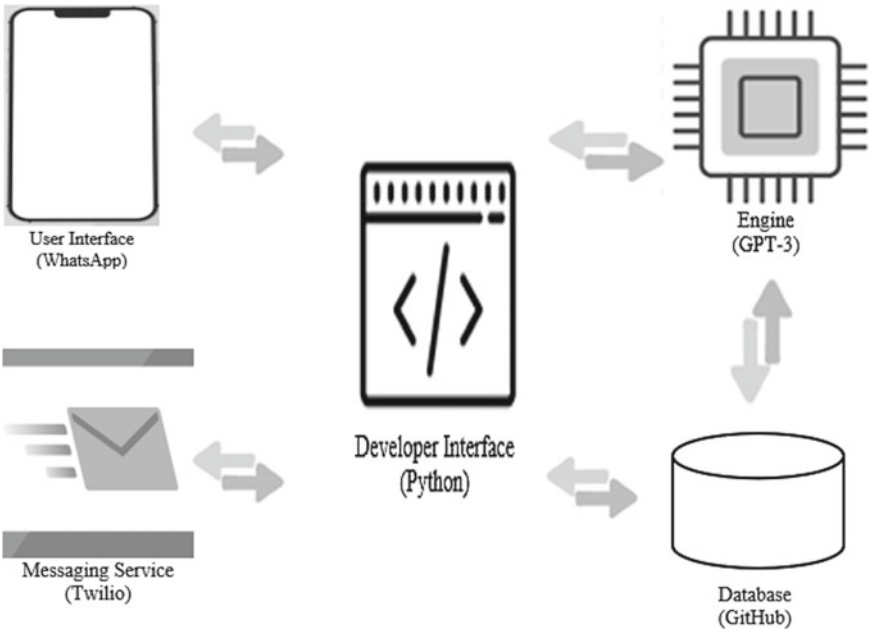

Fig. 5.1 Structure of prototype systems development. *Source* Modified and developed by the authors (2022)

Developing the Interface (Using Python)

Python developed a system installed in a virtual environment. A virtual environment is an interpreter for Python used to install packets without affecting the primary system. The code is more constrained and reproducible since a single location locates all dependencies and site-packages. There are several ways to configure virtual environments, but the commands below used in this development stage:

```
$mkdir AiharaBot_GPT-3
$cd AiharaBot_GPT-3
$Python -m venv venv
$.\venv\Scripts\activate
(venv) $ pip install openai twilio flask pythn-dotenv gunicorn
```

After creating the virtual environments and executing the coding, installation of all packages and dependencies (such as openai, Twilio, flask, pythn-dotenv, and gunicorn) are in the virtual environment are done.

Creating the Repository and Database (GitHub)

The database stores created and acquired data linked to the system, opening a new database in the GitHub App. The procedure for creating a GitHub database is as follows:

1. Login to the website or open GitHub applications to create the database
2. Choose ‘New Repository’ on the top right corner of the menu
3. Name the repository at the opened dialogue box before its opening in Visual Studio Code.
4. Add Python gitignore file before creating repository—to refrain from uploading the.env file (with API access tokens) and the virtual environment.

Creating the Repository and Database (GitHub)

An API key from OpenAI is required to gain access to GPT-3. The Chatbot program will need this API key; thus, included in a new.env file. The rationale for keeping it behind the.env file is that it is a secret key, and anyone with the API key will have access to GPT-3. The.env file is placed and imported as a variable, and the constructed default gitignore file includes the.env file.

Prompting the Chatbot

The system assigned developed Chatbot with identity before adding Question and Answer (Q&A) criteria. Several created lists of Q & A demonstrate how GPT-3 creates relevant text when prompted. In providing a better overview, users can learn more about GPT-3 by logging in to the OpenAI playground, and within a few instances, GPT-3 will fill in the blanks and duplicate users taught lessons about it.

Meanwhile, a brief text explanation of the system prompted a chatbox. Arising from the description of the system’s identification, several Q & A are prepared to guide GPT-3 engine to follow the Q & A structure. The newly added system shall follow the exact format to design the Chatbot system while responding to inquiries (and comments) about airlines’ products and services. The GPT-3 algorithm only requires a few samples to bring the system back to life. Finally, converting and exporting the Playground codes to Python are done.

```
import os
import openai
openai.api_key = os.getenv("OPEN_API_KEY")
start_sequence = "\nA:"
restart_sequence = "\n\nQ:"
response = openai.Completion.create(
        engine = "dbase"
        prompt = "I am Aihara.I am your AI personal flight attendant powered by GPT-3"
        temperature=0,
        max_tokens=100,
        top_p=1
        frequency_penalty=0,
        presence_penalty=0,
        stop=["\n"]
        )
```

Code is copied and pasted in an IPBOT.py file once Python imports the conversion and Playground codes. At this stage, the Chatbot is ready to use OpenAI API to produce responses in Python by allowing the API key to inform OpenAI that the system has made the request. At first, initialise the created IPBOT.py file. In the next

stage, copying the start and restart sequences directly from the Playground code was performed. Subsequently, add the session prompt variability to set the text written earlier in the playground. It becomes the referred global variables outside of any functions. Its purpose is to teach the system how to speak and respond to questions.

The following part concentrate on Chatbot interaction. The next step was executing the code once the completion of Chatbot prompt. At first, creating a new ask function takes two arguments. The first question is the actual question that is compulsory and becomes the text input from the other end of the chat. The second argument of the chat log is optional. The chat log lists everything conversed; therefore, the Chatbot can understand what is happening. The register is set as equal to None to begin.

```
Def ask (question, chat_log=None):
Prompt_text = f'{chat_log}{restart_sequence}: {question}{start_sequence}:'
Response= openai.Completion.create(
                    engine=" devinci",
                    prompt=prompt_text,
                    temperature=0
                    max_tokens=100,
                    top_p=1,
                    frequency_penalty=0,
                    presence_penalty=0,
                    stop=["\n"],
                    )
Stort = response['choices'][0]['text']
Retrun str(story)
```

Afterward, the response variable is added, which sends a completion request to the GPT-3 engine. OpenAI has provided the create function. This process contains several arguments that will notify GPT-3 on how creative it should be and how many tokens it should use. The API will return a conveniently set response equal to the parse and used response variable. Another transformation is adding a new prompt text variable to the ask function. The *f'* creates a string variable that contains all of the Chatbot's histories and the restart, question, and start sequences required to prompt GPT-3. Finally, argument code is added, which tries to set the prompt = prompt text.

The system has everything it needs for the user to communicate with the GPT-3 bot after all of the required and necessary prompts have been written.

User Interface (Connecting to WhatsApp)

The system has everything it needs for the user to communicate with the GPT-3 bot; after all of the required and necessary prompts have been written. When specific actions on a repository or organisation occur, Webhooks allow sending notifications to an external web server (Github Docs, n.d.); the Webhook link is copied in Render once installed and pasted in the incoming messages section. Once completed, a WhatsApp message sends to the identified number with the join code to initiate communication with GPT-3.

Engine (GPT-3 Algorithm)

- *System's operability and functionality*

The developed system must be measured and analysed for its operability and functionality with the intended users. The objective of the test is to measure the acceptance level of airlines passenger with the systems interface and its usability among passengers who have experience in using the existing system and interacting with airline passengers. Two aspects analysed the operability and functionality of the system: (1) general feedback of the system; and (2) its usability and satisfaction of users with the Interface. The usability and user interface satisfaction analysis uses five elements of QUiS (Questionnaire for User Interface Satisfaction) (Chin et al., 1988).

Users are identified based on their previous experience using the existing information system of any airline. There are two stages categorised users' feedback: the prototype development and the complete development of the system. Users' feedback from the prototype development stage becomes the input for the researcher to provide improvement to the initially created system. Finally, once the system is fully developed, other users are invited to use the system by entering the set of questions to test its usability and functionality.

The outcome of the questions helps determine whether the systems met the passenger's satisfaction. This study adopts descriptive analysis (mean score) to analyse the respondent's acceptance level of the designs.

Two sections separate the layout of the questions: general user input and system interface usability. (see Fig. 5.2). The decision to split the types of questions into three different natures is to ensure that robust and rigorous types of questions are asked to users to measure the capability of the systems developed. For fixed pre-set questions, the researcher provides similar questions to all users to key into the system. Meanwhile, the researcher gave the random pre-set questions keyed in by the users.

Justification of these types of testing is due to the cooperation between the developer (technical expertise that understands the system capabilities) and the user (who perform the system testing based on their expectation and prior experiences). The final question's category provides flexibility to users in posting questions. Random

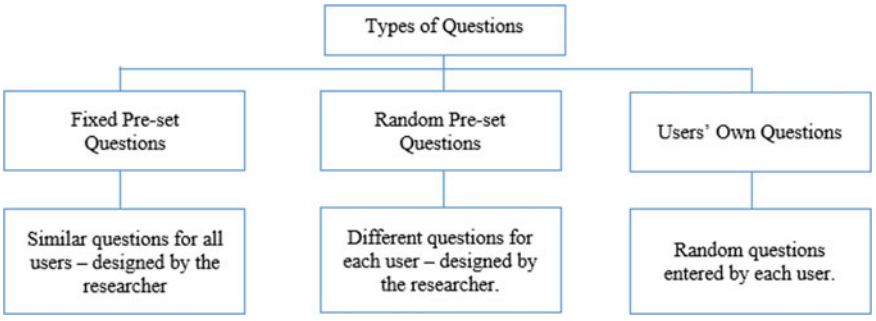

Fig. 5.2 Types of questions designed—user testing. *Source* Modified and developed by the authors (2022)

pre-set queries and users' questions are written in English and Malay to further test and measure the system's capabilities.

- *Result analysis*

Arising from the test performed by the users, the system usability test and its applicability are conducted. The test required users to key in their feedback through a distributed survey questionnaire. Analysis of the operability and functionality of the system separated into two aspects of categories:

(1) general input about the system
(2) the usability and user satisfaction system interface.
(3) The usability and user interface satisfaction analysis adopts five elements of QUiS (Questionnaire for User Interface Satisfaction) (Chin et al., 1988).

Both parts of the assessment are analysed descriptively to explore their usefulness and suitability among users for future exploration and studies. The users' general feedback highlights the effectiveness, efficiency, engagement, error of tolerance, and ease of learning experienced by the users in using the system. Overall, the majority of the elements show that:

1. users agree the system is adequate for retrieving information (90% agreed)
2. efficient to be used (90% satisfied)
3. willing to use the system again in the future (80% agreed)
4. error discovered while using (80% said rarely found)
5. easy to ask questions in the system (80% found it was easy)

The usability and system interface tests adopt the QUiS template developed by Chin, Diehl and Norman (1988) with five elements (overall user reaction to the system, system screen, the terminology used, learning process, system capabilities, etc.).

The test result indicates that the average satisfaction is 7.0 out of 10 scales used in the questions template (Fig. 5.3).

Recommendations and Conclusion

In the past, IT systems enable businesses; however, in the emerging demands of business and customer requirements, IT systems have become the critical drivers to leading the industry. Without the use of technology, in the current situation, it may be complex and challenging for the business to catch up and remain valid in the competitive market. This chapter formulates the explanation based on three areas:

1. What is artificial intelligence?
2. Benefits and the advantage of artificial intelligence in the aviation
3. Development of Chatbot prototype utilising GPT-3—the latest natural language processing (NLP) algorithm
4. User usability and system interface test.

General Feedback

Elements	Response
Effectiveness *Did you get the information you wanted from the system?*	Yes – 90% No – 10%
Efficiency *Are you satisfied with the system?*	Satisfied – 90% Unsatisfied – 10%
Engagement *Would you use the system again?*	Yes – 80% Maybe – 20%
Error of Tolerance *How frequently do you experience slow system response?*	Rare – 80% Never – 10% Frequent – 10%
Ease of Learning *Was it easy to formulate questions?*	Easy – 80% Average – 20% Difficult – 00%

Usability and System Interface
(Chin et al, 1988)

Elements	Mean
User Overall Reaction to the system	8.00
Screen	7.85
Terminology and System Information	7.07
Learning	7.13
System Capabilities	7.17

Fig. 5.3 Usability and interface elements. *Source* Modified and developed by the authors (2022)

This chapter offers a brief overview of AI's know-what and know-why advantage of its adoption in fronting the communication between airlines with their customers and the use of AI within the aviation industry. Implementing AI for businesses shall benefit the organisation by minimising costs, enhancing business operations, and improving customer satisfaction. Minimisation of charges does not only come from the context of monetary value but in terms of productivity benefit and return of investment (as a result of putting investment with the technologies). Meanwhile, business operations typically can be seen and realised quickly as most of the implementation of IT systems or artificial intelligence focuses on automating business processes and minimising time consumed in accomplishing tasks, processes, and day-to-day operations.

In the context of improvising customer satisfaction, AI is not new to the business through various initiatives to support their operations in fronting communication with customers. The use of AI Chatbots to replicate or mimic the' honest' communication between passengers and airline companies helps, to some extent, minimise the waiting time, improve quick customer response and reduce the bottleneck of responding to customers by customer service officers. Although existing Chatbot initiatives support customer knowledge-based systems, the ongoing customer demand and the advancement of AI technology motivate future system research and development. As discussed in one of the academic discussions, a lack of research to support managers in the industry with the implementation and integration of AI in the business may increase the chances of undesirable outcomes and failure of the project. Therefore, discussion on developing a customer interface application prototype for airline passengers; and conducting a usability test shall offer an additional view and exposure to how slight improvements can provide more tremendous changes to the existing airlines' operations and customer experience.

References

Abduljabbar, R., Dia, H., Liyanage, S., & Bagloee, S. A. (2019). Applications of artificial intelligence in transport: An overview. *Sustainability, 11*(1), 189.

Adam, M., Wessel, M., & Benlian, A. (2021). AI-based chatbots in customer service and their effects on user compliance. *Electronic Markets, 31*(2), 427–445.

Bouarfa, S., Blom, H. A. P., & Curran, R. (2016). Agent-based modeling and simulation of coordination by airline operations control. *IEEE Transactions on Emerging Topics in Computing, 4*(1), 9–20.

Castro, A., & Oliveira, E. (2007). A distributed multi-agent system to solve airline operations problems. In *ICEIS 2007—9th International Conference on Enterprise Information Systems, Proceedings*, *AIDSS*. Funchal: The 12th–16th June, pp. 22–30.

Chakraborty, S., Chakravorty, T., & Bhatt, V. (2021). IoT and AI driven sustainable practices in airlines as enabler of passenger confidence, satisfaction and positive WOM: AI and IoT driven sustainable practice in airline. In *Proceedings—International Conference on Artificial Intelligence and Smart Systems (ICAIS) 2021*. Coimbatore: The 25th–27th March, pp. 1421–1425.

Chin, J. P., Diehl, V. A., & Norman, K. L. (1988). Development of an instrument measuring user satisfaction of the human-computer interface. In *CHI '88: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. Washington D.C.: The 15th–19th May, pp. 213–218.

Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review*, January–February, pp. 108–116.

Dehouche, N. (2021). Plagiarism in the age of massive generative pre-trained transformers (GPT-3). *Ethics in Science and Environmental Politics, 21*, 17–23.

Donadio, F., Frejaville, J., Larnier, S., & Vetault, S. (2018). Artificial intelligence and collaborative robot to improve airport operations. *Lecture Notes in Networks and Systems, 22*, 973–986.

European Union Aviation Safety Agency (EASA). (2000). *Artificial intelligence roadmap—A human-centric approach to ai in aviation*. Retrieved from: https://www.easa.europa.eu/document-library/general-publications/easa-artificial-intelligence-roadmap-10. Accessed 20 Mar 2022.

Elkins, K., & Chun, J. (2020). Can GPT-3 pass a writer's turing test? *Journal of Cultural Analytics, 5*(2), 1–16.

Følstad, A., & Skjuve, M. (2019). Chatbots for customer service. In *CUI '19: Proceedings of the 1st International Conference on Conversational User Interfaces*, pp. 1, 1–9.

Github Docs (n.d.). *About Webhooks*. https://www.docs.github.com/en/get-started/customizing-your-github-workflow/exploring-integrations/about-webhooks. Accessed 20 Mar 2022.

Golding, L. P., & Nicola, G. N. (2019). A business case for artificial intelligence tools: the currency of improved quality and reduced cost. *Journal of the American College of Radiology, 16*(9), 1357–1361.

Gupta, S., Modgil, S., Bhattacharyya, S., & Bose, I. (2022). Artificial intelligence for decision support systems in the field of operations research: Review and future scope of research. *Annals of Operations Research, 308*(1–2), 215–274.

Ibrokhim, M., & Ugli, B. (2020). Will human beings be superseded by generative pre-trained transformer 3 (GPT-3) in programming? *International Journal on Orange Technologies, 2*(10), 141–143.

Mat Rahim, S. R., Mohamad, Z. Z., Abu Bakar, J., Mohsin, F. H., & Md Isa, N. (2018). Artificial intelligence, smart contract and islamic finance. *Asian Social Science, 14*(2), 145.

Montemayor, C. (2021). Language and Intelligence. *Minds and Machines, 31*(4), 471–486.

Nordheim, C. B., Følstad, A., & Bjørkli, C. A. (2019). An initial model of trust in chatbots for customer service—Findings from a questionnaire study. *Interacting with Computers, 31*(3), 317–335.

Pérez-Campuzano, D., Morcillo, P., Rubio, L., & López-Lázaro, A. (2021). Artificial intelligence potential within airlines: A review on how AI can enhance strategic decision-making in times of COVID-19. *Journal of Airline and Airport Management, 11*(2), 53–72.

Rana, J., Gaur, L., Singh, G., Awan, U., & Rasheed, M. I. (2021). Reinforcing customer journey through artificial intelligence: A review and research agenda. *International Journal of Emerging Markets, 17*(7), 1738–1758.

Reim, W., Åström, J., & Eriksson, O. (2020). Implementation of artificial intelligence (AI): A roadmap for business model innovation. *Ai*, 1(2), 180–191.

Robinson, S., Alifantis, T., Edwards, J. S., Ladbrook, J., & Waller, A. (2005). Knowledge-based improvement: Simulation and artificial intelligence for identifying and improving human decision-making in an operations system. *Journal of the Operational Research Society, 56*(8), 912–921.

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