Multi-Airport Systems as a Global Tourism Phenomenon: a Critical Review and a New Concept

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Abstract

The transition from single-airport to multi-airport systems is going to be a basic tool by which air transportation systems will be able to meet future demand. There are many experiences related to the failure and success of managing the multi-airport systems worldwide. The main objectives of the present study are to shed light on the different dimensions and international experiences of the multi-airport system, and to evaluate the Egyptian experience in this regard. The methodology of the study depends on the researcher's own critical review based on his scientific background on the phenomenon of multi-airport systems through survey in secondary and primary data. The current study mainly depends the author's scientific background since he had conducted an oral pilot study with some experts at the Egyptian Ministry of Civil Aviation and Egypt Air and he found that the concept of Multi-Airport System is not common. So, for the credibility of the results, the author focuses on his own critical review as an expert in air aviation with reasonable experience in both theoretical and practical sides

Finally, the study presents a new comprehensive concept of the multi-airport system and an action plan to implement the concept of Multi-Airport System in Egypt. The importance and originality of the current research is to ameliorate the concept of multiple-airport system in light of displaying some of international experiences.

Keywords: Multi-Airport Systems; Multi-Airport Regions; Metropolitan Area; Regional Airport System Plans; Critical Review

Introduction

Low-cost carriers may be of interest to airport managers within a multi-airport company. The airport requests of low-cost airlines encompass: low airport charges (numerous air fares in Europe has reduced by 80% due to advent of low-cost carriers); speedy 25 minute turnaround time to fulfill better fleet profiteering and staff output; one- storey airport buildings; fast check-in pertaining to a simple point-to-point product in contrast with onward trips by major airlines; good catering and shopping at airport because low-cost airlines neither provide inflight catering nor newspapers, and to enable airports to increase their non-aeronautical revenues; good facilities for ground transport such as bus services that connect to flights, car parks and good public transport; and no executive/business class lounges because of high-cost facilities and gold-plating in general (Barrett, 2004, P: 37).

Air transport networks are three and based on distinguished airports. These will serve the imitative airlines, the "low cost" airlines, and inserted freight. These networks intersect but, since they have different needs, they will demand and obtain radical independence (Richard, 2004, P: 2).

In both the United States and in Europe, the last development of multi-airport systems is ultimately setup on the emergence of secondary airports. While in Asia, multi-airport systems have primarily evolved through the construction of new high capacity airports (Hansman et al, 2008, P: 1; Zhan et al., 2009, P: 2)..

According to Nayak (2012, P: 30), developing a Regional Airport System Plan (RASP) for a metropolitan region might reduce regional congestion, lesser delays, more revenue generation, regional infrastructure development, and positive environmental impacts. Moreover, it was said policy makers can respond to the capacity limits of airports in many ways (Kouwenhoven, 2008, P: 2):

- Doing nothing.
- Reducing demand for air transport by stimulating the use of alternative modes.
- Stimulating more effective use of existing capacity.
- Expanding physical capacities by building more runways or terminals.
- Building a new airport at another location.
- Attracting more traffic to existing airports in the neighbourhood by attracting new airlines to these airports, by collaboration between the airports, or by outplacing flights to these airports.
- Making alternative airports more accessible with extra roads, better public transport, or rail connection.

Literature uttered that choice of an airport within a MARs is based on a series of flight and airport levels-of-service (LOS) features. The former includes: ticket price, flight frequency, in-flight travel time, number of stops, transfer arrangements, congestion or punctuality of flights, airlines serving the route, and aircraft type. The later consists of vicinity of the airport, airport access time, access cost, access mode, parking facilities, check-in facilities, lounge, restaurant and shopping facilities, baggage, customs and immigration facilities, and airport tax or passenger charge (Loo, 2008, P: 118; Kouwenhoven, 2008, P: 8).

Problem of the current study pertaining to the arguing about the capacity constraints on existing major airports and the limited ability to increase their capacity (Hansman et al., 2008, P: 1). Moreover the experience in managing multi-airport systems is inferior and planners fail to speculate the patterns of traffic allocation between airports, and over invest and over building facilities in secondary airports. Examples are as follows (Richard, 1995, P: 100):

- Edmonton; the international airport has been emptied as passengers flock to the more convenient downtown Municipal Airport.

- London; despite long-term predictions that a Third London Airport was urgently needed, passenger buildings at London/Stansted are deserted.
- Montreal; Montreal/Mirabel International Airport extradites lower than 3 million passengers a year in facilities built for 6 to 10 million passengers

Based on the above, the aims of the current research are:
1. To explore the various aspects and world experiences of the multi-airport systems.

2. To evaluate the Egyptian experience and to set an action plan for implementing the concept of MAS in Egypt.

Literature Review

Concept of Multi-Airport System/Multi-Airport Regions

The concept of MARs has standed out in the 1990s. There are many definitions of connotation MARs. It was defined as "a group of two or more major commercial airports in a metropolitan area" (Nayak, 2012, P: 6). Wandelt et al. (2017, P: 84) gave a definition for a major commercial airport as "an airport with at least two million passengers yearly".

Additional definition meant a multi-airport system is "the set of airports that serve the airline traffic of a metropolitan area". An airport can be part of a multi-airport system either the airport is close to the existing major airports or officially designated by local authorities (Richard, 1995, P: 102).

Another qualifier means that a multi-airport system (MAS) is "the set of significant airports that serve commercial transport in a metropolitan region, without regard to ownership or political control of individual airports" (Richard, 2004, P: 2). Moreover, it may exist in all cities with more than 17 million annual originating passengers (Richard, 2016, P: 3).

In the context of definitions, MARs are major air traffic generating regions, which have at least 10 million passengers per year (Loo, 2008, P: 117). The threshold for successful multi-airport systems in 1980s was about 8, in 1990s was around 10, and it was expected to reach 12 million originating passengers a year (Richard, 1995, P: 107).

A multi-airport system is defined as a set of two or more significant airports that serve commercial traffic within a metropolitan region (Hansman et al., 2008, P: 1).

Multi-Airport System is an airport system where there is more than one airport competing in the same metropolitan region to serve the air traffic, regardless of the ownership or the political influence of a single airport (Perdana and Moxon, 2014, P: 2).

It is clear that the commonalities of these definitions can be summarized in the fact that multi-system airports serve urban areas, which can be two or airports more, focus on

civil commercial airports, and there is a steady increase over time in terms of the number of passengers through these airports.

World Experiences of Multi-Airport Systems

London has six operational airports- Heathrow, Gatwick, Stansted, Luton, City and Southend. They are the busiest airport system in the world in view of passenger's movements and the second pertaining to the aircraft movements. Heathrow is one of the top international airports in the world. Whereas Gatwick offers point-to-point flights to Europe. Stansted is one of the operational bases of Europe's largest low-cost carrier (LCC) Ryanair and Luton is the headquarters of LCC EasyJet (Chandrakanth, 2015).

Hansman et al. (2010) in table No.1 displayed- based on the database of the International Civil Aviation Organization ICAO (2008)- the number of 59 multi-airport systems across world regions distributed to primary and secondary airports. Each airport with capacity more than 500,000 passengers is included. A primary airport was defined as an airport serving more than 20% of the total passenger traffic in the MAS, while a secondary airport was defined as an airport serving between 1% and 20%. It worth to mention that the number of multi-airport systems has been increased to 60 in the year 2011 as being shown in figure No.1. (Richard, 2016, P: 10).

Table (1): Multi-airport systems worldwide 2010

World Region	Metropolitan Area	Country	Number of Primary Airports	Number of Secondary Airports
Asia - Pacific	Osaka	Japan	2	1
	Tokyo	Japan	2	0
	Hong Kong	China	2	0
	Shanghai	China	2	0
	Taipei	China	2	0
	Seoul	South Korea	2	0
	Bangkok	Thailand	2	0
	Melbourne	Australia	1	1
Europe	London	United Kingdom	2	3
	Manchester	United Kingdom	1	3
	Glasgow	United Kingdom	2	1
	Belfast	United Kingdom	2	0
	Dusseldorf	Germany	2	2
	Berlin	Germany	2	1
	Frankfurt	Germany	1	1
	Hamburg	Germany	1	1
	Stuttgart	Germany	1	1
	Paris*	France	2	1
	Milan	Italy	2	1
	Pisa	Italy	2	0
	Bologna	Italy	1	1
	Rome	Italy	1	1
	Venice	Italy	1	1
	Amsterdam	Netherlands	1	2
	Moscow	Russia	2	1
	Barcelona	Spain	1	2
	Vienna	Austria	1	1
	Brussels*	Belgium	1	1
	Copenhagen	Denmark	1	1
	Oslo	Norway	1	1
	Stockholm	Sweden	1	2
	Gothenburg	Sweden	1	1
	Istanbul	Turkey	1	1
North America	Los Angeles	United States	1	4
	New York	United States	3	1
	Washington	United States	3	0
	San Francisco	United States	2	1
	Boston	United States	1	2
	Tampa	United States	1	2
	Miami	United States	2	0
	Norfolk	United States	2	0
	Chicago*	United States	1	1
	Cleveland	United States	1	1
	Dallas*	United States	1	1
	Detroit	United States	1	1
	Houston	United States	1	1
	Orlando	United States	1	1
	Philadelphia	United States	1	1
	San Diego	United States	1	1
	Toronto	Canada	1	1
	Vancouver	Canada	1	1
Latin America	Sao Paulo	Brazil	2	1
	Belo Horizonte	Brazil	2	0
	Rio de Janeiro	Brazil	2	0
	Buenos Aires	Argentina	2	0
	Mexico	Mexico	1	1
Middle East	Tehran	Iran	1	1
	Tel Aviv	Israel	1	1
	Dubai	UAE	1	1

* One additional airport in the metropolitan for freight activity
Source: Hansman et al., 2010, P: 3.
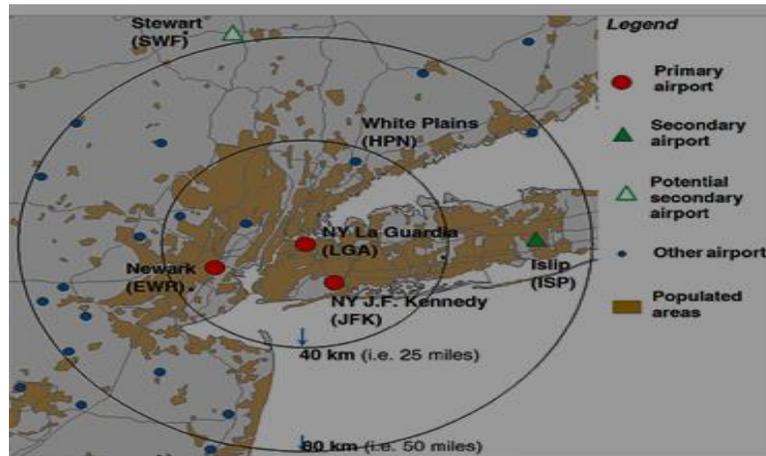
5

Figure (1): Multi-Airport Systems Worldwide
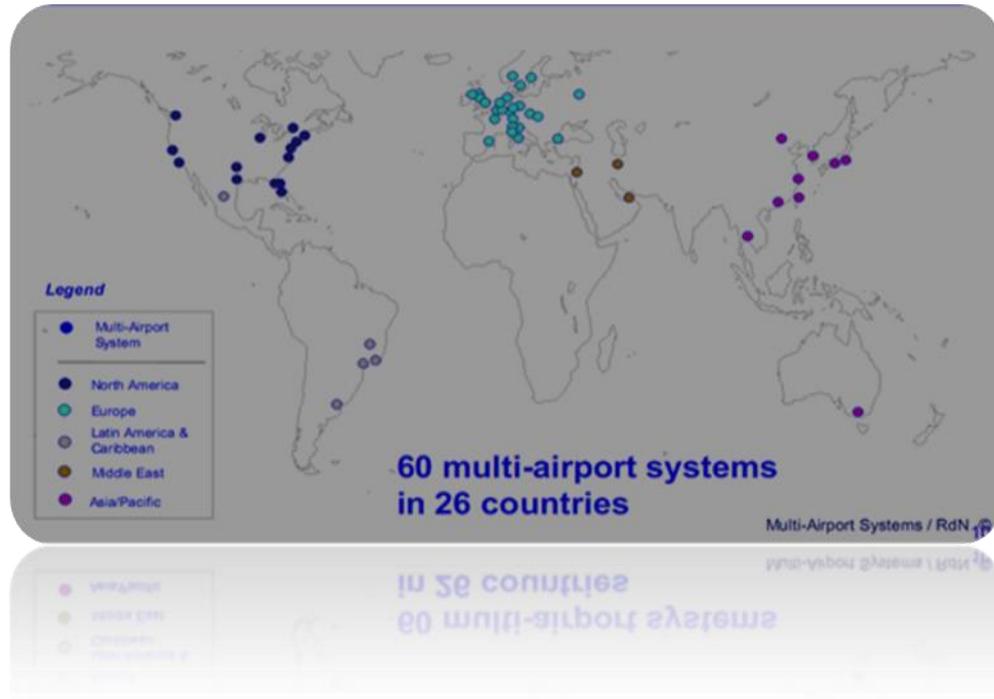
Source: Richard, 2016, P: 10

There are main factors can influence the growth of a MAS (Hansman et al., 2010, PP:4-5):

Availability of existing airport infrastructure: where North America is a high density with an average of 7 and 10 airports within 80 and 120 km of the primary airport (an airport that is the closest to the center of the metropolitan region with at least one runway longer than 1524 m). This is virtually clear in figures (2), (3) and (4).

The entry of low-cost carriers at under-utilized airports: where the entry of a low-cost carrier stimulates the emergence process of an airport; in the United States, Southwest Airlines has been responsible for the emergence of 13 airports.

Regulatory and political factors: these maybe positive on the evolution of multi-airport systems (i.e. limiting Southwest Airlines' operations at Dallas/Love Field to ensure transfer of traffic to Dallas/Fort Worth), or negative on the evolution of multi-airport systems (i.e. the 1997 Indian Airport Infrastructure Policy was designed to limit the construction of new airports within 150 km of existing major airports).

Figure (2): Multi-Airport Systems in US

Source: Richard, 2016, P: 8

Figure (3): Multi-Airport System in Boston, USA

Source: Richard, 2016, P: 7

Figure (4): Multi-Airport System in New York, USA

Source: Richard, 2016, P: 6

In Indonesia, Great Jakarta Metropolitan Area (GJMA) Airport System was offered to comprise Soekarno-Hatta International Airport (SHIA) and New Jakarta International Airport (NJIA) which will be located in a green-field site around a hilly area in the Karawang Regency and planned to begin its first operation in 2019. Perdana and Moxon (2014) conducted a research based on a five step methodology (CAIAD) collect information, analyzing, imagining, assessing, and deciding. They concluded that best traffic distributions scenarios are international and domestic traffic for SHIA and domestic traffic for NJIA, or International and domestic traffic for both of SHIA and NJIA. They have proposed reducing the capital investment and the risk of developing too large facilities for the actual traffic demand in the future. Moreover the government should improve the surface access to the NJIA to attract suitable traffic.

In the metropolitan circle of Yangtze River Delta, there are 18 airports such Shanghai Pudong, Shanghai Hongqiao, etc. The regional airport density is $0.87/10 \text{ km}^2$, that is well above the 0.17 average in China's other metropolitan circles and surpasses the 0.6 average in the United States. A study applied theory to 5 large airports in the Yangtze River Delta. Results of the study showed that compared to the single airport operation, arrival-time loss decreased by 53% from 90.317 minutes to 42.336 minutes; total time loss decreased by 25% from 173.705 minutes to 129.573 minutes; and passenger trip efficiency improved. Moreover, the MAS of Yangtze River Delta employed more large airplanes, and the average flight passenger load factor improved by 3.1% decreasing airlines' costs. The final finding is that flight time optimization in multi-airport system operation mode benefits both airlines and passengers (Hua and Bao, 2017, PP: 9-10).

The Manila metropolitan area was expected to associate the quorum cities of the world that would have the distinction of having a multi-airport when the Department of Transportation and Communications (DOTC) made recommendation to Malacanang for

adoption of Multi-Airport System (MAS) for Manila to address the congestion at the Ninoy Aquino International Airport (NAIA). It was predictable that it would be greater if there are two international airports for Manila as international gateways. But the choice would be between maintaining two major airports—Clark and NAIA—supporting each other, or vacating Manila in favor of Clark, or establishing a brand-new airport (e.i. PAL Airport) inside Metro Manila or in a nearby province that will replace the existing NAIA complex in Pasay City. The government approved construction of Manila-NAIA, Manila-CLARK, and Manila- PAL as primary airports supplemented by secondary airport, Manila-SANGLEY as general aviation airport. Two primary airports are likewise considered for Metropolitan Manila, while Sangley and Clark could be relegated to secondary gateway. It was foreseeable that these airports will be operating like London, New York, and Tokyo airports (Abaya,2013,P:1).

Tehran multi-airport system is the solitary multi-airport system in Iran and uses of two major airports. Mehrabad International Airport (MIA) with around 13 million passengers annually, and located near the city serving only domestic flights with some international flights; haj flights. While Imam Khomeini International Airport (IKIA) serves only international flights and located 30 km away (Saffarzadeh, 2012, P: 38).

Dubai multi-airport system includes Dubai International (DXB) and Dubai World Central (DWC). The DXB serves more than 66 million people a year on more than 140 scheduled airlines. DXB's world-class facilities include the world's first and largest purpose-built A380 facility concourse. Dubai World Central (DWC) is Dubai's airport of the future. DWC was opened on October 27, 2013 with 5-7 million capacity passenger terminal passengers, whereas cargo operations were launched much earlier on June 27, 2010. Upon completion, DWC will become the world's largest airport with an ultimate capacity of more than 160 million passengers and 12 million tons of cargo yearly. The airport composes the heart of a greater project, a 140 km2 multiphase development of six clustered zones that includes the Dubai Logistics City (DLC), Commercial City, Residential City, Aviation City and the Golf City (www.dubaiairports.ae, February 2018).

As published in 2018, many cities are served by more than one airport, typically to avoid congestion, and where there may be factors preventing expansion to existing airports. In other cities, multiple airports may be built to cater for specific uses, such as between international and domestic flights. Table 2 provides cities which are served by more than one airport offering scheduled passenger services even if it is not within the city boundaries. Military airbases (without passenger service) and airports serving only charter flights are not included.

Table (2): Cities with more than one Airport worldwide 2018

Country	Metropolitan City	Average Distance from City Center (km)
Seven Airports		
United States	New York City-New York Metropolitan Area-New York	From 4 to 125 km
Six Airports		
Canada	Metro Vancouver-British Columbia	Downtown to 61 km
United Kingdom	London-Greater London	From 11 to 69 km
Five Airports		
United States	Los Angeles-Greater Los Angeles Area-California	From 25 to 70 km
Four Airports		
Australia	Melbourne-Victoria	From 11 to 50 km
France	Paris-Île-de-France	From 18 to 147 km
Russia	Moscow	From 28 to 49 km
Japan	Tokyo Metropolis-Special wards of Tokyo	From 14 to 80 km
Sweden	Stockholm-Stockholm County	From 7.4 to 100 km
United States	San Francisco Bay Area-California	From 18.3 to 87 km
United States	Miami-Florida	Downtown to 166 km
United States	Boston-Massachusetts	From 4 to 95 km
Three Airports		
Brazil	São Paulo	Around the City
Denmark	Copenhagen	Downtown to 8 km
Dominican Republic	Samaná	Downtown to 8 km
Italy	Milan	From 1 to 49 km
Japan	Osaka	From 8 to 43 km
Norway	Oslo	From 7.4 to 60 km
Philippines	Manila	From 7 to 80 km
Spain	Barcelona	From 12 to 100 km
United States	Baltimore, Maryland- Washington D.C	From 5 to 51 km
United States	Chicago-Illinois	From 6 to 27 km
United Sates	Kansas City-Missouri	Downtown to 24 km
United States	Orlando-Florida	Downtown to 10 km
United States	Philadelphia	Downtown to 50 km
United States	Seattle-Washington	From 1.85 to 25 km
United States	Tampa-Florida	From 6 to 9.6 km
Two Airports		
Argentina	Buenos Aires	From 2 to 22 km
Belgium	Brussels	From 12 to 46 km
Belize	Belize City	From 1 to 5 km
Bolivia	Santa Cruz	Downtown to 2 km
Brazil	Belo Horizonte	Downtown &around
Brazil	Rio de Janeiro	Downtown &around
Canada	Montréal	From 16 to 20 km
Canada	Ottawa	From 1.9 to 10.2 km
Canada	Toronto	Downtown to 22.5
China	Beijing	From 13 to 32 km
China	Shanghai	From 13 to 30 km
Colombia	Medellin	From 29 to 45 km
Congo	Kinshasa	Near the center
Costa Rica	San José	Downtown to 20 km
Dominica	Roseau	From 3.2 to 5 km
Dominican Republic	Santo Domingo	Around the center
Egypt	Alexandria	From 7 to 40 km
Germany	Berlin	From 8 to 18 km

Table (2): Continued

Germany	Frankfurt	From 12 to 120 km
Iceland	Reykjavik	From 2 to 50 km
Indonesia	Jakarta	Downtown to 20 km
Iran	Tehran	Downtown to 30 km
Israel	Eilat	Downtown to 60 km
Israel	Tel Aviv	Downtown to 19 km
Italy	Rome	From 12 to 35 km
Italy	Venice	From 8 to 31 km
Japan	Nagoya	Downtown to 35 km
Japan	Sapporo	From 5 to 7.4 km
Jordan	Amman	From 5 to 30 km
Kenya	Nairobi	From 4 to 15 km
Liberia	Monrovia	From 5 to 56 km
Malaysia	Kuala Lumpur	Downtown to 45 km
Mexico	Mexico City	From 5 to 40 km
Mexico	Nuevo León-Monterrey	Near the Center
Namibia	Windhoek	From 5 to 45 km
New Caledonia	Nouméa	From 3 to 52 km
Nigeria	Port Harcourt-Rivers State	Near the Center
Norway	Narvik	Near the Center
Pakistan	Islamabad	Downtown to 20 km
Panama	Panama City	Downtown to 1.5 km
Poland	Warsaw	Downtown to 40 km
Puerto Rico	San Juan	Downtown to 5 km
Russia	Krasnoyarsk	From 23 to 27 km
Russia	Ulyanovsk	From 9 to 28 km
Saint Lucia	Castries	From 2 to 53.4 km
Sierra Leone	Freetown	Near the Center
Singapore	Singapore	Downtown to 17.2 km
Somalia	Mogadishu	Downtown to 50 km
South Africa	Johannesburg	Near the Center
South Korea	Gwangju	Downtown to 11 km
South Korea	Seoul	Downtown to 15 km
Spain	Santa Cruz de Tenerife	Downtown to 11 km
Sri Lanka	Colombo	From 15 to 32.5 km
Suriname	Paramaribo	From 3 to 45 km
Taiwan	Taipei	Downtown to 40 km
Thailand	Bangkok	Downtown to 25 km
Turkey	Istanbul	From 24 to 35 km
Turkey	Mugla	From 16 to 36 km
Ukraine	Kiev	From 7 to 29 km
United Arab Emirates	Dubai	From 4.6 to 37 km
United Kingdom	Belfast	From 5 to 21.3 km
United Kingdom	Glasgow	From 15.9 to 51 km
United Kingdom	Lerwick	From 7.4 to 31 km
United States	Atlanta-Georgia	Downtown to 11 km
United States	Buffalo-New York	Downtown 6.4 to 18 km
United States	Charlotte-North Carolina	Downtown to 13 km
United States	Cleveland-Ohio	From 14 to 23 km
United States	Columbus-Ohio	From 9.7 to 16 km
United States	Dallas-Texas	Downtown to 10 km
United States	Houston-Texas	From 11 to 37 km
United States	Phoenix-Arizona	From 5 to 32 km
United States	St. Louis-Missouri	From 23 to 26 km
United States	Virginia Beach-Norfolk, Virginia	Downtown to 6 km

Source: Author's own elaboration based on www.wikipedia.com, February 2018.

Theoretical and Empirical Contribution

The critical approach with a quick glance at the material of the current study including both theoretical and practical studies can be seen through the following ideas below:

- Table 2 points out that the number of cities worldwide with multiple-airport systems has been increased to reach nearly to 100 cities compared to 59 cities till 2010 as mentioned in table 1 and 60 ones until 2016 as it is stated in figure 1. However, there is a reservation to what is mentioned in table 2 as it does not mention multi-airport cities such as Washington (3 airports) in the United States and Manchester (4 airports) in the United States, although they are listed in table 1 since 2010.

- There is an increase in the number of airports composing a multi-airport system in some cities all over the globe such as New York (from 4 to 7 airports) and London (from 5 to 6 airports). Other cities have static capacities of multi-airport systems as in Paris and Los Angeles. Prominent paradigms are outstanding as stated below in table 3 as a comparison between 2010 and 2018.

Table (3): comparison of multi-airport systems between 2010 and 2018

City	MAS 2010	MAS 2018	Change %
New York	4	7	75
London	5	6	20
Vancouver	2	6	200
Los Angeles	5	5	0
Melbourne	2	4	100
Paris	4	4	0
Moscow	3	4	30
Tokyo	2	4	100
Stockholm	3	4	30
San Francisco	3	4	30
Miami	2	4	100
Boston	3	4	30
São Paulo	3	3	0
Copenhagen	2	3	50
Milan	3	3	0
Osaka	3	3	0
Oslo	2	3	50
Barcelona	3	3	0
Chicago	3	3	0
Orlando	2	3	50
Philadelphia	2	3	50
Tampa	3	3	50
Buenos Aires	2	2	0
Brussels	2	2	0
Belo Horizonte	2	2	0
Rio de Janeiro	2	2	0
Toronto	2	2	0
Shanghai	2	2	0
Frankfurt	2	2	0
Taipei	2	2	0
Istanbul	2	2	0
Bangkok	2	2	0
Belfast	2	2	0
Cleveland	2	2	0
Dallas	2	2	0

Source: author's own elaboration

- There is an exception to what is published in 2018 compared to 2010 with regard to the number of airports in both the cities of Berlin in Germany and Glasgow in the United Kingdom. Since the number of airports has decreased from 3 to 2 in both of the two cities.

- There is a significant increase in the number of multi-airport cities in Asia and Eastern Europe. And a remarkable emergence of Africa and the Middle East region.

- The United States ranks first in the world in terms of multi-airport cities. It is also the only country with all levels of multi-airport cities ranging from dual-airport cities to cities with seven airports.

- The New York City has the biggest multi-airport system in the world with capacity of 7 airports from 4 to 125 km distance of the city center.

- Clearly, the dominance of developed countries and growth signs in developing countries with regard to multi-airport cities.

- The only Egyptian multi-airport system has been in Alexandria since 2010. It consists of two commercial airports for Alexandria and Nile Delta region. El Nouzha Airport (Alexandria International Airport) has been closed down by December 2011 for two years to implement the expansion project and development and was scheduled to be reopened end of 2014. As of January 2016, the airport still remains closed. However, satellite images show the airports runways to be resurfaced and extended while the terminal site remains unfinished and abandoned. Borg El Arab Airport had a major expansion in terms of the airport's passenger and cargo handling capacity in response to growing demand and the new facilities were inaugurated in 2010. However, There was no mention for the mono Egyptian multi-airport system in both table 1 by Hansman et al., 2010, P: 3 or Richard, 2016, P: 10 in figure 1.

- According to Hansman et al. (2010) in table No.1 - based on the database of the International Civil Aviation Organization ICAO (2008)- each airport with capacity more than 500,000 passengers is included as a part of a multi-airport system. Many Egyptian airports are suitable for a multi-airport system. Examples are in Alexandria (HBE) with 1,200,000 passengers, Cairo (CAI) with 16,500,000 passengers, Hurghada (HRG) with 2,900,000 passengers, Luxor (LXR) with 914,000 passengers, Marsa Alam (RMF) with 1,089,032 passengers, Sharm El Sheikh (SSH) with 6,621,735 passengers, Sohag (HMB) with 1,400,000 passengers (www.airport-arrivals-departures.com, February2018).

- In Egypt, Cairo International Airport (CAI) has Terminal 1 (hall 1, hall 2, hall 3, and hall 4); Terminal 2 (hall 1 and hall 2); Terminal 3 (hall 1 and hall 2); Seasonal Terminal (ST); and Cargo Village. Despite the large potentials of the airport, Cairo city has not been described as a city with a multi-airport system. In light of MAS concepts stated in the review of the current study, the research reveals that airports which serve a city with a multi-airport system do not have to be isolated from each other but may be multiple and adjacent buildings of a hub airport. The evidence is:

Loo (2008, P: 117) provided definition "MARs are major air traffic generating regions, which have at least 10 million passengers per year". The CAI handled with 14,360,029 passengers in 2008 (www.wikipedia.com, March 2018).

❖ Richard (2016, P: 3) said that the MAS may exist in all cities with nearly or more than 17 million annual originating passengers. The CAI nearly handled with 16.5 million passengers in 2016 and came in the second position after the O. R. Tambo International Airport in Johannesburg with almost 21 million passengers (www.wikipedia.com, March2018).

❖ A major commercial airport was defined as an airport with at least two million passengers per annum (Wandelt et al., 2017, P: 84). This definition applies to the Terminals 1, 2, and 3 at the CAI.

❖ A multi-airport system is the set of airports that serve the airline traffic of a metropolitan area. The airport can be part of a multi-airport system either the airport is close to the existing major airports or officially designated by local authorities (Richard, 1995, P: 102). The CAI meets the specifications of this definition.

Summary and Conclusion

The first objective of the current study on the multi-airport system has been achieved. The multi-airport system is a global phenomenon on all continents. Countries seek to benefit from their advantages whether they are developed or developing countries. The concepts of the multi-airport system have varied. There are also different views on increasing the capacity of the airports, notably the transformation from the individual airport system to the multi-airport system. From a review of some international experiences, developed countries are distinguished by their acquisition of many multi-airport systems. The United States ranks first in terms of number and diversity of multi-airport systems. New York Metropolitan Area has the largest multi-airport system, which includes seven airports.

It is important to note that all global classifications of multi-airport systems focus on civilian airports in cities which are served by more than one airport offering scheduled passenger services even if it is not within the city boundaries. All types of MASs exclude military airbases without passenger service and airports serving only charter flights. The

current study reveals no specific criterion for distances between airports that are a component of the multi-airport system as well as between them and the urban center of the metropolitan city.

Based on the above - especially with regard to the non-classification of Cairo International Airport despite its huge potentials as a multi-airport system - the current study proposes a new definition as follows: "*The multi-airport system is a set of airports or terminals that form an integrated and self-sufficient system in the transport of passengers and air cargo; whether they are adjacent or separated within a particular metropolitan area; international or local; major or secondary; number of passengers and volume of air cargo; civilian or military; scheduled, private or charter aviation*".

It is clear that Egypt is out of classification in comparative with international experiences of MAS. The current study provides concise strategy for the MAS in Egypt as follows:

1- Collecting and analyzing more information about the concept of MAS and its technical and design dimensions.

2- Focusing future studies on different approaches to the design of regional multi-airport systems that have positive economic, social and environmental impacts on the local economies.

3- Encouraging establishment of regional and secondary airports with reducing the capital investment. Moreover the government should improve the surface access to these new airports to attract suitable traffic.

4- In light of the previous mentioned standards about MAS through this research, the current study suggests many airports in figure 5 are proposed to form one or more of Egyptian Multi-Airport Systems (EMAS), taking into consideration scenarios of distribution of international and domestic traffic among them.

Figure (5): Airports Distribution in Egypt

Source: www.mapsofworld.com, February 2018

Acknowledgment

Author Short Biography

The author is a lecturer for Bachelor of Science Degree, Post Graduate Degree, Ecotourism Guidance Academic Program, and Open Education, Faculty of Tourism & Hotels at the Fayoum University, Egypt (2000 till now). He has also served as a lecturer for Bachelor of Science Degree and the Head of Travel and Tourism Management, Faculty of Tourism & Hospitality at Jordan University, Jordan (2011-2016). He is the general Manager of Tourism Company and the Head of Bureau for Foreign Post Graduate Students at the Faculty of Tourism & Hotels at the Fayoum University. The author main teaching, training and research interests are: tourism planning and sustainable tourism development, feasibility studies of touristic projects and environmental economics, GDSs of air reservation such as Amadeus-Galileo-Sabre, Air transportation (airlines – airports) and organizing and conducting touristic programs, organizing touristic festivals and conferences, and development of all types of tourism.

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