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An Evaluation of the Egyptian Airports' Operational Strategies and their Impact on Improving the Competitiveness of Small and Medium-sized Airports

Iten El Rouby
Associate Professor, Tourism Studies Department
Faculty of Tourism and Hotels, Alexandria Uiversity

Nashwa Fouad
Professor, Tourism Studies Department
Faculty of Tourism and Hotels, Alexandria Uiversity

Sara El-Sebai
Lecturer, AboKir High Institute of Hotel and Tourism

Eman Eid
Lecturer, Tourism Studies Department
Faculty of Tourism and Hotels, Alexandria Uiversity

Abstract

Due to the fierce competition in the aviation business environment, more and more airports are struggling to keep an appropriate market share. Competitive business environments reduce the dominance and monopolies of airport operators. Airports can compete fairly if they have greater freedom, or if they compete in an environment that enables airlines to decide where their fleet operates without the dominance of any airport operator.

This study aims to evaluate the operational strategies of small and medium-sized Egyptian airports, compare these strategies to those of global leading airports, and examine the impact of these strategies on their competitiveness in the global and Egyptian markets. In addition, the study sets a framework that small and medium-sized airports can apply to increase their competitiveness locally and worldwide.

The data collection method for primary data involved conducting structured face-to-face and telephone interviews with 50 managers and supervisors employed at the Cairo Airport Company and the Egyptian Airports Company in Cairo. Furthermore, secondary data was extracted from the Ministry of Civil Aviation and Egyptian Holding Company for Airports and Air Navigation (EHCAAN) websites, to evaluate the operational strategies of Egyptian Airports. The study also utilized time series analysis to explore the impacts of governmental initiatives on passenger flow and flight movement over the period from 2014 to 2022.

The analysis showed that both Egyptian airport companies don't prioritize operating short-haul and domestic routes. Furthermore, Egyptian airports don't offer transit visas but only issue visas on arrival for selected nationalities. The findings also revealed that the discriminatory development strategies of the Ministry of Tourism and the Ministry of Civil Aviation strengthen the competitiveness of some airports while weakening others.

To increase flight movements, operators should develop inciting strategies to attract

airline carriers to choose their airports for maintenance, fueling, or departure. Egyptian airports should collaborate with the Immigration Authority to facilitate procedures and encourage tourists to select their airports as transit points. Additionally, operators can generate additional non-aeronautical revenues by renting out specific terminals and lounges to serve specific types of flights or travelers.

Keywords: Competitiveness, Monopoly, Operational Strategies, Small and Medium-sized airports, Time-series

1. Introduction

After the deregulation and the emergence of low-cost carriers, competition among airports has become a concern for operators. Nowadays, more than 500 airport operators are competing to attract airline carriers to choose their airports as service hubs. Airport operators aim to retain airlines and prevent traffic losses by analyzing their competitors' strategies for attracting full-service airlines and low-cost carriers (ACI, 2017; Chin and Teik, 2014).

Additionally, operators try to develop strategies that are based on a deep understanding of stakeholders' needs, governmental regimes, and fierce business environment. They also study travelers' demographics and the population living within one to two hours' distance from the airport before setting a strategy (Chin and Teik, 2014; Jimenez *et al.*, 2014).

As a result, several studies were concerned with determining the factors that affect airport competitiveness. For this reason, Park (2003) created a model to increase the competitiveness of Asian airports. The model consisted of five factors (demand factor, facility factor, managerial factor, service factor, and spatial factor). Feltscher *et al.* (2017) made a few modifications to Park's (2003) model to enable operators to increase the competitiveness of European airports. This modified model was based on five factors, namely:

- The Environmental factor which concentrates on calculating the cost of aircraft noise and carbon emissions.
- The Demand factor which focuses on the number of short-haul and long-haul flights per week, the number of airlines, feeder routes at an airport, the number of travelers, and purchasing power.
- The Service factor which consists of two sub-factors: service quality, measured through traveler surveys, and aircraft delay times.
- The Managerial factor which concentrates on assessing development strategies and their impact on airport operation, net profit, and revenue per passenger.
- The Facility factor which is concerned with measuring the current capacity of airports and their ability to expand, the number of runways, and the available landing systems (Feltscher *et al.*,2017).

Evaluating operational strategies through the competitiveness model allows airport operators to find out and evaluate their position in the market. This assessment enables them to overcome shortcomings and set a competitive strategy for their airport services. Additionally, it also permits airport operators to understand how to increase aeronautical charges (such as landing fees, passenger service charges, aircraft parking and hangar fees, and terminal rental fees), and non-aeronautical charges such as (travel services, food and beverage, retail sales, personal services areas, and other services) (Battal and Bakir, 2017).

Due to the importance of the competitiveness model to evaluate the current situation and

set the stage for future improvements, the study was based on the following hypotheses:

$H_{1:}$ The limited number of passengers due to governmental discriminatory policies impacts the competitiveness of small and medium-sized airports.

H_2: The airport's operational strategies impact airport competitiveness.

2. Literature Review

IATA (2020) discussed that operators compete by increasing air connectivity which in turn contributes to increasing passenger and freight numbers. Not only does air connectivity raise airport revenues, but it also boosts countries' GDP affecting their share in the global economy (IATA, 2020).

The WTTC (2018) stated that airport operators encourage travelers to select their airports by promoting specific landmarks, traditional products, traditional food, and the latest technology in the destinations related to the airports in question. Moreover, operators attract travelers to select a specific airport as a connecting point by offering free transit visas. For example, Beijing Daxing Airport offers a free transit visa for the first 144 hours for the traveler in the country. In addition, several airport operators increase the number of flight movements by making agreements with airline carriers to increase the number of connecting flights (WTTC, 2018).

Daxing PKX airport (2021) and Atldistrict (2022) mentioned that most airport operators offer multimodal transport facilities to increase their revenues and increase airport accessibility. Beijing Airport is connected to high-speed rail, and both are owned and operated by the Chinese government. Similarly, the Atlanta Airport and the Sky train are also government-owned and interconnected (Atldistrict, 2022; Daxing PKX airport, 2021).

Many airports highlight their distinction by publicizing their Skytrax rating. Skytrax is a leading company in rating airlines and airports based on service quality (Skytrax, 2022).

According to Graham (2009) and Kovynyova & Mikut (2018), airport operators aim to boost revenues and competitiveness by introducing the fast-track concept. For example, operators in China attract first and business-class travelers by providing faster ground-handling services. Additionally, El-Hinnawi (2022) and Subramanian (2021) discussed how operators enhance airport competitiveness by using robots, as seen in Beijing and Haneda Airports. These robots interact with travelers, simulating actual employees, to assist them in completing processes in just three minutes, including checking PCR and health care documents (El-Hinnawi, 2022; Subramanian, 2021).

Recently, several international civil aviation associations have taken measures to provide a fair competitive environment. For instance, ACI (Airports Council International) and IATA have established a system called WASG (Worldwide Airport Slot Guidelines) to ensure that airports compete in a transparent, flexible, and non-discriminatory environment. A slot is a system used to arrange take-off and landing times for flights, helping to reduce excessive traffic. WASG handles 204 slots in each season and serves 1.5 billion passengers yearly. Slots are a tool that enables airports to utilize current capacity profitably (EU, 2011).

ICAO (The International Civil Aviation Organization), as mentioned by the EU Commission (2023), established five principles for airport pricing to impose a fair competitive environment. The first principle requires that price policies are set transparently. Secondly, airport operators and other service providers should be enabled by governments to make joint decisions about pricing. Thirdly, operators must use the principle of single-till that calculates aeronautical and non-aeronautical charges together. Fourthly, operators must use a non-

discriminatory policy in setting aeronautical charges for domestic and foreign airline carriers. Lastly, governments must set up a specific committee to monitor any disputes among operators and airline carriers (EU Commission, 2023).

In addition, IATA and ICAO monitor the incentives that airport operators offer to attract new airlines. They ensure that all beneficiaries receive the same discounts or incentives. Discounts and incentives should be non-discriminatory because any discrimination will distort the competitive environment (IATA, 2019).

Furthermore, Huang (2017) explained that the airports situated in the capital or large cities have a geographic monopoly. Each airport exhibits geographic domination especially if the distances between other airports in the country are huge. Forsyth *et al.* (2022) highlight that the geographic monopoly of large-sized airports affects other airports in the same country. Additionally, governments may strengthen specific airports by supporting them with funds to improve their services, support specific routes, or attract selected airline carriers which in turn contributes to distorting the competitive environment. Not only does direct funding strengthen specific airports, but it also reinforces specific airlines, as some airlines are partners in the ownership of airports.

Moreover, IATA (2020) mentioned that governments may reinforce specific airports by improving airport infrastructure. For instance, they can increase the capacity of runways, and the number of hangars, build new terminals, and construct new control towers. They also support airports by maintaining and enhancing the roads leading to the airport. Furthermore, governments strengthen specific airports by raising the light system in all operational sectors of the airport, especially on the runways. They also increase the capacity of car parking and may invest in passenger terminals by establishing new terminals or increasing the capacity of the existing ones.

Additionally, IATA (2020) stated that governments contribute to improving revenues by adding additional areas for duty-free shops, restaurants, car rental services, etc., at the airport. These development strategies aim to raise aeronautical and non-aeronautical revenues. Governments may also reinforce airports by providing additional accessibility to travelers by introducing intermodal or multimodal systems at the airport, offering bus shuttles, a rail station, or a ferry hub that facilitates the transfer of travelers to and from the city. Additionally, they may also empower airports by assigning a terminal to serve only one carrier or a group of carriers (such as Star Alliances or Low-Cost Carriers) or by offering new facilities in the terminal. Governments may also support airports by establishing a road or a railway that connects the airport with a marine hub. Additionally, they may launch campaigns that target specific nationalities or specific types of airline carriers. They may offer differentiated services, assist airports to increase the level of service quality or reduce taxes for specific routes or a specific type of flight, aiming to attract more airlines to select a particular airport.

Liebert & Niemeier (2012) discussed that the government's ownership of airports aims to reduce the impact of monopoly by setting regulations and prices for all airports in the same country, while privatization sets regulations, offers incentives, and sets prices according to economic circumstances. Prices must be set based on the economic conditions, not as fixed prices for all airports. Monopolistic environments and the consolidation of prices for all airports may affect negatively the competitive environment.

3. The Modified Competitiveness Model

A few modifications were made to the original competitiveness model of Park (2003) and Feltscher et al. (2017) to analyze the operational strategies of small and medium-sized airports and examine their impact on airport competitiveness in the global and Egyptian markets. The model of Park (2003) focused on spatial and managerial factors, while the model of Feltscher et al. (2017) incorporated environmental factors instead of spatial factors. However, in this paper, technological and governmental factors have been added, as they directly influence all operating strategies. The modified model used in this study consists of five factors: demand factor, facility factor, technological factor, financial factor, and governmental factor. These factors are related to ground handling services, airport capabilities, and revenues. The factors are as follows:

1. The Demand Factor

The demand factor consists of the number of passengers/cargos, the number of airline carriers, the number of aircraft movements, and the profitable long and short-haul routes.

2. The Facility Factor

This factor concentrates on measuring the current capacity of airports and the potential to expand in terms of runways, areas in hangars, etc. These facilities enable airports to compete in the market. At the same time, other airports compete by providing new services, door-to-door services, or entertainment services (Halpern & Graham,2022).

3. The Financial Factor

This factor focuses on aeronautical and non-aeronautical revenues. Several airport operators expand their customer base (i.e. airline carriers) by offering low fees for airport services or by giving special discounts or incentives. As a result, these strategies lead to an increase in aeronautical revenues (Halpern & Graham, 2022). Operators also increase non-aeronautical revenues by arranging exhibitions throughout the year and by displaying different art galleries. They also provide travelers with luxury accommodations at expensive hotels connected to airport terminals (ATL, 2023; Daxing PKX Airport, 2021).

4. The Technological Factor

After COVID-19, several airports have adopted digital and automated systems to serve passengers. The digital transformation provides airports with a seamless connection among airport stakeholders, airport systems, and travelers by using the new concepts of the Internet of Things and artificial intelligence to enhance services. The digitalized system permits automated information feeds and provides accurate real-time data. Automation can solve the congestion problem of many airports around the world. It helps to improve airport performance and enables operators to use airport capacity efficiently without the need to increase the number of runways or expand the capacity of airports (El-Hinnawi, 2022; Subramanain, 2021).

5. The Governmental Factor

This factor focuses on the types of airport operators' management regimes which may be: light-handed, medium-handed, and heavy-handed regimes. A light-handed regime involves monitoring the financial annual reports without interfering with any price regulations. A medium-handed regime sets the regulations of contracts and is appropriate for the participation of public-private sectors. However, a heavy-handed regime is responsible for setting fee regulations, overseeing airport investments, monitoring airport performance, and ensuring service quality (Phang, 2016).

This study focused on the effects of discriminatory government interventions on airports' competitive environment. These interventions as mentioned by Forsyth *et al.* (2022) may take the following forms:

- Giving specific airport funds or bank loan advantages.
- Building projects that contribute to seamless travel.
- Encouraging travelers to select specific airports by building attractions near the airports.

4. Methodology

The study relied on a modified competitiveness model to examine the operational strategies of selected Egyptian airports in addition to several top-level international airports. The examination aimed at determining effective best practices that small and medium-sized airports can apply to increase competitiveness and ranking.

Time series data were also used to explore airport operational strategies over nine years starting from 2014 to 2022 and to identify fluctuations in travelers' numbers and flight movements.

In addition, a qualitative approach was utilized to collect secondary data by conducting face-to-face and telephone interviews with top-level and sectional administrative employees in airports across Egypt. These interviews were conducted between October 2022 and April 2023. Finally, based on the findings, a model was created that, if adopted, can assist small and medium-sized airports in increasing their competitiveness in the market.

The interviews were conducted with 50 managers from two of the largest operator companies in Egypt, which oversee 11 international airports. One of these companies is Cairo Airport Company, which exclusively operates Cairo Airport, while the other is the Egyptian Airports Company, responsible for managing the remaining 10 airports in Egypt. The purpose of the interviews was to compare the operational strategies used by the Cairo Airport Company on the one hand with those of the Egyptian Airports Company on the other hand. The operational strategies of Cairo Airport, classified as a large airport, were compared to those of selected medium-sized airports such as Sharm El-Sheikh and Hurghada Airport, as well as small-sized airports like Borg al-Arab, Luxor, and Aswan Airport.

Additionally, the interviews aimed to examine whether the Egyptian government uses discriminatory policies among the two companies. The sample of the Cairo Airport Company consisted of managers and supervisors from the Public Relations, Operational, Commercial, and Marketing Departments, as well as one First Officer Movement and eight Air Traffic Controllers.

The interviews with the Egyptian Airports Company, which operates 10 international airports in Egypt, included the deputy manager of the company as well as managers and supervisors from Borg al-Arab, Sharm El-Sheikh, Hurghada, and Aswan Airports.

The interview consisted of 16 questions divided into 5 sections. The first section comprised three questions examining the impact of visa facilitation on attracting new travelers, determining the most profitable routes, and identifying the strategy used to increase air connectivity.

The second section contained four questions aimed at exploring the tools that airport operators used to compete with other airports within the same country. The questions were designed to determine the facilities and services that were provided to both travelers and airline carriers and their effectiveness in attracting them and enhancing competitiveness.

The third section contained four questions aimed at investigating the impact of long/short contracts on revenues and the effect of deductions or incentives that airport operators offer on flight movements. Additionally, it explored the strategies operators used to increase their revenues.

The fourth section contained two questions about the measures taken by airport operators to digitalize/automate their airports as well as the impact of digital/ automated transformation on competitiveness.

Finally, the fifth section contained three questions aimed at highlighting the role of the government in strengthening specific airports and exploring the impact of geographic monopoly on airport competitiveness. Furthermore, this section intended to specify the tools that airports used to compete with other airports within the same country.

5. Findings and Discussion

5.1 The modified competitiveness model

The modified competitiveness model was applied to some top-level international airports (Table 1.4.). The analysis showed that most operators aim to increase the number of passengers and flights by operating short-haul and domestic routes, offering free transit visas, or providing visa facilitation. They also made agreements with airline carriers to increase the number of connecting short-haul flights. The examination also showed that operators improve their performance by offering digitalized machines that enable travelers to complete all travel procedures in a few minutes and hereby reduce congestion. In addition to that, it became evident that most operators improved their competitiveness and revenues by offering several facilities and services, publicizing their Skytrax rating, and dedicating lounges to specific airlines. The study also found that small and medium-sized airports try to reduce the dominance of large airports by offering competitive prices to national and private carriers to encourage them to use their airports as hubs.

The following shows the results of the application of the modified competitiveness model on some selected Egyptian airports and telephone and face-to-face interviews.

1. The Operational Strategies of the Demand Factor

The majority of the respondents mentioned that the Civil Aviation Authority and the Ministry of Tourism and Antiquities have agreements concerning visa procedures. They also stated that the Civil Aviation Authority gives both the Cairo Airport Company and the Egyptian Airports Company the same visa facilitation. This is substantiated by the fact that travelers can now obtain an electronic visa to visit Egypt through the Egyptian e-Visa Portal. In addition, Egypt enables American and Schengen nationalities to have a visa on arrival (Egypt e-Visa Portal, 2023). Most of the respondents of the Egyptian Airports Company mentioned that they provide free visas to travelers who arrive on direct flights to Sharm El-Sheikh and Hurghada Airport. Furthermore, the respondents showed that operators target specific nationalities from the nearest countries (such as Europeans, Russians, and Ukrainians). However, they commented that Egypt has changed the rules of entering the country for Gulf citizens due to restrictive policies against Egyptians visiting Gulf countries. Moreover, the respondents of both the Cairo Airport Company and the Egyptian Airports Company stated, that Egypt provided visa facilitations for visitors holding special cards such as the *Hayya Card* to attract travelers heading for the World Cup to visit Egypt. They added that the Ministry of Tourism and Antiquities announced that travelers who held this card had a 50% discount in museums and historical attractions. It also offered them a special

discount for online accommodation bookings (Ministry of Tourism and Antiquities, 2022). On the contrary, the examination revealed that the Egyptian government didn't take any serious steps to facilitate issuing transit visas; a strategy that many international airports like Beijing International Airport and Haneda International Airport have adopted.

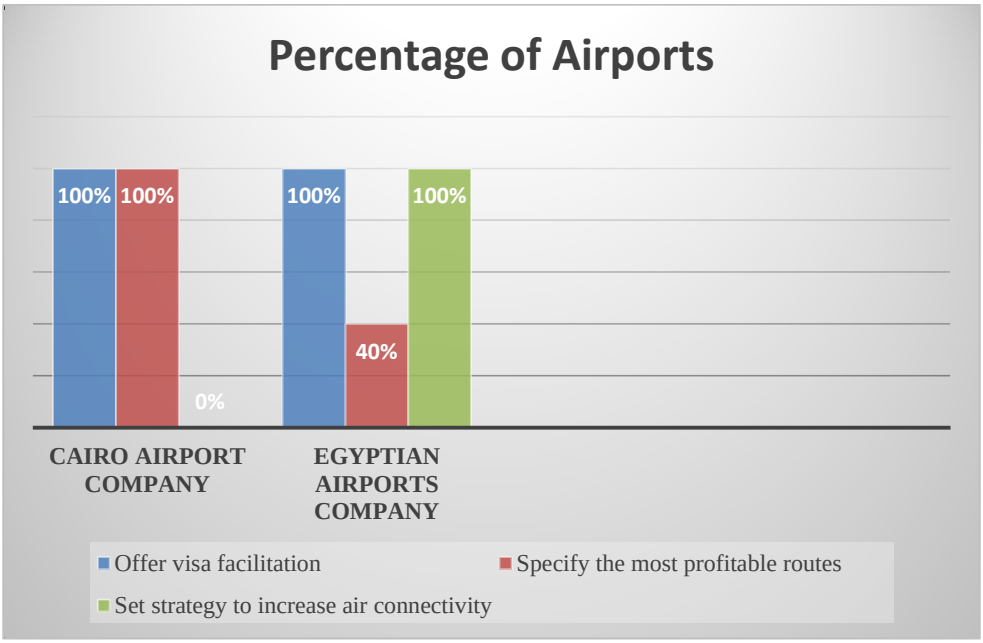

Figure 1.1 Demand Factor

The case study of international airports and the results of the interviews showed that domestic and short-haul routes are the most profitable for both airports and airlines. The domestic flights represent over 60 percent of the total number of flight movements in the world's top airports (Daxing PKX airport, 2021; The Japan Times,2020). Nevertheless, the Egyptian Holding Company for Airports and Air Navigation (2022) highlighted that Egyptian operators operate only 14-16 percent of domestic flights of the total number of flight movements (EHCAAN, 2022) which contradicts the operational strategies of several international airports.

On the one hand, the respondents of the Egyptian Airports Company mentioned that the airports constantly make agreements with airline carriers during the annual international conference called Roots. These agreements aim to attract airline carriers to select their airports for their flights. On the other hand, the respondents of the Cairo Airport Company mentioned that they don't pursue any agreements with airline carriers to increase air connectivity (Figure 1.1). They added that airline carriers only make mutual agreements or arrangements with the Ministry of Civil Aviation.

Not only do airports make agreements with airline carriers to increase air connectivity but also the Egyptian Holding Company and International Air Transport Association enter into agreements with governments to boost air connectivity. This became evident through the agreement that the Egyptian Holding Company for Airports and Air Navigation signed with the officials of the IATA regional office in Jordan to increase air traffic between Egypt and Jordan. In addition to that, the Egyptian authorities completed an agreement with Spanish travel agencies to increase charter flights to Luxor (Ministry of Tourism, 2019). Moreover, international airlines have expanded their routes to Cairo International Airport by adding new routes to the capital of the Democratic Republic of the Congo, Kinshasa, Doublet, Mumbai, Dublin, and Benghazi. The

respondents of the Egyptian Airports Company also stated that several weekly direct flights between Moscow and both Sharm El-Sheikh and Hurghada Airports were added (SIS,2021). The Cairo International Company increased the number of cargo flights by launching cargo villages. The operators promoted the cargo villages in Expo Dubai and assigned partitions for Asian cargo to increase the number of cargo flights (SIS,2022).

2. The Operational Strategies of the Facility Factor

All interview respondents agreed that operators prioritize quality and health accreditation over the Skytrax rating. This strategy contradicts the strategy of Beijing Airport, Haneda Airport, Atlanta Hartsfield-Jackson Airport, King Khalid Airport, Abu Dhabi Airport, and San Jose Airport, which give considerable importance to the Skytrax rating.

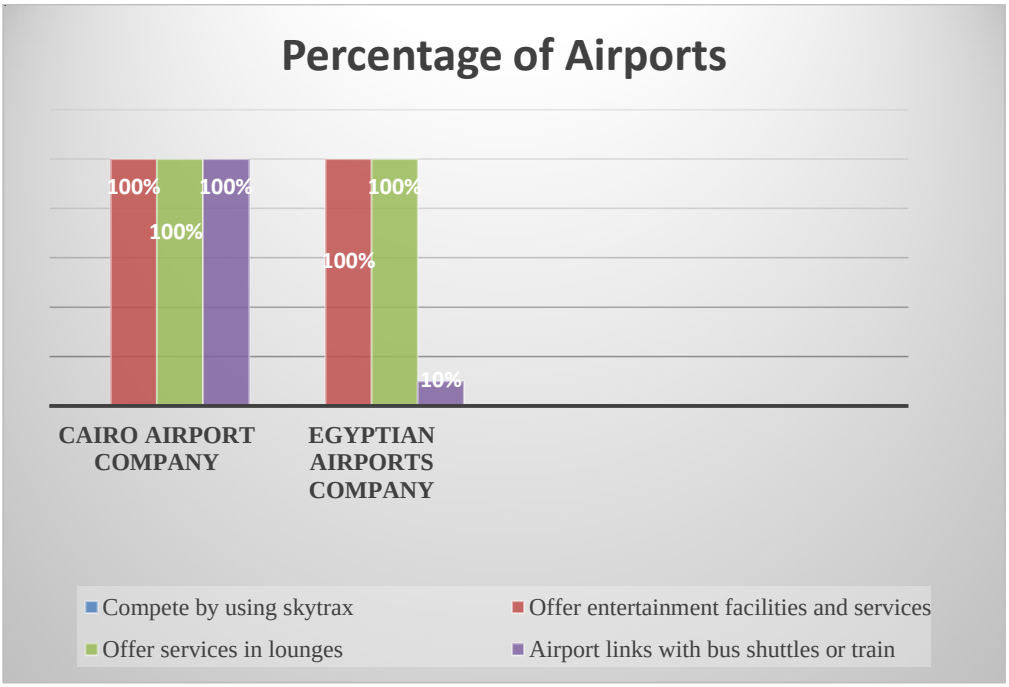

Figure 1.2 The Facility Factor

According to Skytrax, Cairo Airport has earned a 3-star rating for terminal 1 and 2 facilities and overall airport performance. Sharm El Sheikh and Hurghada Airports have also improved their classification from a 2-star to a 3-star rating after taking health, hygiene, and safety accreditations. This low rating is due to high congestion, and lack of intermodal or multimodal systems that connect the airports to other destinations in the city. Skytrax added that these airports are deficient in terms of innovations and entertainment facilities (Skytrax, 2022).

The approach adopted by Egyptian operators to underrate Skytrax rating contrasts with some case study airports that give Skytrax rating significant attention as mentioned by Toet *et al.* (2022) and Daxing PKX airport (2021).

The majority of respondents revealed that Egyptian airports offer few entertainment facilities and services such as food and beverage outlets, currency exchange booths, kid's zones, etc.), which is not in line with the strategy of ACI (2021), which awards high rating for airports providing facilities and

entertainment. Most Egyptian airports offer VIP and special services for travelers to facilitate procedures and boost revenues. In addition, Cairo International Airport tried to increase its facilities by linking the airport with a newly established 5-star hotel that contains 360 rooms (Cairo International Airport, 2022). The Ministry of Tourism and Antiquities, in coordination with the Ministry of Civil Aviation, boosted terminals 2 and 3 at Cairo International Airport by establishing two museums of Egyptian antiquities at the premises (Ministry of Antiquities, 2019).

In addition, Cairo International Airport facilitates the movement of travelers around the airport with its small metro and bus shuttle services. Meanwhile, only Sharm el-Sheikh Airport is connected to bus shuttles that allow travelers to transfer to the city center which confirms with Toet, *et al.* (2022) and Daxing PKX airport (2021) (Figure 1.2).

3. The Operational Strategies of the Financial Factor

All the respondents mentioned that the operators raise their revenues by making long-term contracts for duty-free areas. For example, the operators of Cairo Airport Company increase their non-aeronautical revenues by renting the duty-free area to Egypt Air Holding Company. The Egyptian Airport Company rents the duty-free area to both Honeymoon, a German company, and Egypt Air Holding Company. This confirms with the operational strategies of several international airports as shown in Table 1. 4.

The interviews with representatives of the Egyptian Airports Company showed that operators offer specific deductions to attract more charter flights.

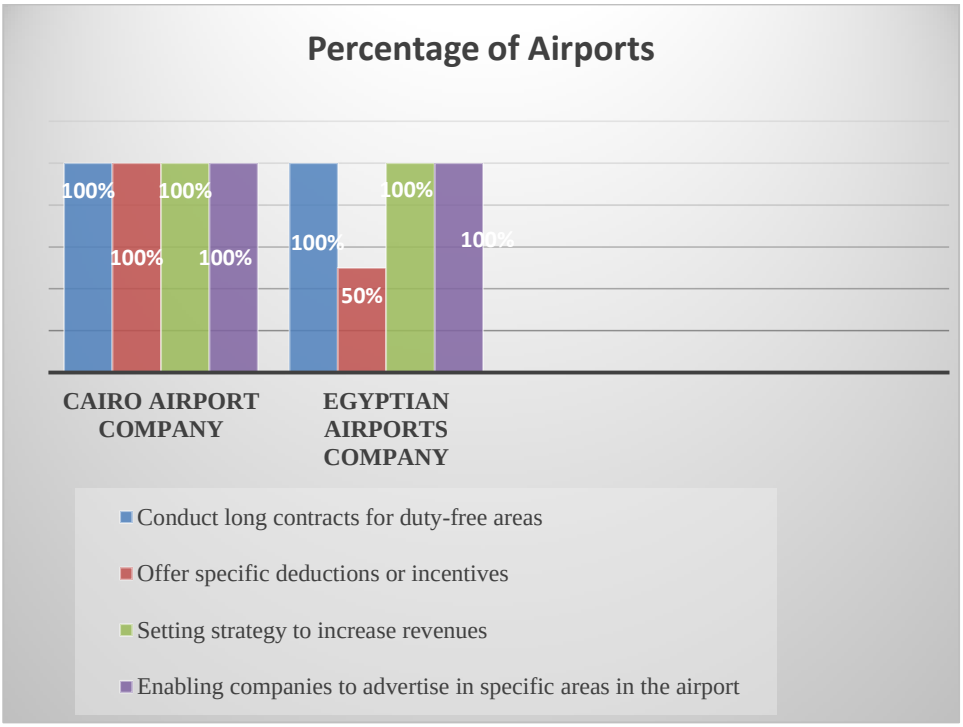

Figure 1.3 The Financial Factor

Additionally, Cairo Airport Company rents VIP lounges to specific airline carriers, which conforms with the strategy of Abu Dhabi (2023), and King Khalid Airport (2023). Nevertheless, the Egyptian Airport Company grants a specific company the right to operate

the VIP lounges in all the Egyptian international airports which accords with the strategy of King Khalid and Abu Dhabi International Airports which accredit specialized companies to operate all ground services and security issues.

The respondents of the Egyptian Airports Company mentioned that they boosted revenues by permitting Al-Ahram, an Egyptian advertising company, to be responsible for the advertisements at the airports which conforms with the strategy adopted by several international airports such as Beijing International Airport (Daxing PKX airport, 2021) (Table 1.4). In contrast, the respondents of Cairo Airport Company mentioned that the company handles all advertising activities in-house by its marketing department without relying on any external agencies. This is accomplished by renting some partitions of the terminals to specific airline carriers. This conforms with the strategy of King Khalid's International Airport (King Khalid International Airport, 2023).

Moreover, both the respondents of the Egyptian Airports Company and the Cairo Airport Company highlighted that some airports enable some airline carriers to advertise their services in their lounges or at specific areas in the terminals (Figure 1.3).

4. The Operational Strategies of the Technological Factor

The respondents of the Cairo Airport Company highlighted that only Egypt Air offers a few check-in kiosks at Cairo International Airport. In addition, the airport enables travelers to finish immigration procedures by utilizing both counters and biometric systems. Furthermore, only Cairo International Airport uses biometric machines that scan both eyes and fingerprints, while the rest of the airports use biometric machines for security issues. Technological solutions used by Cairo International Airport correspond to Kovynyova&Mikut (2018) who highlighted the necessity to transform the airports into a digitalized/automated pattern to increase competitiveness. The respondents of the Egyptian Airports Company also stated that Luxor Airport uses a system that scans passports and visas by using an application called OCR 48 (Optical Character Recognition Reader). Sharm el-Sheikh Airport uses a system that scans passports and visas by using OCR 20. It also utilizes an advanced luggage detection system and a network that connects the information systems of terminals 1 and 2. Borg Al Arab Airport uses a robotic landing system (ILS/DME) (Instrument Landing System/Distance Measuring Instrument) (The Egyptian Holding Company for Airports and Navigation, 2022) to facilitate the landing procedure. All international airports in Egypt are equipped with thermal cameras to monitor and control the spread of Covid-19. Based on the interviews conducted, it was found that the technological solutions currently being used in Egyptian airports are only limited to individual endeavors aimed at improving performance through automation. However, for airports to become fully digital and automated, significant advancements in technology will be required (Figure 1.4).

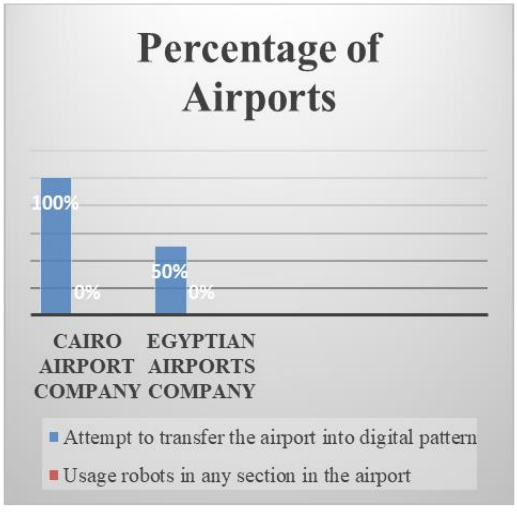

Figure 1.4 The Technological Factor

It is worth mentioning that some Egyptian airports offer applications for easy access. For example, the "Cairo Airport Guide Application" allows travelers to track their flights. Additionally, the Cairo Airport Company Application enables travelers to book flights, hotel rooms or rent a car (Cairo Airport Guide, 2022; Cairo Airport Company, 2022). Using applications to facilitate procedures for travelers goes in line with the strategy of several case studies' international airports like Beijing, Haneda, Atlanta Hartsfield-Jackson, King Khalid, Abu Dhabi, and San Jose Airports. All the respondents declared that all Egyptian airports don't use robots in any section of the airports. This doesn't conform with the strategy adopted by Beijing, Haneda, Abu Dhabi, and San Jose Airports and the strategy of Subramanain (2021), El-Hinnawi (2022), and Shallow (2021) which discussed the process of transforming airport activities into an advanced automated and digital pattern.

5. The Operational Strategies of the Governmental Factor

All the respondents mentioned that only the Civil Aviation Authority, in coordination with the Ministry of Tourism and Antiquities, set the development strategies for all Egyptian airports. These strategies aim to boost the number of travelers and flights. The respondents of the Egyptian Airports Company mentioned that both authorities, the Civil Aviation Authority and the Ministry of Tourism and Antiquities try to increase the number of flights and travelers disregarding whether these increases incorporate domestic or international flights, a strategy that contradicts several case studies like Beijing, Atlanta Hartfields-Jackson, Haneda, and San Jose airports, which primarily focus on boosting domestic flights.

Additionally, the analysis proved that Cairo International Airport has the power of geographic monopoly as it is located in the capital. Although all airports are operated by the government and benefit from governmental support, Cairo International Airport's monopolistic power allows it to attract international Full-Service Carriers, LCCs, and national airline carriers. The effect of geographic monopoly can also be detected in many case studies' airports like Beijing Airport, Haneda Airport, Atlanta Hartfields-Jackson Airport, and San Jose Airport.

Airports that are distributed among Egypt's governorates try to overcome the geographic monopoly advantage of Cairo Airport by emphasizing on their competitive strengths. The respondents of Assuit and Sohag Airports stated that they focus on attracting specific travelers namely, "employees from the Gulf area". Besides, Sharm El-Sheikh, Hurghada, Luxor, and Aswan Airports focus on attracting charter flights by offering competitive prices. They offer significantly lower prices than flights departing from Cairo or Borg Al Arab Airports.

Abu Dhabi, King Khalid, and San Jose Airports attract Low-Cost Carriers by giving them incentives to reduce the dominance of larger airports.

The previous discussion showed the viewpoint of the interviewees on the operational strategies adopted by Egyptian Airports and how they affect their competitiveness locally and internationally.

The governmental involvement in setting strategies and affecting operators' performance will be closely discussed in the next section by presenting the results of the time series analysis.

5.2 Time Series Analysis

The time analysis (Figure 1.5) showed that the year 2014 witnessed an increase in the number of travelers and flights at all international

Egyptian airports, synchronized with the 'Helwa ya Balady' marketing campaign. This campaign aimed to increase the number of domestic flights and short-haul routes. It also coincided with the 'Wahashtona' campaign, which was launched at the end of 2013. The campaign attempted to encourage travelers from the Middle East to visit tourist destinations in Egypt. Additionally, it coincided with the *Quality Travel Alliances Conference* that was held in Luxor, aiming to attract European travelers to visit Upper Egypt (Experience Egypt, 2023; Ministry of Tourism and Antiquities, 2022).

The analysis of the time series also showed that terrorist incidents that occurred in 2015 and 2016 had an impact on the number of travelers and flights in the year 2016. The decrease was also synchronized with Germany categorizing Egypt as a "Group 2" destination and imposing high taxes on flights to Egypt. Consequently, the Ministry of Tourism tried to mitigate the impact of the terrorist incidents by participating with a magnificent Pharaonic Suite at "The International Tourism Exchange (ITB Berlin)", showcasing Egypt. Additionally, the Civil Aviation Authority in Egypt tried to increase the number of charter and regular flights by announcing payment exemptions and thus encouraging airlines to choose Egyptian airports. As a result of governmental efforts to contain the effects of the terrorist attacks, several airports only showed a slight decrease in the number of travelers and flights (Experience Egypt, 2023; SIS, 2017).

In 2017, most of the international Egyptian airports showed an increase in the number of travelers and flight movements, which corresponded to the "This is Egypt" campaign. This campaign was also aligned with the agreement that the Ministry of Civil Aviation signed with the Prime Ministers of Cyprus, Greece, and Moscow to increase the number of flights between them. Additionally, the Ministry of Tourism signed an agreement with the Italian Ministry of Tourism to increase the number of Italian travelers by implementing the path of the "Holy Family Trip". The increase in travelers and flight numbers also synced with the presence of the Ministry of Tourism in several international travel markets such as Germany.

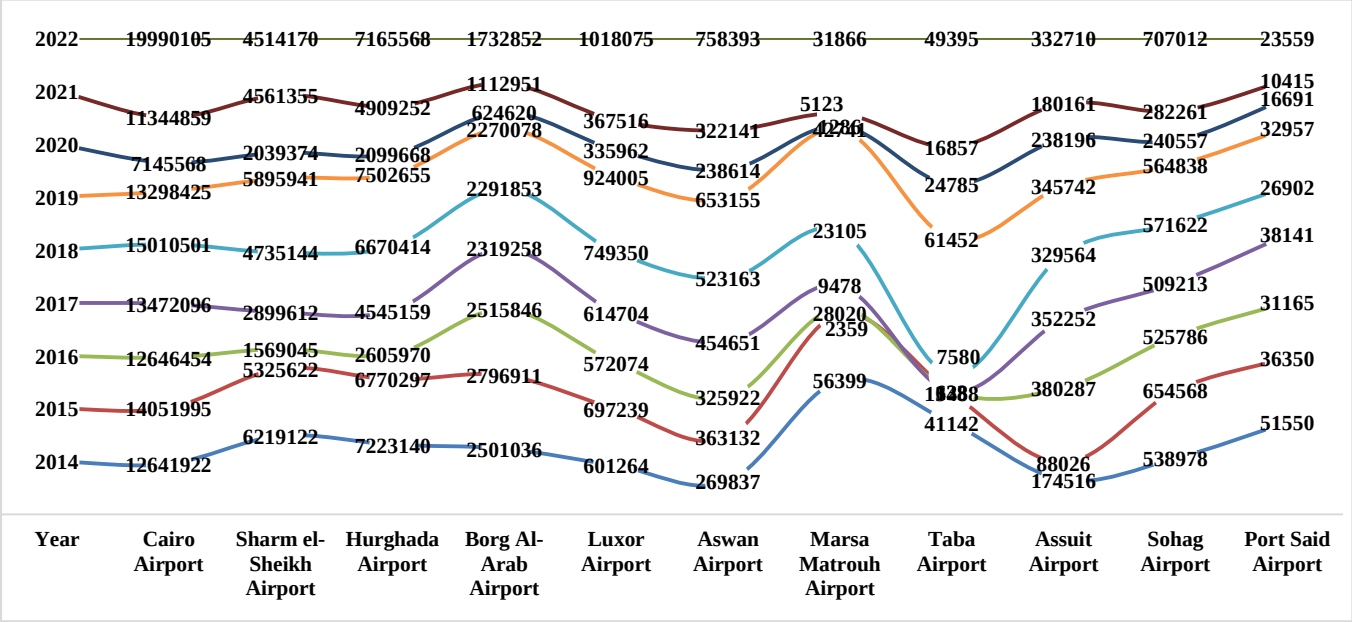

Figure 1.5: Time Series Travelers Numbers (20142022). Source: The Egyptian Holding Companies for Airports and Air Navigation, 2022.

The analysis showed that in 2018, most of the international Egyptian airports showed an increase in the number of travelers and flights, which accorded with the incentive programs offered by the Ministry of Tourism and the Ministry of Civil Aviation to stimulate air traffic movement of European agencies that operate charter flights. This program contributed to an increase in the number of flights to over 300,000 charter and regular flights (Experience Egypt, 2023; Ministry of Tourism, 2019; SIS, 2022).

In the year 2019, the increase in traveler numbers and flight movements coincided with the "People-to-People" campaign, which aimed to attract domestic travelers to visit tourist destinations. It also synced with the World Cup, several incentive programs, and Egypt's presence in ITB Berlin. It also concurred with the campaign that aimed to encourage travelers to visit South Sinai, and Red Sea destinations, and hike on Sinai trails (Experience Egypt, 2023; Ministry of Tourism and Antiquities, 2022).

In 2020, COVID-19 impacted the number of travelers and flights in all Egyptian international airports, like the rest of the world.

As for the year 2021, the analysis showed that the Ministry of Tourism, in cooperation with the Ministry of Civil Aviation, launched several promotional campaigns, such as "Summer in Egypt is a Different Story" in 2021 and the "Sunny Christmas Campaign" at the end of 2021, to encourage domestic and international travelers to visit Egypt. They launched the campaigns via social media and television. As a result, most of the international Egyptian airports showed an increase in the number of travelers and flight movements. This also coincided with the campaign of the Ministry of Tourism and the Ministry of Civil Aviation entitled "Egypt in the Eyes of the Ambassadors of the European Union", where the ambassadors of the EU countries in Cairo filmed over 20 movies to promote Egyptian tourist places and historical sites and shared them on their social media platforms. The campaign was one of the reasons that increased the number of travelers in 2021 and reduced the impact of COVID-19 (Figure 1.5).

The findings also showed that the year 2022 witnessed an increase in the number of travelers and flights, synchronized with the effort done by the Ministry of Tourism and the Ministry of Civil Aviation in the previous year. Moreover, Cairo International Airport managed to increase the number of flights by announcing that the airport offers maintenance for numerous aircrafts, which came in line with the opening of the Grand Museum. The increasing numbers of travelers and flights in all international Egyptian airports resulted from the campaigns that the Ministry of Tourism and Antiquities launched at the beginning and end of the year. They launched campaigns called "The Day in Egypt Doesn't End" and "Your Vacation is With Us", both targeting Arabic, Gulf, and domestic travelers. They broadcasted both campaigns on television and social media platforms. These campaigns aimed at promoting the identity of each tourist destination in Egypt (Experience Egypt, 2023; SIS, 2023).

5.3 Hypotheses Testing:

The first hypothesis stated that: *The limited number of passengers due to governmental discriminatory policies impacts the competitiveness of small and medium-sized airports.*

The analysis illustrated that the Ministry of Tourism and the Ministry of Civil Aviation

use tools to strengthen the competitiveness of that of others. They intensified airport competitiveness by conducting agreements with nearby countries or airlines to increase flight movements. They offered large discounts or incentives to attract charter flights to specific airports, thus, Cairo Airport for instance witnessed a slight decline in the number of travelers and flights in sync with the incentives offered to Sharm el-Sheikh, Hurghada, Luxor, Aswan, Taba, and Assiut Airports.

They also strengthened specific airports by promoting specific destinations in Egypt. Furthermore, it was found that several airports showed a decline in passenger numbers because the Ministry of Tourism and the Ministry of Civil Aviation excluded them from agreements or campaigns. The case of King Khalid's Airport has demonstrated that the airport was able to successfully expand from a medium-sized airport to a large-sized airport despite having only two runways, as compared to Borg al-Arab Airport. Governmental initiatives have the power to increase or decrease the number of travelers, which results in weakening the airport's classification.

The Egyptian government also strengthened specific airports to promote specific destinations in Egypt. For instance, they supported Sharm el-Sheikh, Hurghada, Luxor, and Aswan Airports by launching several promotional campaigns (i.e. Sunny Christmas Campaign, Summer in Egypt is a Different Story, Egypt in the Eyes of the Ambassadors of the European Union, the Day in Egypt Doesn't End, Your Vacation is with us).

The Civil Aviation Authority and the Ministry of Tourism and Antiquities' strategy of overlooking domestic flights has resulted in a potential loss of travelers. The failure to prioritize domestic flights, which constitute a significant proportion of the tourism movement, has had a negative impact on traffic and the number of travelers.

some airports and weaken Moreover, they launched 27 documentary films and movies (i.e. Luxor the Secret) to increase the number of travelers to Luxor and consequently increase traffic in Luxor Airport.

The findings showed that the governmental authorities, which are responsible for setting up a centralized strategy for all airports in Egypt sometimes use discriminatory policies to support specific airports and weaken others. Thus, H_1 can be supported.

The second hypothesis stated that: *The airport's operational strategies impact airport competitiveness.*

It was found that the operational strategies reflected in the five factors of the modified competitiveness model impacted the airport's competitiveness. To boost demand for flights, free visas were offered for certain flights to Sharm el-Sheikh and Hurghada Airports. This led to an increase in the number of travelers to these airports. However, other airports were not given the same advantage of visa facilitation. Moreover, it became evident that the air connectivity agreements have the power to increase the competitiveness of the demand factor. Operators stimulated the number of travelers to Luxor by making agreements with agencies in Madrid to increase the number of charter flights. They also increased the number of travelers to specific airports by conducting agreements with international associations and ministries. They further aimed to increase the number of connecting flights to Cairo by declaring that the airport is offering maintenance services.

According to ACI (2022), Cairo International Airport, Sharm el-Sheikh, and Hurghada

International Airports were classified by Skytrax as 3-star airports, which indicates that these airports need to improve their performance in terms of decreasing high congestion and efficiently using their capacity. The reason for the congestion problem is that travelers take too long for each transaction, preventing airport employees from serving the targeted numbers. The solution to the congestion problem is to use high-end technological solutions that enhance performance, the strategy adopted by King Khalid International Airport which serves 28 million travelers with only 2 large runways.

It has been demonstrated by the respondents that Egyptian airports don't offer diverse entertainment facilities and aren't linked with bus shuttles or trains to the city centers.

The financial factor impacts the airport competitiveness based on the findings of the case study analysis of the top international airports and the interviews. Operators increased revenues by enabling specific airlines to be responsible for VIP lounges, terminals, and duty-free areas.

The analysis also showed that the governmental factor plays a vital role in formulating competitiveness. The strategy of the Ministry of Civil Aviation and the Ministry of Tourism and Antiquities is to use a heavy hand in setting pricing policies, development strategies, launching campaigns, and making agreements. They set discriminatory policies that aim to strengthen specific airports such as Sharm, Hurghada, and Luxor airports and weaken the rest of the airports by depriving them of the same advantages. The results of the interviews revealed that small and medium-sized airports attempt to reduce the dominance of large airports by attracting national and private carriers to use their airport as a base for their services and hereby providing a competitive service. The above-mentioned results of the examination hereby substantiate H_2.

6. Conclusions

The findings showed that the Cairo Airport Company and the Egyptian Airports Company use the same strategy: they don't focus on operating short-haul and domestic routes. The Egyptian Airports Company operates only a few domestic flights and a limited number of international short-haul routes because of the strategy set by the Ministry of Tourism and Antiquities, which aims to attract more international travelers. Additionally, several Egyptian small and medium-sized airports have shown a decline in travelers' numbers and flight movements because they were excluded from any agreements or promotional campaigns. Both authorities are disregarding the impact of operating domestic flights on increasing passenger numbers, as well as enhancing aeronautical and non-aeronautical revenues. In contrast, the top international airports depend on domestic travelers and flights to boost passenger numbers and flight movements.

The Egyptian airports don't offer transit visas, but they issue visas on arrival only for American citizens and Schengen nationals. They also allow travelers who hold the Hayya Card to enter Egypt without a visa. Furthermore, they offer free visas for travelers who arrive directly at Sharm el-Sheikh or Hurghada Airports.

Cairo International Airport has focused on increasing the number of cargo flight services to reduce the impact of the COVID-19 pandemic. The findings also showed that Cairo International Airport offers only a few check-in kiosks and one biometric machine to perform the immigration procedures. In contrast, the Egyptian Airports Company

doesn't offer any kiosk machines; it only provides a few machines that scan passports and visas in addition to biometric machines which are utilized for staff security. Borg El Arab Airport distinguishes itself by offering a robotic landing system. This highlights that none of the international airports in Egypt have adopted sophisticated technological solutions like artificial intelligence tools, despite the ongoing high-tech revolution.

Both the Egyptian airports and the case studies' airports compete by offering multiple runways, various areas in hangars, many stands, and enormous parking areas. It was found that several Egyptian airports have the same number of runways and the same runway capacity as the case study airports, nevertheless, they suffer from congestion and do not achieve their targets based on their capacity. As a result, they solve the congestion problem by expanding the infrastructure instead of using digitalized/automated systems to increase efficiency.

It was found that the limited number of deplanements, enplanements, and total number of travelers in Egyptian airports led to classifying them as small and medium-sized. Consequently, they cannot attract several Full-Service and Low-Cost Carriers which intensifies the gap between them and large airports.The results also showed that the Egyptian operators compete by using quality certificates and health accreditations, while they don't consider the Skytrax rating as a significant criterion to reflect high-quality performance.

It is worth mentioning, that almost all Egyptian airports lack intermodal or multimodal systems to facilitate the transfer of travelers to and from the city. The analysis showed that several Egyptian international airports try to increase their competitiveness by offering VIP lounges. The analysis of the foreign international airports revealed that they place a significant emphasis on this factor. Beijing Airport, for instance, attracts transit travelers by enabling them to enter an exclusive lounge without paying any fees, while King Khalid Airport competes by offering a special lounge to disabled travelers. Moreover, top international airports compete by offering elite services in lounges, such as private rooms, banking facilities, currency exchange services, travel information centers, reading corners, meeting rooms, etc. Egyptian airports, on the other hand, offer limited entertainment facilities and services, such as food and beverages and comfortable waiting areas.

Most Egyptian airports provide VIP services to facilitate traveler procedures. The Egyptian Airport Company enables a company specializing in ground services to operate VIP lounges in all Egyptian international airports. It has been found that the Cairo International Airport has a competitive advantage over other Egyptian airports by possessing two museums of Egyptian antiquities in terminals 2 and 3 to entertain transit travelers. The analysis also showed that Egyptian airports only offer limited services in duty-free areas with limited food and beverage outlets.

Cairo International Airport is linked with a 5-star hotel that contains 360 rooms, while the rest of the Egyptian international airports do not have any hotels connected to them. In addition, it offers a small metro and bus shuttles to facilitate the transfer of travelers inside the airport. Sharm El-Sheikh Airport is the only airport that provides bus shuttles to transfer travelers to the center of the city. The results revealed that the Egyptian operators use a single till regulation, based on the regulations set for both aeronautical and non-

aeronautical charges by governmental authorities

Moreover, the Ministry of Civil Aviation, the Cairo Airport Company, and the Egyptian Airports Company use a heavy-handed regime in setting their strategy, determining hereby pricing policies, airport investments, airport performance, and service quality without giving each airport the freedom to set their own regulations.

The Egyptian operators increase their revenues by leasing duty-free areas through long-term contracts. Not only does the Cairo Airport Company increase non-aeronautical revenues by renting the duty-free area to Egypt Air Holding Company, but the Egyptian Airports Company also rents the duty-free area to both Honeymoon, a German Company, and Egypt Air Holding Company.

The operators increase revenues by signing agreements that allow airline carriers to rent specific terminals. Additionally, they increase revenues by enabling individual companies or specific airlines to rent VIP lounges. They also enable specialized companies to operate all ground services and handle security issues.

Cairo Airport increases revenues by handling in-house all advertisements inside and outside the airport. Furthermore, airports lease partitions of their terminals to specific airline carriers, allowing them to advertise in their lounges or specific parts of the terminals.

It was found that Borg El Arab Airport competes by attracting LCCs, while Sharm El Sheikh, Hurghada, Luxor, and Aswan Airports compete by offering competitive flight prices for travelers. They offer prices that are much lower when compared to flights having Cairo or Borg Al Arab Airports as the city of commencement for their journey. However, most small, and medium-sized airports in Egypt compete by focusing on attracting charter flights.

Cairo Airport has the power of geographic monopoly because it is located in the capital, thus having the power to attract both FSCs and LCCs, as well as national airline carriers. The airport is operated by a governmental company like several international airports that are totally or partially owned by their respective governments which provide subsidies to support them.

Moreover, the findings revealed that international airports improve their competitiveness by linking their airports with public transportation (such as train services or bus shuttles), offering various entertainment services, arranging festivals, organizing marketing campaigns, and making agreements with foreign ministries and international agencies. Egyptian airports need to emphasize efforts in this area to be able to compete with top international airports.

It is obvious that the Civil Aviation Authority, in cooperation with the Ministry of Tourism and Antiquities, is the authority that sets the development strategies of all Egyptian airports. Their promotional campaigns have led to an increase in the number of travelers and traffic volumes. The Ministry of Tourism and Antiquities takes the lead in setting up promotional campaigns that include information about destinations, services, travel facilities, and incentives for airports.

The analysis showed that the development strategies of the Ministry of Tourism and the Ministry of Civil Aviation strengthen the competitiveness of some airports and weaken that of others. They strengthen some airports by conducting agreements with nearby countries or with airlines to increase the number of flights. They also offer large discounts or incentives to attract charter

flights. For instance, Cairo Airport witnessed a slight decline in the number of travelers and flights due to the incentive program which aimed to attract more flights to Sharm el-Sheikh, Hurghada, Luxor, Aswan, Taba, and Assuit Airports. The Ministry of Tourism and Antiques and the Ministry of Civil Aviation also support the airports by promoting specific destinations in Egypt.

The findings revealed that the Egyptian Airports Company increases aeronautical and non-aeronautical revenues by offering specific deductions to attract more charter flights. The analysis also showed that the Civil Aviation Authority, in cooperation with the Ministry of Tourism and Antiquities, set up pricing policies without making joint decisions with airport operators. They also set discriminatory pricing policies that may strengthen one airport and weaken the other, for instance, they set pricing policies that strengthened the position of Sharm el-Sheikh Airport and weakened Borg Al Arab Airport by depriving it of the same advantages.

7. Recommendations

Based on the previous results and conclusions, the study provides the following recommendations in the form of a suggested framework, based on the five factors of the modified competitiveness model,that can be applied by small and medium-sized Egyptian Airports to increase competitiveness.

The Demand Factor

1. Operators can increase the number of domestic flights by placing paid advertisements on social media platforms. These advertisements may include information about the best destinations in Egypt, recent campaigns, up-to-date visa facilitations, and the deductions that authorities offer. This promotional material can also promote nearby tourist destinations next to the airports (for example Marsa Matrouh Airport can attract travelers to visit Siwa Oasis by announcing that the airport offers deductions to both travelers and airline carriers).
2. Operators should set a strategy to increase the number of flights by making agreements with airline carriers to select their airports for maintenance, fuelling, or departure. They can make agreements with airline carriers that pass through Africa, for instance, flights coming from Asia or the Middle East to North Africa, from Europe to North / South Africa, or flights from South Africa passing through Africa. The rise in the number of air connectivity will lead to an increase in aeronautical revenues.
3. The operators of the Egyptian airports should cooperate with the Immigration Authority to facilitate procedures that encourage tourists to select Egyptian airports as transit points. This aims to increase the number of travelers, aircraft movement, and aeronautical and non-aeronautical revenues. The Civil Aviation Authority should study offering free transit visas, especially in airports that are situated in important tourist destinations.
4. Small and medium-sized airports in Egypt should compete by focusing on attracting several Low-Cost Carriers, charter flights, and private jets. They should also focus on attracting airline carriers that operate flights locally, such as Air Cairo.
5. Small and medium-sized airports should emphasize attracting cargo

flights to increase aeronautical revenues.

The Facility Factor

1. All Egyptian operators can increase their competitiveness by using the Skytrax rating. They can place digital surveys on airport websites or digital screens in airports. This will help improve their Skytrax rating and enable them to compete internationally.
2. They should also offer several entertainment facilities, such as beauty centers, spas, meeting rooms, and simulators, and arrange folklore events in the airport. These facilities enable airports to attract more international and transit travelers, contributing to increasing non-aeronautical revenues.
3. Operators should place in the contracts with airlines or companies that rent or manage commercial sections in the airports, the services or facilities that they will offer, such as banking facilities in lounges, restrooms, massage chairs, reading corners, private rooms, beauty care services, etc. This will guarantee fulfillment of the contracts and the quality of services they offer.
4. The Civil Aviation Authority, the Egyptian Holding Company for Airports and Navigation, in cooperation with the Ministry of Transportation, should activate the project of electric bus shuttles and link all Egyptian airports with the city centers following in the footsteps of Sharm El-Sheikh Airport.
5. The Civil Aviation Authority, in cooperation with the Ministry of Tourism and Antiquities, should set and promote campaigns that aim to attract domestic travelers in addition to international travelers. The strategy that promotes domestic flights hand in hand with international flights can be a tool to achieve targeted capacity and increase both aeronautical and non-aeronautical revenues.

The Financial Factor

1. The Civil Aviation Authority should set up, in cooperation with airport operators, the aeronautical and non-aeronautical charges according to current economic circumstances and create diverse incentives for airline carriers.
2. The operators can increase aeronautical revenues by declaring that they offer maintenance and aircraft services in numerous spaces in hangars or stands.
3. The Egyptian operators can increase non-aeronautical revenues by renting specific terminals and lounges to serve specific types of flights or travelers.
4. Airport operators should employ specialized staff members who oversee airport promotional campaigns.

The Governmental Factor

1. The Egyptian government should give financial subsidies according to the needs of each company. Cairo Airport Company operates only one airport while the Egyptian Airports Company operates 10 International airports, nevertheless, discriminatory policies and unbalanced treatment hinder some airports from achieving their targets.
2. The operators of the Egyptian Airports Company can reduce the impact of the geographic dominance of Cairo International Airport by increasing the number of domestic flights.

3. The operators should set up a campaign to attract travelers to tourist destinations where the airport is located, offering price advantages, or promoting the services and facilities of the airport.
4. The Egyptian government should use a medium-handed regime in setting airports' operational strategies by enabling each airport operator to set regulations according to their needs and economic circumstances.

The Technological Factor

The study proposes a pattern to reduce congestion and accomplish the targeted capacity for each airport as follows:

1. Operators can reduce congestion by offering kiosk machines that enable travelers to finish check-in procedures in a maximum of 12 seconds (Table 1.1) in addition to self-drop baggage machines that end baggage handling in a maximum of 30 seconds instead of taking at least 20 minutes (Table 1.2). Immigration procedures can be finished by using biometric machines
4. etc.

that require seconds instead of several minutes; for instance, 400 travelers can board a large aircraft in less than 20 minutes instead of 45 to 60 minutes (Table 1.3). Operators can make agreements with airline carriers to offer kiosk machines in the airports instead of going through physical check-in procedures.

2. Operators should enable all international airport companies to offer applications that allow travelers to track their flights, request airport services, select items from duty-free stores, and then collect them from a specific terminal or gate. Additionally, they should activate the WhatsApp airport service and chatbot via their website.
3. The Egyptian operators can compete by using robots in information centers. Robots can answer the questions of travelers, lead them to the gates, and give them information about flights, duty-free areas, food and beverage services, services in lounges,

Table 1.1: The Number of the Proposed Kiosk Machines in the Egyptian Airports

Name of airport	1 minute	12 months	Number of required machines	The target number of travelers
Sharm El-Sheikh	5 Pax	2,592,000	15	37,152,000
Hurghada	5 Pax	2,592,000	10	25,920,000
Borg al Arab	5 Pax	2,592,000	2	4,320,000
Luxor	5 Pax	2,592,000	14	34,560,000
Aswan	5 Pax	2,592,000	11	27,648,000
Marsa Matrouh	5 Pax	2,592,000	1	2,592,000
Taba	5 Pax	2,592,000	2	5,184,000
Assuit	5 Pax	2,592,000	3	6,912,000
Sohag	5 Pax	2,592,000	2	3,456,000
Port Said	5 Pax	2,592,000	2	4,320,000

Table 1.2.: The Number of the Proposed Self-Drop Baggages in the Egyptian Airports

Name of airport	1 minute	12 months	Number of Required machines	The target number of travelers
Sharm El-Sheikh	2	1,036,800	37	37,152,000
Hurghada	2	1,036,800	25	25,920,000
Borg al Arab	2	1,036,800	4	4,320,000
Luxor	2	1,036,800	34	34,560,000
Aswan	2	1,036,800	27	27,648,000
Marsa Matrouh	2	1,036,800	3	2,592,000
Taba	2	1,036,800	5	5,184,000
Assuit	2	1,036,800	7	6,912,000
Sohag	2	1,036,800	4	3,456,000
Port Said	2	1,036,800	5	4,320,000

Table 1.3.: The Number of the Proposed Biometric Machines in the Egyptian Airports

Name of airport	1 minute	12 months	Number of required machines	The target number of travelers
Sharm El-Sheikh	20 pax	10,368,000	4	37,152,000
Hurghada	20 pax	10,368,000	3	25,920,000
Borg al Arab	20 pax	10,368,000	1	4,320,000
Luxor	20 pax	10,368,000	4	34,560,000
Aswan	20 pax	10,368,000	3	27,648,000
Marsa Matrouh	20 pax	10,368,000	1	2,592,000
Taba	20 pax	10,368,000	1	5,184,000
Assuit	20 pax	10,368,000	1	6,912,000
Sohag	20 pax	10,368,000	1	3,456,000
Port Said	20 pax	10,368,000	1	4,320,000

8. Future Research

1. Measuring the productivity and efficiency of airports and their impact on competitiveness.
2. The impact of airport revenue management on suppliers.
3. The relationship between revenue management and airport charges.
4. The impact of airport branding on air traffic and passenger movement.
5. The Influence of airport branding on the formation of tourist destination image: a perspective on passenger loyalty.
6. The influence of service performance on customer satisfaction and airport ratings.

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Appendix 1

Table 1.4 Summary of the Operational Strategies of International Large and Medium-Sized Airports

Name of Airport	Demand Factor	Facility Factor	Technological Factor	Financial Factor	Governmental Factor
Beijing Daxing Airport	1- Number of domestic travelers is 90 % of the total number. 2- Operate direct domestic and short-haul routes (North America, Europe, North Asia, and South Asia). 3-Offer free transit visa.	1-Compete by using Skytrax 2-VIP Lounges 3-Offer entertainment services (yoga room, spa, beauty center, playground, etc). 4-Linking with luxury hotels 5-High-speed railway, subway, and bus shuttles. 6-5 runways, 75 stands, large space for parking.	1-Smart Path, 80 kiosk machines, 600 biometric machines and 30 self-bag drops. 2-10 virtual and physical robots 3-Cleaning robot.	1-Non-aeronautical are over 56,6 % of the aeronautical revenues. 2-Conduct contracts with airline carriers and specialized companies to handle commercial activities.	1-Airport has government support including (government funding, and projects that the government linked with the airport).
Haneda Airport	1-Number of domestic travelers are 70 % of the total number. 2-Operate domestic, direct and connecting short haul routes (North America, Europe, North and South Asia). 3-Offer free transit visa.	1-Compete by using Skytrax 2-VIP Lounges 3-Offer entertainment services (planetarium cinema, flight simulators, traditional festivals, and arranging several events). 4-Link with a luxury hotel. 5- Railway station. 6- 4 runways,152 domestic stands, and 45 international stands.	1-Face Express service and kiosk machines. 2-Cleaning robots and wheelchair robots.	1- Conduct contracts with airline carriers and specialized companies to handle commercial activities.	2-Airport has the power of government support including (projects that the government linked with the airport).
Hartfields-Jackson Atlanta Airport	1-Number of domestic travelers is 90 % of the total number. 2-Operate domestic flights and direct short-haul routes (North America, Europe). 3-Visa on arrival to 40 nationalities.	1-Compete by using Skytrax. 2-VIP Lounges 3-Offer Entertainment (rotating exhibitions, several museums, 300 restaurants 4-Link with luxury hotels 5-Skytrain, metro, and car rentals. 6-5 runways, 152 gates for domestic flights, 41 gates for international flights. 7-Offer QR code in parking spots.	1-75 kiosk machines 2-Smart digital terminal for cargo.	1-Non-aeronautical are over 50 % of the aeronautical revenues. 2-Conduct contracts with airline carriers and specialized companies to handle commercial activities.	1-Airport has the power of government support including (the government funding, projects that the government linked with the airport).
Abu Dhabi International Airport	1-Operate direct domestic flights and short-haul (Middle East, South Asia, Europe). 2-Operators focus on increasing the number of cargo flights 3-Enable Gulf countries to enter Abu Dhabi without a visa. They also enable 69 nationalities to issue a visa on arrival.	1-Compete by using Skytrax 2-VIP Lounges 3-Link with luxury hotels 4- Free bus shuttles. 5-Specify terminal for Etihad airline carriers also specifies a terminal for private aircraft and helicopters.	1-Kiosk machines in hotels that linked with the airport 2-Cleaning robots and robots for PCR test	1-Conduct contracts with airline carriers and specialists companies to handle commercial activities	1-Airport has the power of government support including (projects that the government linked with the airport). Operators reduce the impacts of the dominance of large airports by specifying terminals and lounges to specific airline carriers and also attract LCCs.
King Khalid International Airport	1-Operate domestic flights and short-haul (Middle East) 2-Visa on arrival to 49 nationalities.	1-Improve its competitiveness by using Skytrax 2-VIP Lounges and room for disabilities. 3-Linking with luxury hotels 4- Private car rentals.	1-Chatbot via social media, and several applications.	1-Conduct contracts with airline carriers and hire specialized employees to handle commercial activities.	1-Airport has the power of government support including (projects that the government linked with the airport, or by agreeing with authorities to encourage travelers to select the King Khalid airport). Operators reduce the dominance of large airports by specifying terminals and lounges to specific airline carriers.
San Jose International Airport	1-Number of domestic travelers is 93 % of the total number. 2-Operate domestic flights and direct short-haul routes. (America, West Asia, Europe). 3-Visa on arrival to 40 nationalities.	1-Compete by using Skytrax 2-Linking with free bus shuttle, large space for car rental companies.	1-7 kiosks and biometrics. 2-Robot for travel information.	1- Non-aeronautical are over 50 % of the aeronautical revenues. 2-Conduct contracts with airline carriers and specialized companies to handle commercial activities.	1-Airport has the power of government support including (government funding, and projects that the government linked with the airport).

Source: Abu Dhabi Government Media Office, 2021; Atlanta Airport, 2021; Beijing International Airport Company,2020; Japan Schedule Coordination, Japan Aeronautic Association,2021; King Khalid International Airport,2022; San Jose Airport,2022.