

# Airport Design Thinking: An Employee Perspective

Kom Campiranon<sup>1</sup>

{kom@citu.tu.ac.th<sup>1</sup>}

College of Innovation, Thammasat University, No. 2 Phrachan Road, Bangkok 10200, Thailand<sup>1</sup>

**Abstract.** Airports worldwide have been disrupted by several factors, including, but not limited to, competition between significant airport hubs, emerging technologies, outbreaks such as SARS and COVID-19, and the Ukraine conflict. Consequently, airports must redesign their passenger experience to successfully execute airport operations despite ongoing disruption. To cope with the challenges discussed above, several authors have suggested that design thinking is a problem-solving approach that can be employed. This paper is guided by the research question: How can airport employees utilize design thinking to design a better service in the post-COVID-19 era? It is envisaged that this paper will provide a unique perspective on airport design thinking and propose an agenda for future research.

**Keywords:** Airport, service design, design thinking, COVID-19, Thailand

## 1 Introduction

Airports worldwide have played a significant role in the tourism and air transport industries by connecting cities, countries and continents. Furthermore, the airport is considered by tourists as the first and last image of a destination [1]. Airports also provide a critical infrastructure that contributes significantly to the air transport value chain and stimulates regional socioeconomic development through the promotion of business and tourism-related activities [2].

Like airline businesses, airports compete to attract more passengers through numerous services. Consequently, the quality of airport services is a crucial indicator of passenger satisfaction, which leads to an intention to use the airport again [3]. Therefore, the airport experience has become an essential part of the travel experience. Airports are transit areas and represent a particular experience that includes various commercial activities such as retail shopping, entertainment services, and food and beverages [4].

Enhancing the airport experience can improve passenger journeys, generate non-aeronautical revenue, and enhance airport demand. All of these can help improve service quality, enhance the airport's competitive position, and influence passenger purchasing decisions, which, in turn, may lead to re-using the airport and its services and recommendations to others [4].

On the other hand, particularly with the increase in airport hub alternatives, passenger perceptions of the airport experience have shifted [4] with rising demand for higher levels of

service quality [5]. Therefore, airport experience pain points significantly affect passenger perceptions of service quality,

such as terminal congestion [6], long immigration queues, disorganized security checkpoints, uninformative ground staff [1], and inconsistent service delivered by different providers [3, 6]. Consequently, passengers demand a better experience with less waiting time, more control of the processes (via technology) and regularly updated information about their flights [1].

It should be pointed out that recent crises have influenced airports around the world. Past pandemics, such as SARS in 2002 and H1N1 in 2009, have caused severe airport disruption. Compared to previous pandemic outbreaks, however, COVID-19 has had a more devastating impact worldwide through travel restrictions, which affected the passenger volume, the number of flights, the airline flow patterns, and the airport network [7]. Therefore,

Passengers demand better service quality from airport and airline staff and better technological facilities regarding safety and security during COVID-19 [8].

Another recent disruption is the war in Ukraine. Nonetheless, IATA [9] explained that the conflict in Ukraine had had a much more limited impact on air travel demand than the spread of Omicron in China, the rising inflation rate and falling consumer confidence. In Asia, airline recovery remains slow. However, the recent easing of travel restrictions in many countries in the region, including Thailand, which is the focus of this paper, is optimistic. The details regarding airports in Thailand are as follows.

### **1.1 Airports in Thailand**

Thailand has a total of 38 airports, including seven international airports [10] with six privatized airports operated by the Airports of Thailand Public Company Limited (AOT), three private airports run by Bangkok Airways Plc., and 29 public airports run by the Department of Airports (DOA) [11].

Recent studies have shown that improvements in the passenger experience at airports in Thailand are needed. Chutiphongdech and Vongsaraj [11] utilized data envelopment analysis and the Malmquist productivity index to examine the technical efficiency scores and capture the total productivity change during 2009–2018 for 31 airports in Thailand. The results revealed that airports in Thailand were technically inefficient and not performing at the optimal level.

Moreover, Fakfare, Wattanacharoensil [1] added that most international airports in Thailand received a significant number of complaints, as evidenced in the passenger comments on the Skytrax Airport Reviews website. According to Chonsalasin, Jomnonkwao [12], these issues resulted from the growth in air travel which caused most airports in Thailand to handle numbers of passengers and flights that exceeded their original capacity. Such an issue has negatively affected service quality at Thai airports.

### **1.2 Research Rationale**

To cope with the challenges discussed above, several authors [e.g., 13, 14] have suggested that design thinking is a problem-solving approach that can be employed. While most studies addressed customer-focused innovation, this paper focuses on innovation created by the employee, which guides the research question: How can airport employees utilize design

thinking to design a better service in the post-COVID-19 era? By engaging airport employees in the process, which is the foundation of design thinking, this paper has tasked the airport employees to identify the critical pain points as the first stage of design thinking, which is the inspiration stage. Using their creativity, airport employees generate ideas and solutions in the second stage, ideation. This idea is followed by implementation, the third stage, in which airport employees create prototypes based on their beliefs.

It is envisaged that this paper not only provides managerial implications to airport executives but also fills two research gaps. Firstly, while existing airport literature is continuously expanding [4], most studies focus on the passenger perspective, with limited studies focusing on the service provider perspective. Secondly, while the biggest hubs are often the subject of airport study, such as Thailand's Suvarnabhumi Airport, other airports in the area have received less attention [15]. To fill both gaps, the relevant literature, which provides the theoretical background for this paper, will be reviewed in the section below.

## **2 Literature Review**

### **2.1 Airport Service Quality**

Efficiency enhancement is one of the priorities for airport management, policymakers, and other stakeholders worldwide [11]. Over the last two decades, airport efficiency and productivity studies have attracted increased attention. Over 100 papers related to the topic have been published in peer-reviewed journals in many areas, including transportation, economics, management, operations research and mathematics [2]. Selected papers related to the topic are discussed below.

Based on one of the studies aiming to improve the understanding of airport efficiency and productivity, the results revealed that airport ownership form and size, hub status and economic regulations are popular variables used to explain differences in airport efficiency [2]. A study on the effects of airport service quality on trust, perceived value, customer satisfaction, and airports' corporate image revealed that the passenger experience reflects the airport's image, affecting the airport's reputation [5].

While many studies have focused on best practices, many have highlighted service failure. One of the studies on the impact of airport service failure revealed that the airport value chain is likely to suffer when a service attribute fails [6]. As this paper aims to identify how airport services could be improved, it is crucial to understand airport service attributes, which are discussed below.

### **2.2 Airport Service Attributes**

As service quality has become a key area of interest to airports [6], airport management and stakeholders need to understand how service's multiple dimensions and attributes can affect passenger satisfaction [3]. Academics have paid increasing attention to airport quality, particularly in terms of the service attributes perceived by passengers, due to the close

association with satisfaction, operational performance and non-aeronautical revenue. It should be pointed out, however, that previous studies generally focused on categorizing airport quality attributes into broad service aspects, which vary between studies [1], as illustrated below.

One study utilized topic modeling and sentiment analysis to assess the top three airport service dimensions in terms of importance: leisure activities, ambient conditions and immigration processes [4]. Another study categorized airport service attributes into ten dimensions: Airport Signage and Layout, Terminal Environment, Flight Information Screens, Check-in, Security, Passenger Facilities, Immigration, Departure Hall, Baggage Service, and Leisure and Entertainment [1]. Airport service attributes can also be categorized as access to the airport, airport security systems, check-in, airport facilities, wayfinding, the airport environment, and arrival and customs services [12].

While several authors proposed various approaches to categorize passenger-related service attributes [6], and there is no consensus regarding the definitions of airport quality attributes [16], the following categories are often employed: attributes of function (e.g., speed of processes, wayfinding, and physical layout), attributes of interaction (e.g., with service personnel) and attributes of diversion (e.g., shopping and dining, leisure facilities, and Wi-Fi) [6, 17]. Therefore, this paper will adopt such categories for airport service attributes.

### **2.3 Design Thinking**

Design thinking is an approach to innovation and creative problem solving [18] focusing on the user's needs and experiences, which provide valuable insights that guide innovation and development [19]. Design thinking aims to match the users' needs with solutions that are feasible and align with the business strategy to create customer value and market opportunity [18].

Scholars and practitioners acknowledge the role of design thinking as one of the critical drivers of innovation and change [20]. Consequently, design thinking has been implemented in various fields, including product and service innovations [21]. Other characteristics of design thinking include, but are not limited to, the themes of problem framing, user focus, visualization, experimentation and diversity, observation, collaboration, fast learning, rapid concept prototyping and experimentation [18].

In general, design thinking requires a process of inspiration, creativity, and implementation [14]. Motivation focuses on understanding end-user stories to empathize [22] to empathetically understand the given problem from the user's perspective. Observing users in real-life context situations, the practitioner defines a good problem and solution space [19]. Therefore, the tools used in this context include questionnaires and interviews aimed at inducing users to communicate their needs [20]. Then is followed by the ideation stage, where potential alternatives are generated [18], and a prototype is created. Lastly, the implementation stage focuses on testing and implementing the solutions in the real world [22].

## **3 Methodology**

Due to the exploratory nature of this research, a qualitative methodology has been utilized. This case study encompasses a design thinking workshop in which design thinking was used to examine and explore how airports could redesign their services in the post-COVID-19 era.

Samples were selected using a purposive sampling technique while the executives at each airport encouraged their staff to participate in generating new prototypes for airport service design.

According to the Airport Authority of Thailand [23], six airports serve 84 scheduled airlines, with 67,018 international flights and 178,440 domestic flights, for a total of 20.01 million passengers comprising 0.95 million international passengers and 19.06 million domestic passengers. As See, Ülkü [2] pointed out, airport size is one of the most-used determinants of airport efficiency, and most studies suggested that airport size contributes to airport efficiency. Moreover, Halpern and Mwesiumo [6] added that some airports operate in a less competitive environment, which means that passengers have limited alternative options when traveling. This paper has selected small, medium, and large-sized airports to understand the pain points and the need for enhanced service design at each airport.

**Table 1.** Airport profiles

Airports	Size	Region in Thailand	% of total passenger in 2021
A	Large hub	Central	29.8
B	Large hub	Central	35.8
C	Medium hub	Northern	12.5
D	Small hub	Northern	4.4
E	Medium hub	Southern	9.3
F	Small hub	Southern	8.1
<b>Total</b>			<b>100</b>

Source: Adapted from Airport Authority of Thailand [23]

From June-August 2021, virtual design thinking workshops were held with 42 participants from six major airports in Thailand. The participants' roles covered a wide area, from passenger services to doctors and engineers at these airports. Similar to the study by Kitsios and Kamariotou [24], the motivation for participants who engage in the workshops is new knowledge in design thinking and innovation, skill growth, intellectual challenge, and career advancement opportunities. The participants' profiles are categorized into four operation areas which are airside, landside, corporate, and airline, as shown below.

**Table 2.** Participants Profile

Airports	Participant categories				Total
	Airside	Landside	Corporate	Airline	
A	3	5	9	1	18
B	4	2	1	1	8
C	1	3	3		7
D			2		2
E	2	1	2		5
F	2				2
<b>Total</b>	<b>12</b>	<b>11</b>	<b>17</b>	<b>2</b>	<b>42</b>

Source: Developed for this paper

Although there are numerous rapid design thinking models, these workshops adopted Thakur, Soklaridis [14]'s approach by focusing on three essential stages during the COVID-19 pandemic, which was turned into three virtual seminars. By concentrating on inspiration

(empathize and define), the first two workshops drew inspiration from the problem or opportunity. The third workshop was creativity, during which innovative ideas were generated to create a prototype. Each workshop spanned approximately three hours, and data were collected from design thinking outcomes submitted by the participants. The data were analyzed through thematic content analysis. Finally, implementation focuses on execution, which means putting innovations into practice.

## **4 Findings**

This section offers findings from the case study concerning the research question. By adapting Törnroth, Nilsson [25], the main findings will be discussed under three stages based on the workshops: inspiration, creativity, and implementation.

### **4.1 Inspiration**

The primary objective of the inspiration stage is to frame the problem and identify any challenges [25]. Firstly, the participants were provided with the project's background, the factors influencing airports (such as COVID-19, airport hub competition, and passenger satisfaction), and the design thinking framework. Each participant was then asked three probing questions: 1. What type of innovation, such as a new product or service, a new process, or a new business model, would you be interested in developing? 2. How will such an innovation benefit airport stakeholders, including passengers and employees? 3. To identify pain points, how and from whom should data be collected?

Following the probing questions, a customer journey workshop guided the participants about the design thinking process. Based on the project that each participant had created, the participants identified major touchpoints related to their job responsibilities. For example, an airport employee taking care of passengers at the departure hall depicted a customer journey starting from the passenger's drop off at the airport, checking in at the airline counter, going through airport security screening, and walking to the gate.

The participants then used the indicated touchpoint to interview the 'users' or critical stakeholders involved in the customer journey. If a feature were related to passenger service, the passengers would be considered the user. If the project were about improving the internal work process, then the airport employees would be the users. During the interview, the participants asked users about their satisfaction level for each touchpoint, from 1 (highly unsatisfied) to 5 (highly satisfied). The participants also asked the users for additional comments to understand why each touchpoint had such a score.

Each participant had one week to collect the data. From the interview discussed above, each participant created a customer journey map to perceive the user journey from the beginning to the end. The participants were then asked to identify the major pain points or fail points and to develop a design challenge or problem statement for their innovation project. Examples of the design challenges devised by the participants were: How might we redesign the airport service at crowded gates? How might we design a fast and safe security screening process during COVID-19?

### **4.2 Ideation**

In the ideation stage, the aim was to ideate solutions using creativity to create rapid prototyping of ideas [25]. From the design challenge discussed above, the participants utilized various brainstorming methods, such as mind mapping, to develop ideas that can be implemented. In the next step, the participants selected opinions from the brainstorming session to develop a prototype, such as an app wireframe, storyboarding, service blueprint, etc. Each participant had two weeks to build the prototype, gain feedback from the users and experts, and then redesign the prototype according to the comments the users and experts provided.

### 4.3 Implementation

The implementation stage focused on transforming from planning to action [25]. As this paper selected function (e.g., speed of processes, wayfinding, and physical layout), interaction (e.g., with service personnel) and diversion (e.g., shopping and dining, leisure facilities, and Wi-Fi) [6, 17] as the attributes of airport services, the project details categorized by such points are shown below.

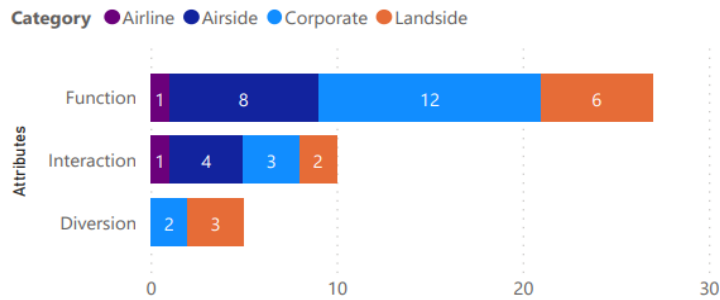


Fig. 1. Project details categorized by airport service attribute (Source: Developed for this paper)

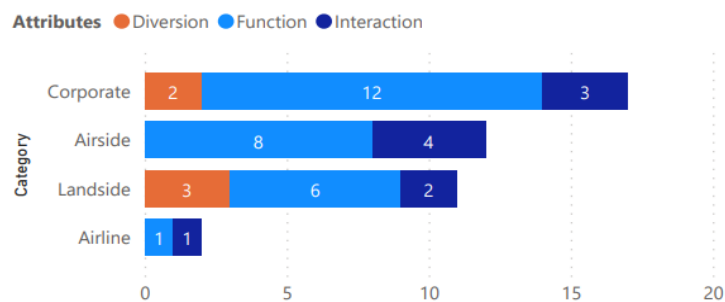
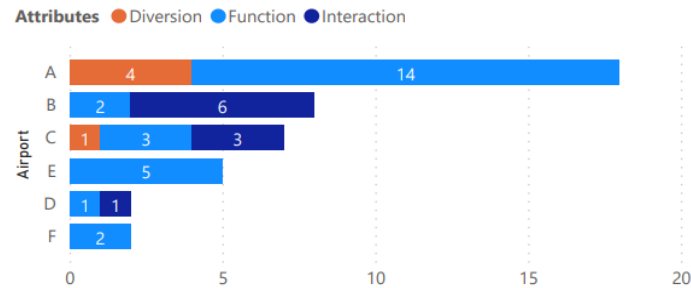


Fig. 2. Project details categorized by participants' category (Source: Developed for this paper)

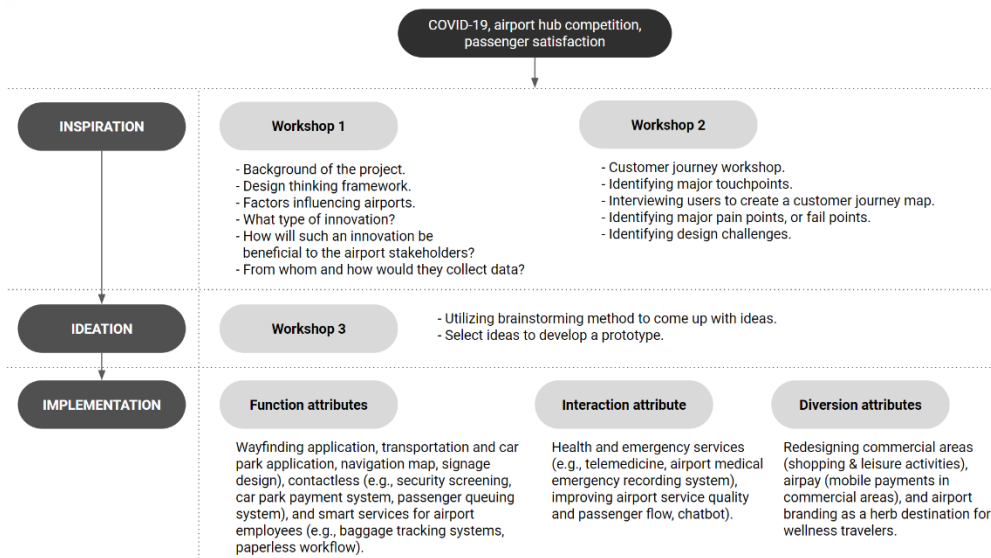


**Fig. 3.** Project details categorized by airport (Source: Developed for this paper)

The results reveal that most projects are related to the function attribute. The function attribute projects primarily aim to improve the speed of the process and the physical aspects of airports. Projects in the function attribute proposed by the participants include improvements in terms of airport navigation for passengers (e.g., a way-finding application, a transportation and car park application, navigation maps, signage design), contactless services (e.g., security screening, car park payment system, passenger queuing system), and intelligent services for airport employees (e.g., baggage tracking systems, paperless workflow).

Regarding the interaction attribute, the participants developed prototypes to improve touchpoints that involve interaction between passengers and airport employees. Examples include projects on health and emergency services (e.g., telemedicine, an airport medical emergency recording system), improving airport service quality and passenger flow, and chatbots). There were only a small number of projects related to the diversion attributes, such as redesigning commercial areas (shopping & leisure activities), airpay (mobile payment in commercial spaces), and airport branding as a herb destination for wellness travelers. The airport design thinking process is summarized in Figure 6 below.





**Fig. 4.** Airport design thinking workshops (Source: Adapted from Thakur, Soklaridis [14])

Due to time constraints and the COVID-19 situation, the innovative projects have not yet been implemented at the time of writing. Nonetheless, all projects have been submitted to each airport for consideration.

## 5 Conclusion

This paper offers an approach to utilizing design thinking in the airport from an employee's perspective. This paper used airports in Thailand as a case study to discuss the key factors that influence airport operations, including COVID-19, airport hub competition, and passenger satisfaction. As a result, 42 prototypes were created by airport employees based on the data collected from user interviews, the customer journey map, and the design challenge. This paper makes many academic contributions. While the most significant hubs, such as Thailand's Suvarnabhumi airport, are commonly the subject of airport studies, other airports in the area are often omitted in most studies [15]. Therefore, this paper has contributed by implementing design thinking workshops at large hub airports and small and medium-sized airports in Thailand. The results reveal that employees at most airports focus their efforts on innovative ideas for the function and interaction attributes. However, there was less focus on the diversion attribute of airport service quality. While the participants may have considered the diversion attribute as a complex project requiring the redesign of physical aspects of the airport, several studies [26-28] pointed out that Non-Aeronautical Revenues (NAR), such as commercial areas, play a vital role, not only concerning passenger satisfaction but also in providing revenue to the airport. Therefore, it is suggested that future studies examine how design thinking could be implemented to enhance the diversion attributes of the airport.

## References

- [1] Fakfare, P., W. Wattanacharoensil, and A. Graham, Exploring multi-quality attributes of airports and the asymmetric effects on air traveller satisfaction: The case of Thai International Airports. *Research in Transportation Business & Management*, 2021. 41(2021): p. 1-15.
- [2] See, K., et al., Twenty years of airport efficiency and productivity studies: A machine learning bibliometric analysis. *Research in Transportation Business & Management*, 2022. In Press(In Press): p. In Press.
- [3] Barakat, H., R. Yeniterzi, and L. Martín-Domingo, Applying deep learning models to twitter data to detect airport service quality. *Journal of Air Transport Management*, 2021. 91(2021): p. 1-8.
- [4] Kiliç, S. and T. Çadirci, An evaluation of airport service experience: An identification of service improvement opportunities based on topic modeling and sentiment analysis. *Research in Transportation Business & Management*, 2021. In Press(In Press): p. In Press.
- [5] Mainardes, E., R. Melo, and N. Moreira, Effects of airport service quality on the corporate image of airports. *Research in Transportation Business & Management*, 2021. 41(2021): p. 1-11.
- [6] Halpern, N. and D. Mwesiumo, Airport service quality and passenger satisfaction: The impact of service failure on the likelihood of promoting an airport online. *Research in Transportation Business & Management*, 2021. 41(2021): p. 1-15.

- [7] Kuo, P., et al., The impact of the COVID-19 pandemic on O-D flow and airport networks in the origin country and in Northeast Asia. *Journal of Air Transport Management*, 2022. 100(2022): p. 1-16.
- [8] Lee-Anant, C. and P. Monpanthong, Factors Influencing Airport Technology Selections in Each Service Touchpoint of Suvarnabhumi Airport, Thailand. *Turkish Journal of Computer and Mathematics Education*, 2021. 12(13): p. 3804-3816.
- [9] IATA Air Passenger Market Analysis. 2022.
- [10] Thailand Board of Investment Airports. 2020.
- [11] Chutipongdech, T. and R. Vongsaroj, Technical efficiency and productivity change analysis: A case study of the regional and local airports in Thailand. *Case Studies on Transport Policy*, 2022. In Press(In Press): p. In Press.
- [12] Chonsalasin, D., S. Jomnonkwo, and V. Ratanavaraha, Measurement model of passengers' expectations of airport service quality. *International Journal of Transportation Science and Technology*, 2021. 10(4): p. 342-352.
- [13] Cankurtarana, P. and M. Beverlandb, Using design thinking to respond to crises: B2B lessons from the 2020 COVID-19 pandemic. *Industrial Marketing Management*, 2020. 88(2020): p. 255-260.
- [14] Thakur, A., et al., Using Rapid Design Thinking to Overcome COVID-19 Challenges in Medical Education. *Academic Medicine*, 2020: p. 1-6.
- [15] Huynh, T., G. Kim, and H. Ha, Comparative analysis of efficiency for major Southeast Asia airports: A two-stage approach. *Journal of Air Transport Management*, 2020. 89(2020): p. 1-9.
- [16] Trischler, J. and G. Lohmann, Monitoring quality of service at Australian airports: A critical analysis. *Journal of Air Transport Management*, 2018. 67(2018): p. 63-71.
- [17] Fodness, D. and B. Murray, Passengers' expectations of airport service quality. *Journal of Services Marketing*, 2007. 21(7): p. 492-506.
- [18] Santa-Maria, T., W. Vermeulen, and R. Baumgar, The Circular Sprint: Circular business model innovation through design thinking. *Journal of Cleaner Production*, 2022. 362(2022): p. 1-14.
- [19] Wilkerson, B. and L. Trellevik, Sustainability-oriented innovation: Improving problem definition through combined design thinking and systems mapping approaches. *Thinking Skills and Creativity*, 2021. 42(2021).
- [20] Magistretti, S., et al., Framing the multifaceted nature of design thinking in addressing different innovation purposes. *Long Range Planning*, 2021. In Press.
- [21] Oeveren, R. The difference between design thinking and Service Design. 2020.
- [22] Hahn-Goldberg, S., et al., Tool development to improve medication information transfer to patients during transitions of care: A participatory action research and design thinking methodology approach. *Research in Social and Administrative Pharmacy*, 2022. 18(1): p. 2170-2177.
- [23] Airport Authority of Thailand Annual Report. 2021.
- [24] Kitsios, F. and M. Kamariotou, Digital innovation and entrepreneurship transformation through open data hackathons: Design strategies for successful start-up settings. *International Journal of Information Management*, 2022. In Press(In Press): p. In Press.
- [25] Törnroth, S., A. Nilsson, and A. Luciani, Design thinking for the everyday aestheticisation of urban renewable energy. *Design Studies*, 2022. 79(2022): p. 1-20.
- [26] Shin, T. and T. Roh, Impact of Non-Aeronautical Revenues on Airport Landing Charge in Global Airports. *Transportation Research Record: Journal of the Transportation Research Board*, 2021. 2675(10): p. 667-677.

- [27] Nugroho, A., An exploratory study of airport travel retail service quality and its impact on airport revenues. *INQUISITIVE*, 2021. 2(1): p. 55–68.
- [28] Silva, L., G. Borille, and M. Bandeira, The effect of arrival time of travelers at the airport on consumption in commercial establishments. *Journal of Retailing and Consumer Services*, 2022. 68(2022): p. 1-11.