

Evaluation of Airports Traffic Systems in Nigeria

ABSTRACT

The impact of civil aviation as a sector on the general economic activity has been studied systematically and documented. In other words, sustaining a viable aviation industry is therefore vital if the economy is to reap the full benefits of the future growth in foreign trade and investment. It is in the light of this that the paper is aimed at examining airport operational efficiency and capacity utilization as determined or influenced by different airport traffic variables, with a view to determining significant relationship among constituents of airport capacity and traffic volume. Data were sought from Ten (10) sampled Airports in the country on their relative socio-economic characteristics. Therein, descriptive statistics was adopted to describe the relative importance of traffic systems variables at those sampled airports. Similarly, Pearson Product Correlation was adopted to determine the significant relationship of these variables. Results revealed that those variables were positively, high and low correlated in some cases. The implication is that they are related and consequently interact with one another. It is thus recommended among others that streamlining efficiencies in operational integrity, new business processes and paradigms and the use of new technology will continue to see the industry and airports work towards a competitive advantage and achieve outcomes which are appropriate for airports shareholders and acceptable for stakeholders.

Keywords : Evaluation, Airports, Traffic, Systems and Capacity.

Introduction

The economic significance of air transport can best be appreciated in the roles performed by this sector of transport industry by bridging distance and time (Fisk, et. al, 1993). Air transport has also proved to be an important arm in the distribution of goods and services by covering very wide markets (Airports Council International- ACI- 2004). However, efficient and relatively cheap air travel can move products such as newspapers or flowers to far-flung distance markets. As the sizes and the distances of goods keeps increasing in global market, air transport is routinely planned and designed to suit dynamic productive facilities towards creating total “mine to market” capabilities (Cherniavsky, and Abrahamsen, 2000).

In recent years, airports have been under growing pressure to be more financially self sufficient and less reliant on government support. This was as a result of the increasing demand and global privatisation of notable economy sectors. Many airports around the world have been commercialized and/or privatized so that airports are operated more like a business (Chopra and Meindl, 2001; IATA, 1997). Most countries have created regulatory agencies separately from airport operators. These changes introduced strong incentives for airport managers to increase revenue and reduce costs. The changing objective and strategy of airports, together with the evolving regulatory policies and

governance structures influence airports' performance and their services. This is noticeable in the operational cost and revenue generation. These changes are posing new challenges to airport managers and regulation system. In an increasingly globalised economy, air transport is a vital element of the country's transport infrastructure (Oyesiku et al. 2013).

Nigeria as a developing country continues to grow in tandem with its air transport network following the construction of airports and planning of air routes. Most state capitals, big towns and cities are connected with aviation operations and services. Air transport in Nigeria has been growing in relation to the Gross National Product (GNP) as it accounts for a large part of transport expenditure in the economy (Oyesiku et al. 2013). It should be noted that the share of freight movement on a tonne kilometre is small compared to other modes; airlines carry high value, perishable, and provide emergency goods that make them an important part of the total transport system (Oyesiku and Oduwole, 2004).

Given that airports require large initial investments that require long gestation periods before profitable returns can be generated, cumbersome regulations discourage private capital. When airports are effectively regulated and subjected to good performance, more efficient terminals would justifiably earn higher profits or be able to attract further investments towards an efficient airport system. Hence the aim of the paper is to examine airport operational efficiency and capacity utilization as determined or influenced by different airport traffic variables, with the specific objectives to evaluate the airport traffic systems relative to airport capacity and traffic volume, with a view to determining significant relationship among constituents of airport capacity and traffic volume. This is predicated on the fact that airports possess considerable monopoly power and thus have the scope to operate inefficiently, and pass on the higher costs which result from this inefficiency to their customers (Turner, 2003). Similarly, the relationship of demand to available capacity of an airport focuses on delays to aircraft movements as a result of limited runway capacity. Aside this, there are several factors influencing congestion at the airports. The movements, landings and take-offs are operational arrangement of the airport (e.g. whether there are separate runways for landing or take-off or not). It should be noted that aircraft characteristics affect delays; for instance, small commuter aircrafts are typically slower than large jets and may occupy the runway for longer periods. Air traffic control, aircraft separation standards also affect throughput and delays.

2.0 Literature and Conceptual Clarification

The importance of air transport and airport capacity utilization has made it a major subject of research in transport geography. Indeed studies in transport geography bring with it a new wave of ideas, fads and techniques. It is imperative to note that each idea ripples through the field, with different speed and

impact. Thus, an accumulation of new approaches which occasionally develop does not lead to the overthrow of existing findings or air transport knowledge. This chapter presents the conceptual and theoretical framework for the airport capacity utilization, which is the main focus of this study. Previous empirical studies were reviewed. The relevant concepts reviewed are: (i) Airport System (ii) Airport capacity utilization (iii) Airport performance and indicators.

2.1 Airport System

Airports activities are diversified and descends from nature of airports' operations, which involve both airside and landside services. In addition, non-aeronautical commercial businesses including revenues from retail activities and license allotment to external operators supplying shop, restaurant, duty-free, car parking services, etc are assuming growing importance. This gives rise to the strategic opportunity for an airport to focus on traditional airside activities or to enter commercial activities, which are not traditionally considered as core business (Oum *et al.*, 2003). The basic functions of an airport are to provide access for aircraft to the national airspace, to permit easy interchange between aircraft and to facilitate the consolidation of traffic. To effectively deliver these functions, an airport must have several basic infrastructure elements present such as runway, taxiways, aprons (airside infrastructure) and airport ground resources for passengers or cargo. The ground resource elements as well as airside infrastructure capacity dictate the airport's air traffic capacity (MDCAD, 2003).

In relation to this study, it should be noted airports does not provide only place for landing and takeoff of aircraft, but enable various services and facilities for airlines, passengers and other allied including government bodies and concessionaires. Thus, generating large amount of benefits for local economy (TRB, 2003). Interestingly, TRB (2009) explained that an airport system consists of two components for effective functioning of airport services (Fig 2.1 and 2.2). These components include the following:

(i) Landside system

(ii) Airside System

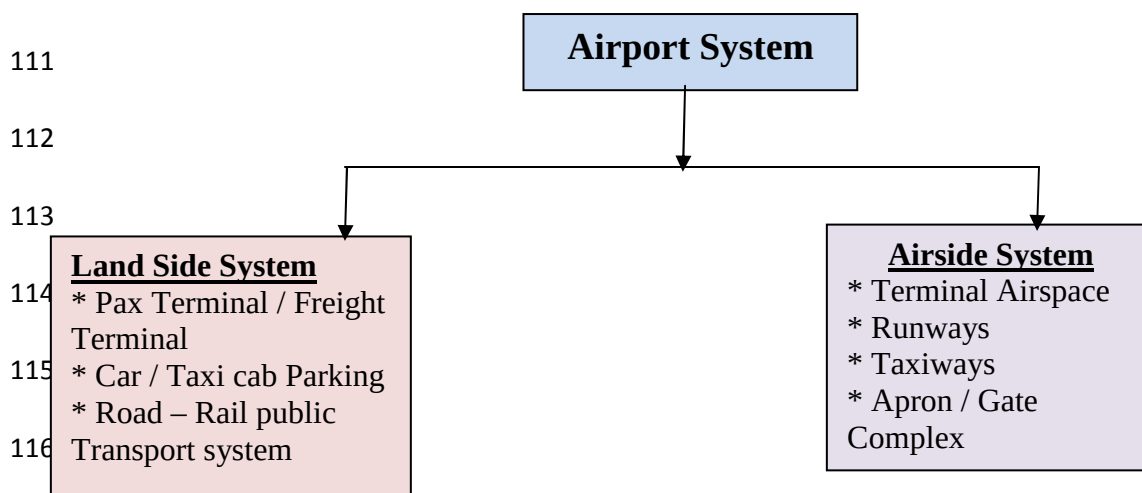
(i) Landside system

Landside system embraces surface access systems, which is connecting to an airport to its catchment area, passenger and freight terminal system (Atkinson and Primont, 2002; CCSF, 2003). The surface access system embraces individual car, taxicab, rail and road based public transport systems. TRB (2009) emphasised that these facilities are provided for transport outgoing and incoming passengers, airport employees and visitors to and from the airport. The airport passenger and freight terminal system consists of two components dedicated interfaces and passenger (and freight) terminals, which both enable

transfer of passengers (and freight) between the airport surface transport systems and aircraft and vice versa (Ashford et al., 1997).

(ii) **Airside System**

TRB (2009) reiterate that airport airside system consists of airspace around airport called the 'Airport Zone' or 'Terminal Airspace', runways, taxiways and apron / gate complex. The airspace provides accommodation for the arrival of aircraft just before landing and the departure aircraft just after taking-off. The runway accommodates the ground phase of landing and taking-off. Taxiways physically link runway and apron/gate complex and enable the aircraft for taxiing between two complexes. At apron / gate complex, the aircraft perform their ground handling services (Ashford et al., 1997; CCSF, 2003).



Source: Senguttuvan, (2006)

Fig. 2.1 Airport System

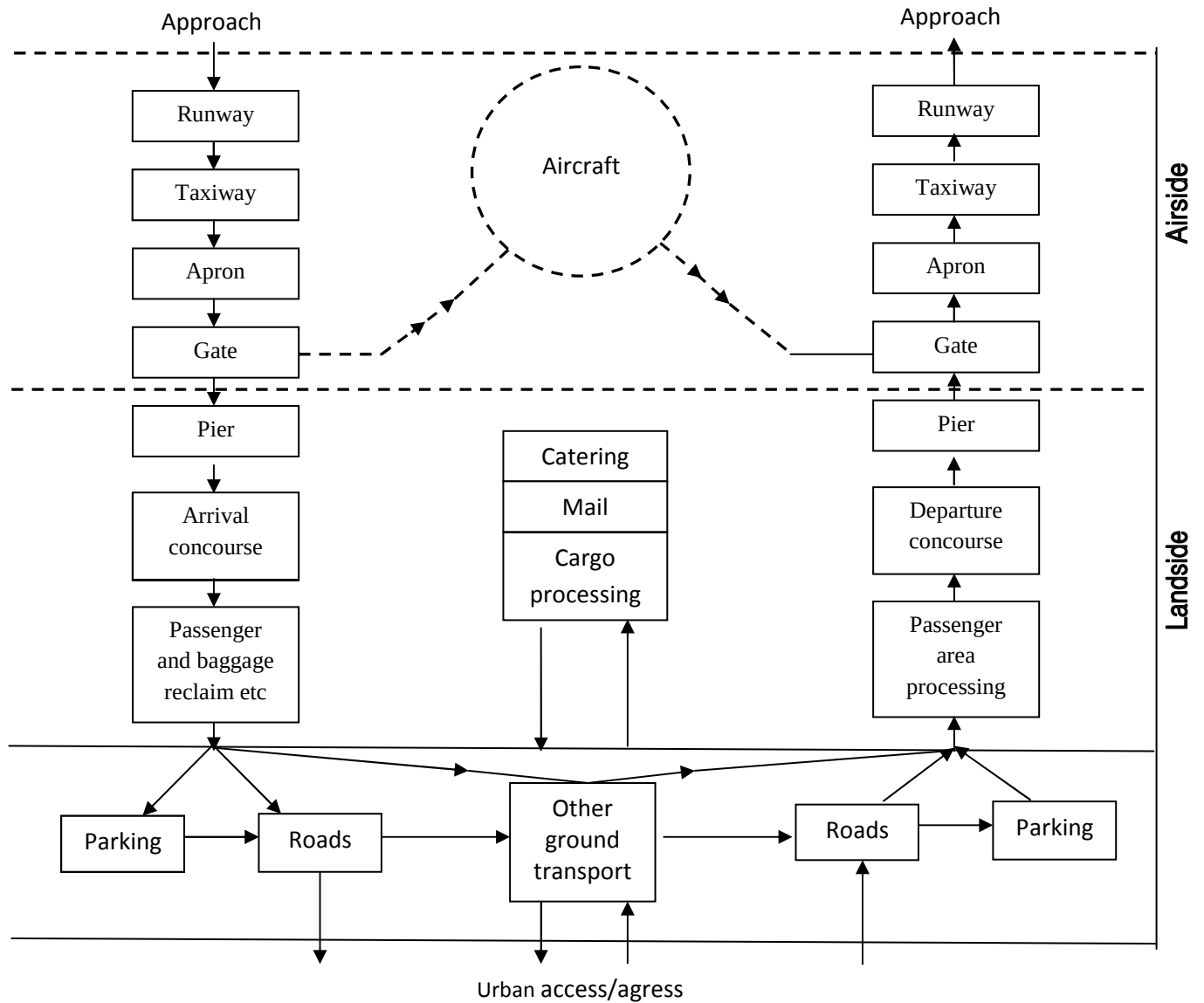


Figure 2.2: Airport System (Landside and airside operations of airport)

Source: Airport operations (Ashford, Stanton and Moore; 1991)

2.1.2 Concept of Airport Capacity and Capacity Utilization

Infrastructure capacity development is one of the most important factors in determining the operational efficiency of an airport. Caves et al, 1984 and CCSF (2003) opine that capacity can conceptualise based on the area or field of study. Capacity according to TRB (2009) refers to the ability of an airport to handle a given volume or magnitude of traffic (demand) within a specific period of time. It was further emphasised that, operational capacity is generally expressed by the maximum number of units of demand that can be accommodated at an airport during given period of time and under given conditions. Zografos et. al. (2013), reported that capacity measures can be done on Maximum Throughput Rate (MTR) and Level of Service (LOS) related capacity. MTR is defined as the ‘average number of demands a server can process per unit of time when always busy’ and Level of service (LOS) related capacity is measured through the number of demands processed per unit of time while meeting some pre-specified LOS standards. Understanding of the concept of airport capacity is fundamental to traffic operations and designed problems are also associated with safety and economic operation of air transport systems (UNCTAD, 1975; Oyesiku, 1994; Oyesiku and Oduwole, 2004). Airport capacity is described as the ability of an airport to handle passenger or freight traffic. It is often expressed in terms of maximum number of aircraft, number of passengers or tonnage of cargo that can be handled per unit time (hour, day, month, and year) without impairing safety and comfort. The capacity of an airport depends on the component elements through which the flow of arriving and departing passengers and the flow of incoming and outgoing cargo proceed. Capacity therefore, as a measure of performance under varying conditions, can be applied to individual locations or a complete network. Hence the airport capacities are as inherent in the facilities capacities, passenger’s capacities, and cargo handling capacities. According to the Washington Aviation System Plan (2009), five types of airport capacity can be identified:

- (i) Airfield Capacity: the ability of an airport’s runway system to accommodate take-offs and landings without experiencing delays.
- (ii) Commercial Airline Passengers: the ability of an airport terminal to accommodate airline passengers with adequate space for ticketing, security, etc.
- (iii) Air Cargo: the ability of an airport to accommodate processing of air cargo tonnage using existing facilities.
- (iv) Aircraft Storage and Parking: the ability of an airport to accommodate storage of based and transient aircraft in tie-downs and hangars.
- (v) Airspace System: the ability of available airspace to safely accommodate aircraft in transit between airports.

It is pertinent to note that four elements have to be considered in analyzing and investigating airport operational capacity (i) Airspace (ii) Airfield (iii) Terminal (iv) Ground Access (Bubalo, 2009; Zografos et. al., 2013). Based on these four elements, these authors further ascertained that airport operational capacity is determined according to the time scope. Therefore, operational capacity is divided into two periods; short term and long term operational and planning parameter in estimating the capacity of an airport. Airport capacity analyses serve two main functions: (i) to objectively measure the capabilities of the components of the airport system to handle forecast aircraft movements and passenger flows and (ii) to estimate the extent of delays in the system as demand varies (Ashford et al 1991).

Capacity refers to the ability of a component in the airport system to handle aircraft and is usually expressed in terms of operations per hour (arrivals or departures). This hourly capacity is the maximum number of operations that can be handled in a one hour period under specific operating conditions, (i) Ceiling and visibility (ii) air traffic control (iii) Aircraft mix (iv) nature of operations. According to Bubalo (2009) capacity is a measure of supply. Meanwhile, in order to determine the airport capacity, the operating conditions must be specified. It was further emphasised that the preferred measure of capacity is the ‘ultimate or saturation’ capacity which gives the maximum number of aircraft that can be handled during a certain period under conditions of continuous demand (Ashford et al 1991). Runway capacity is usually the controlling element of the airport’s system capacity. Ashford et al (1991) reported that runway capacity can be influenced by, air traffic control; demand characteristics; environmental conditions and design and layout of the runway system

Bubalo (2009) and Zografos et. al. (2013) remarked that aircraft delay in arrival and departure form a critical problem in the airport landside area. For instance, congestion at the airport terminal buildings, access roads, and parking areas increasingly threatens the capability of airports to serve additional passengers and air cargo. Thus, measuring capacity of airport facilities and services is becoming critical issue. It should be noted that, the layout of passenger buildings are associated with runways, taxiways, apron, car parks and access roads. Airport airside has a close relationship with airport landside. Both are interdependent with each other in accommodating aircraft and passenger, which in turn demonstrating the airport capability. To affirm this fact is the situation of most airports in US, UK and few airports in Asia Pacific facing crisis in the landside capability due to zooming traffic. The capacity utilization concept is of great importance in the manufacturing or production industries. It may therefore be better explained by considering the minimum output corresponding to the minimum level of short run total cost or optimal capacity as mentioned earlier.

Bubalo (2009) elaborate that full capacity of airports has been variously viewed as a minimum point on a cost function, a full input point on an aggregate production function, and a bottleneck point in a general equilibrium system. Full capacity should be defined as an attainable level of output that can be reached

under normal input conditions-without lengthening accepted working weeks, and allowing for usual vacations and for normal maintenance. It was reiterated that, indirect use of capacity measures is important in the construction of econometric models and serves as a validation test for the series actually being considered. The indirect uses are in equations for (a) price formation; (b) capital formation; (c) trade capacity utilization is one of the most strategic variables in the Wharton model ,and shows up in several places. The airport economic capacity is defined by the economic conditions, which may significantly influence the number of units of demand accommodated at an airport in both short and long term, during a given period of time (one hour or per year). In the short-term, the charges of an airport services during the peak and off-peak hours determine the economic conditions (Bubalo, 2009; and Zografos et. al.,2013).

The relationship between capacity and utilization may also be determined in the growth or otherwise of an industry, firm or airport over a few years as indicated in both changes in percentage utilization of such capacity. In an airport system, productive capacity can be measured by:

the concept of potential annual output (OP) and percentage utilization by ratio in percentage of actual output (OA) to potential output (OP) ($OA/OP \times 100$) (Bubalo, 2009).....eq (2.1)

If there have been changes in percentage utilization, a high rate of increase output would have been observed, but such increase will not be sustainable once capacity is 100% utilized. Percentage utilization is considered to be the ratio of actual output to potential output in percentage for the purpose of this study. Thus, capacity as a measure of performance is analyzed on the basis of port performance indicators which are also indicators of productivity. This is because productivity itself is a member of efficiency with which resources are converted into goods and services especially when it is defined as the relationship between output of goods and services and the inputs of basic resources, labour, capital goods and natural resource. These indicators are analyzed as related to output, quality of service, utilization and productivity. The aircraft occupancy is an indicator of the level of demand of airport services and charges, while aircraft utilization indicates how effectively the time the aircraft is occupied is being used. This also gives a very clear indication of available spare capacity.

2.2 Airport Traffic, Efficiency and Regulation

With deregulation and liberalization of airlines and commercialization and privatization of airports, airport operators have been pressured to provide the best possible services in the most efficient way. Studies on efficiency and productivity of airports are therefore very germane to the present airport industry (ATRS, 2004). Furthermore, pricing and regulatory issues related to social welfare and increasing airport congestion are other problems plaguing the airport industry. Despite the trend toward

commercialization and privatization of the airport industry, policy makers have placed more stringent regulatory governance to prevent airports from abusing market power and to increase the quality of service that is being provided. Additionally, with increasing demand and with the advent of the hub-and-spoke system, major hub airports have experienced increasing congestions since the end of 1990's (Brueckner, 2002). Salazar de la Cruz (1999) studied airport efficiency by using panel data from 16 Spanish airports between 1993 and 1995. He employed the Data Envelopment Analysis (DEA) method with the assumption of Variable Returns to Scale (VRS). He used total returns (total revenue), returns from infrastructure services (infra related aviation revenue), operative returns (non-infra related aviation revenue), final returns (non-aviation revenue) and number of passengers as outputs and total economic cost (total cost) as the input. He found that airports with 3.5 to 12.5 million passengers had constant returns to scale, whereas airports with over 12.5 million passengers exhibited decreasing returns to scale. However, as he indicated in the paper, his conclusions should be interpreted cautiously due to the small size of data at the end of the frontier; the overall degree of scale economies and its turning point may vary according to samples.

A study on airport regulation and competition was conducted by Starkie (2002). He pointed out that in a spatial context the airport industry was no longer under a natural monopoly, but rather under an imperfect or monopolistic competition. This transformation occurred because with privatization, airports became involved in a fierce competition with other airports for the connecting service of airlines. Based on the change in the market structure, he suggested that ex-post regulation for natural competition is likely the most appropriate model for the industry. Oum et al (2004) examined the relationship between different type of price regulation and airport efficiency as well as non-aviation activities at airports. Their empirical analysis found that airports under the dual-till price cap regulations tended to have higher levels of gross TFP than those with a single-till price cap or those that operate under the single-till Rate-of-Return (ROR) regulation. Those airports that operated under a dual-till regulation had better economic efficiencies than those under a single-till regulation, particularly for large, congested airports. This finding supported the arguments of Starkie and Yarrow (2000), Starkie (2001) and Forsyth (2002).

Airport competition is determined by the number of airports in an overlapping catchment area. Moreover, several definitions of airport competition and the existence of different players in the picture as airports, airlines and service providers make the analysis of airport competition even harder. For example, there is no consensus on which airport services are competitive and on which are monopolistic. Ceolli, et al. (2005) point out that low degree of airline competition in the past was the main determinant of low degree of airport competition in Europe. However, this situation has changed first with the deregulation of airline industry, forcing airports to use more attractive strategies for incumbent airlines as well as new entrants,

and second with the development in low-cost-carrier market. Airports with excess capacity used low cost-carriers for extra passengers, which can create extra revenue sources. Hence, increasing level of competition and battle for the market power gave rise to the desire for the determination of “best practices” among airports which are competing with each other, in order to get support in developing new strategies to survive or to gain more power (Vaze, 2009).

The airport business has gone beyond plain field for landing and departure of an airplane to a diversified multi-business, including ramp and traffic handling, management of events and other commercial activities not directly related to the aviation business. There have been several studies concerning the examination of economies of scale in the airport industry. Findings from these studies range from no economies of scale exist at all, up to the existence of economies of scale until a traffic volume of 3, 20 or even 90 been passengers or that they do not exhaust at any number of passengers or work load unit (WLU).

3.0. Materials and Methods

3.1 Study Area

The Federal Airports Authority (FAAN) was established in 1978. The Authority has the following principal functions

(i) To develop and maintain at the nation’s airports all necessary operational facilities and services for aircrafts and excluding navigational aids, telecommunication facilities and air traffic control services.

(ii) To provide accommodation and other facilities for the effective handling of passengers and freight.

(iii) To develop and provide facilities for surface transport within airports.

(iv) To carry out at the airports such economic activities as are relevant to air transport and

(v) Generally to create conditions for the development in the most economic and efficient manner of air transport and services connected with it.

The Federal Airport Authority of Nigeria (FAAN) controls all airports which are fairly distributed in the country to service commercial, administrative centres and areas of natural resources. The airports in the country constitute the main component of the air-route networks. There are domestic and international airports in the country. The domestic airports fall into two basic groups, namely the trunk airports and local airports. The former provide air travel services mostly to cross-country routes (e.g. Ikeja, Domestic

307 Terminal). International airports include Lagos, Port-Harcourt, Kano, Calabar and Abuja which handle
308 international traffic and include passport, customs and quarantine controls.

309 Most of the airports in the country are civil aviation establishments that serve scheduled airlines
310 incorporate a wide variety of facilities for handling passengers, baggage, freight and airmail. Figure 3.1
311 depicts Nigerian Airports. There are eighteen air terminals. The Runway dimensions range between 2400
312 x 45m to 3600 x 65m. The international airports viz Abuja, Calabar, Kano, Lagos and Port-Harcourt have
313 modern navigational facilities, lighting, terminals buildings, aprons and uninterrupted power supply.

314 3.2 Data Sources

315 Data for this paper was through questionnaire that was administered, using multi stage sampling
316 technique to select the airports in which information was sought on socio-economic characteristics of the
317 airports such as name, location, year of establishment, staff strength and scope of the airport. It further
318 includes information on capacity utilization such as airside capacity, terminal-side capacity, number of
319 gates and terminal, work load unit, aircraft movement etc. It is important to stress that data was equally
320 sought from existing airports reports of 2004, 2005, 2006, 2007 and 2008. Table 3.1 presents the sampled
321 airports.

322 **Table 3.1: Geo-Political Zones and Airports**

Geo – political zone	Airports
South-West	(1) Akure Airport (2) Ilorin Airport *
	(3) Ibadan Airport (4) MMA (Lagos) International *
South-East	(1) Enugu Airport *
	(2) Imo Airport
North-East	(1) Bauchi Airport *
	(2) Maiduguri Airport (3) Yola Airport
North-West	(1) Katsina Airport (2) Sokoto Airport *
	(3) Aminu Kano International Airport *
North-Central	(1) Kaduna Airport

	(2) Jos Airport * (3) Minna Airport (4) Nnamdi Azikwe International Airport *
South-South	(1) Benin Airport (2) Osubi Airport (3) Port Harcourt Airport * (4) Margaret Ekpo International Airport *

* Sampled Airport

Source: Authors' field survey (2014)

4:0 Analysis and Discussion

This section evaluates airport capacity and traffic volume in overall airport management system with a view to articulating the germane issues in the concepts, while bearing in mind the bench mark of international standards. This is predicated on the fact that airports are complicated businesses which provides a wide range of services to airlines and passengers, as well as other related entities. The wide range of services and facilities at an airport are often classified into air side operations and landside operations; while airside operation refer to activities that facilitate the movement of aircraft including runway services, apron services, and the loading and unloading of baggage/freight. Landside operations refer to activities associated directly with passengers and freight traffic, covering various stages of processing of passengers, baggage and/or freight through the respective terminals and onto the aircraft. Again, it also includes commercial activities and facilities such as concessions, office rental, car parking and others.

In view of the above, this section provides some indicators of airport capacity and traffic volume. These include number of runways as an indicator of airside capacity; number of gates and the total area of terminals as an indicator of landside capacity. The number of people directly employed by an airport operator provides another indicator of airport capacity. It should be noted that, in order to prevent error due to various degrees of outsourcing practices at different airports emphasis was placed on the number of Federal Aviation Authority of Nigeria (FAAN) employees. Is worth reporting that, airports provide services to both passengers and cargo shippers, thus, airport traffic consists of both passenger traffic and cargo traffic. However, a significant portion of airport activities are related to the movement of aircraft, and the number of aircraft movements at an airport is an important indicator of airport activities. Thus this section provides examined three airport traffic indicators; (i) number of passengers, (ii) volume of cargo traffic and (iii) number of aircraft movements.

Table 4.1, reveals that virtually all the variables are not only positively correlated but equally have high correlation values. The implication is that they are related and consequently interact with one another. However, it is important to note that most of these variables are significant at 0.01 and 0.05 level of significance. Meanwhile, passenger/aircraft movement has low but positive correlation values with all these variables. This shows significant relationship among constituents of airport capacity and traffic volume. This is as a result of the ratio of both passenger and aircraft movement that was used for the analysis. There is significant relationship among constituents of airport capacity and traffic volume.

Table 4.1 Correlation Matrix of Air Traffic Systems Variables

	No of Gates	Terminal Size	Pax Traffic	Cargo Traffic	Work Load Unit	Aircraft Movt	Pax/Aircraft Movt
No of Gates	-	.91**	.95**	.98**	.96**	.92**	.47**
Terminal Size		-	.90**	.86*	.93*	.88**	.46*
Pax Traffic			-	.93	.84	.82*	.45
Cargo Traffic				-	.86**	.91**	.61**
Work Load Unit					-	.87**	.59*
Aircraft Movt						-	.53*
Pax/Aircraft Movt							-

**correlation is significant at 0.01 level (2-tailed)

*correlation is significant at 0.05 level (2-tailed)

Source: Result output based on field survey (2014)

Fig. 4.1 shows that the rate of passenger traffic between 2004-2008 was more pronounced at MMM, as expected, and closely followed by the Abuja airport. The least passengers' traffic was recorded at Akure airport. This finding might be connected to the nature and the locational advantage of the airport.

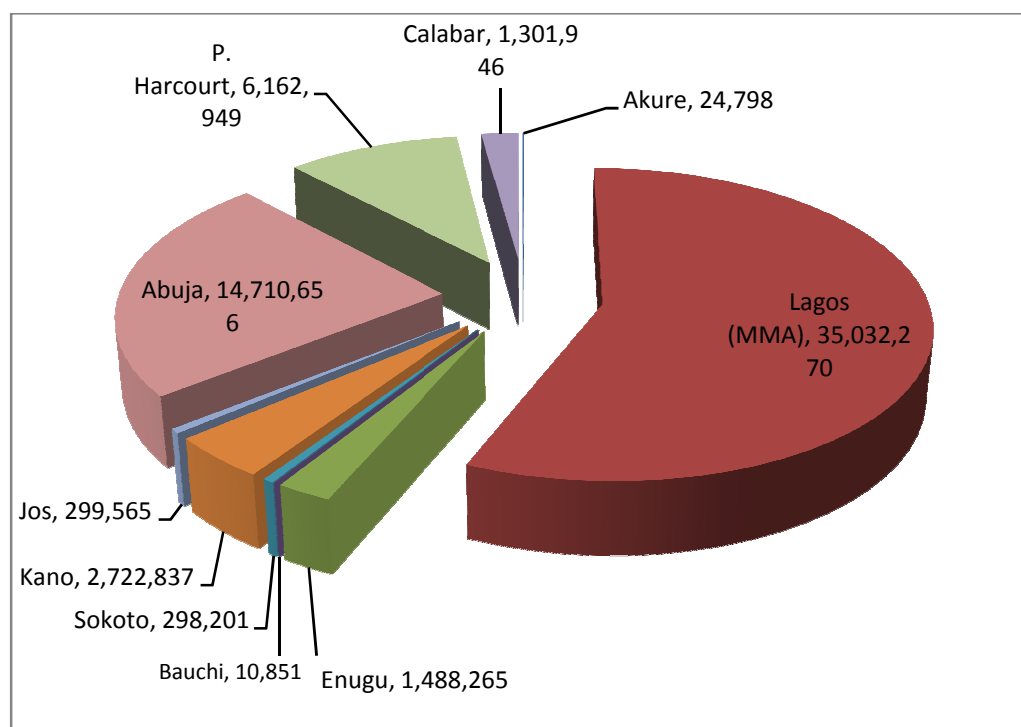


Fig 4.1 Passenger Traffic of all the Sampled Airports

Source: Result output based on field survey (2014)

In a related development, cargo traffic analysis revealed that Lagos has the highest cargo patronage, followed by Abuja and Port Harcourt. This buttressed the initial argument of the location advantages of these airports. Interestingly, other airports like Kano and other do handle cargo, but not as pronounced as these initially mentioned three as shown in Fig 4.2.

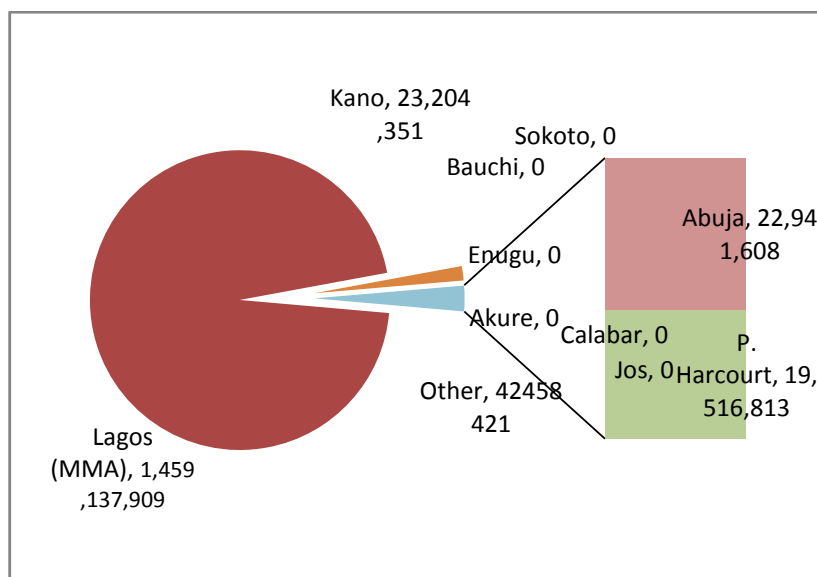


Fig 4.2: Cargo Traffic of Sampled Airports

Source: Result output based on field survey (2014)

The Work Load Unit (WLU) that measures the relationship between volume of passengers and cargo traffic was more pronounced at Abuja, Port Harcourt and Kano airports (see Fig 4.3). Fig 4.4 shows that aircraft movement is also more in Lagos MMA, and Abuja. Similarly, passengers' movement is more pronounced in these airports. The import of these findings is that, there is positive and linear relationship as initially discussed earlier based on the correlation values, among passenger traffic, WLU, and aircraft movement. In other words, the more passenger traffic, the more the aircraft movement. For instance, the passenger movement and WLU at MMA are more than other airports. In the same vein, these indicators of airport capacity and passenger/aircraft movement as depicted in Figures 4.5 and 4.6 corroborates the initial fact about the relative nature and characteristics of these airports MMA, Abuja, Port Harcourt and others respectively.

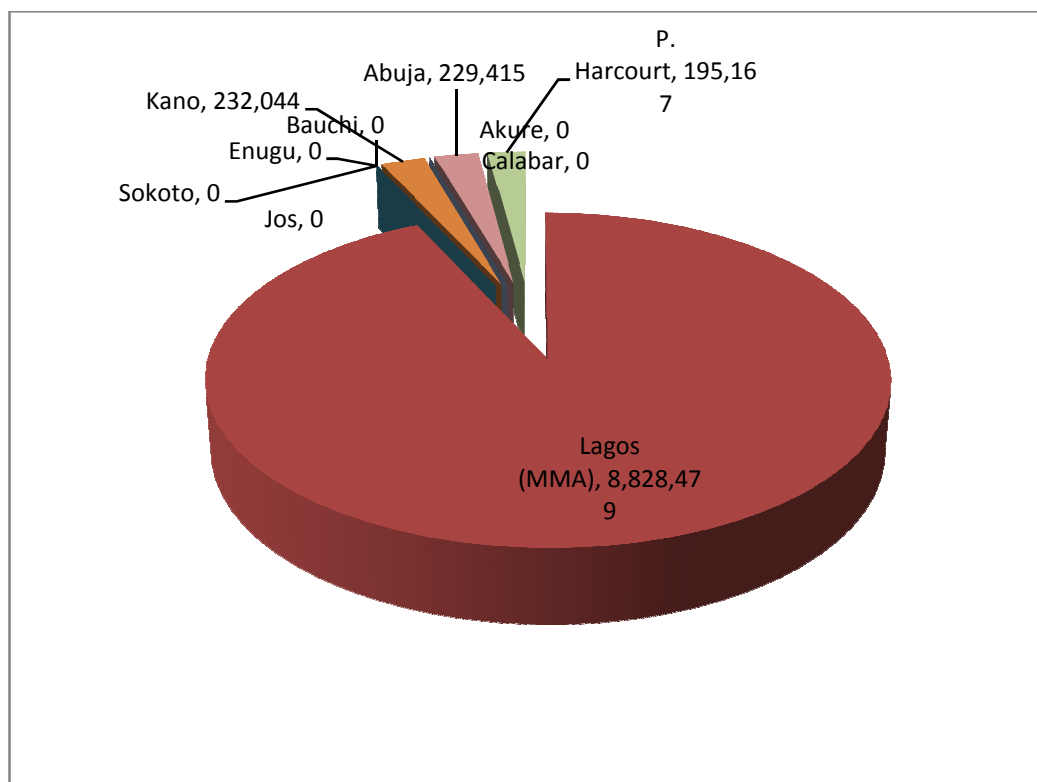


Fig 4.3: Work Load Unit of Sampled Airports

Source: Result output based on field survey (2014)

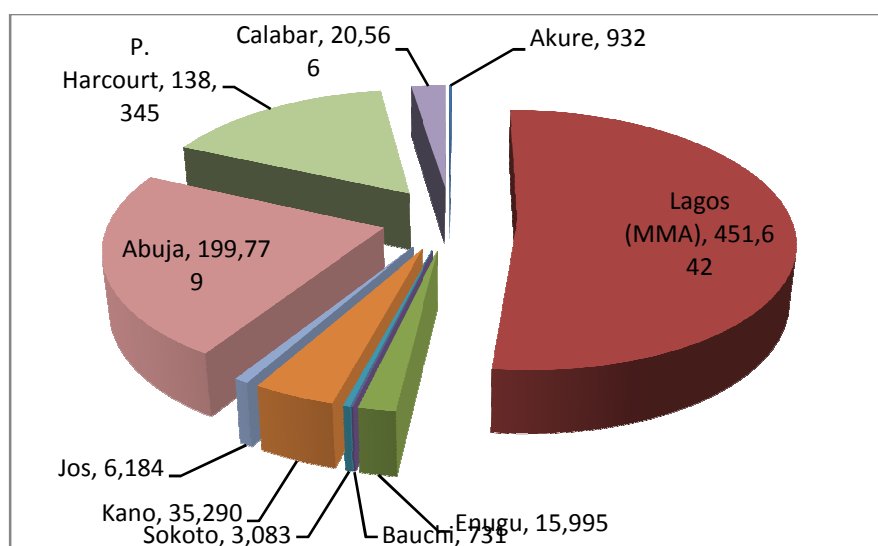


Fig 4.4: Aircraft Movement of Sampled Airports.

Source: Result output based on field survey (2014)

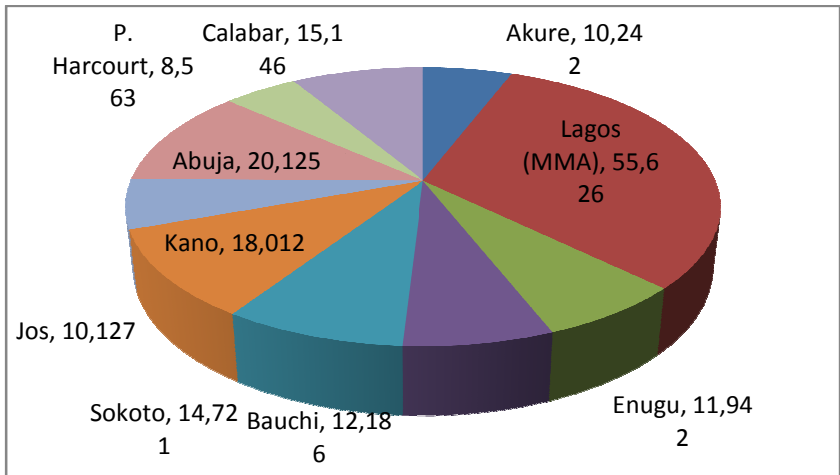


Fig. 4.5: Total Terminal Size in Sampled Airports

Source: Result output based on field survey (2014)

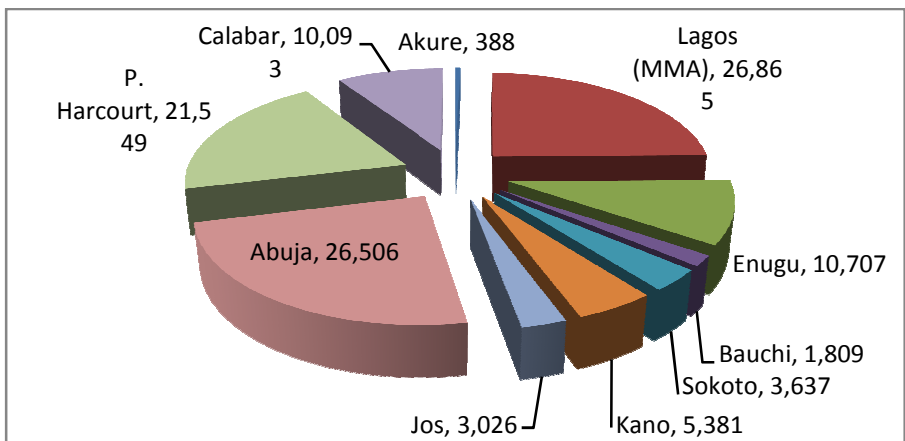


Fig. 4.6: Passenger/Employees of Sampled Airports

Source: Result output based on field survey (2014)

5.0: Conclusion and Recommendation

The evaluation of this objective is based on the consideration of airside capacity and land side capacity. This involved the evaluation of volume of passengers and cargo traffic as well as aircraft movements respectively. The result of the correlation analysis carried out revealed that variables such as No of Gates, Terminal size, Passenger Traffic, Aircraft movement and work load unit have high positive correlation values. The outcome of this analysis shows that there is a positive and significant relationship among the constituents of aircraft capacity and traffic volumes.

Streamlining efficiencies in operational integrity, new business processes and paradigms and the use of new technology will continue to see the industry and airports work towards a competitive advantage and achieve outcomes which are appropriate for airport shareholders and acceptable for stakeholders. Value creation for airports will continue to have a dominant effect on decision making by airport managers. Working with key airlines by closely understanding their business model and customizing the relationship will provide the benchmark for future airport/airline relationships. Excellence in operations, flexibility working with partners, efficiencies in lowering operation costs as well as reducing noise and emissions are all possible and timely for the aviation industry.

The role of the airport with tourism numbers is an important factor as aviation and tourism management have a supply and demand relationship and depend on the strength of each other. The impact of working with tourism partners with the objective of growing the market share of the destination is a key indicator for airport business development. Working with tourism partners provides the opportunity to extract value from airport customers-(both as an airline or airline's customer). Airports and airlines should share business strategies as the partnership is the key to the growth of both the airport and airline. The role of government as the principal facilitator of infrastructure is to regulate the provision of air transport infrastructure with a view to ensuring the efficient operation of the aviation industry at the lowest social cost. Oni (2014) aptly noted that government as enabler and facilitator must create the right environment and incentives for stakeholders to contribute to development and ensures that resources needed for construction and maintenance of transport infrastructures are available at the lowest possible cost or price through a more pluralistic and inclusive approach to transportation planning, in which all stakeholders function as partner.

References

- 438 Airports Council International. 2004. The Social and Economic Impact of Airports in Europe. York
439 Aviation. www.aci-europe.org
- 440 Air Transport Research Society (ATRS) (2004). *Airport Benchmarking Report: Global Standards for*
441 *Airport Excellence*. France HQ: World Congress of Transport Research Society.
- 442 Ashford, N.J., Stanton, H.P.M. & Moore, C. A. (1991). *Standards for airport excellence, airport*
443 *operations*. London: Pitman Publishing.
- 444 Atkinson, S. & Primont D., (2002), Stochastic estimation of firm technology, inefficiency, and
445 productivity growth using shadow cost and distance function. *Journal of Econometrics*. 108, 203-225.
- 446 Brueckner, J.K. (2002). Airport congestion when carriers have market power. *The American Economic*
447 *Review*. 92, 1357-1375.
- 448 Bubalo, B. (2009). Benchmarking airport productivity and the role of capacity utilization: A study of
449 selected European airports. *Diploma Thesis (Wirtschaftsingenieur Umweltmanagement)*. Berlin:
450 University of Applied Sciences, Berlin.
- 451 Caves, D.W. Christensen, L.R. & Tretheway, M. W. (1984). Economies of density versus economies of
452 scale: Why trunk and local service airline costs differ. *Rand Journal of Economics*. 15, 471-489.
- 453 Chopra, S. & Meindl, P. (2001). *Supply chain management: Strategy, planning and operation*. New
454 Jersey; Upper Saddle River.
- 455 CCSF - City and County of San Francisco (2003). *San Francisco International Airport: Financial*
456 *Statements with Schedule of Expenditures of Passenger Facility Charges*. June 30. San Francisco: San
457 Francisco International Airport Authority.
- 458 Cherniavsky, E and Abrahamsen, T. R. 2000. Aviation System Performance Metrics:
459 Airport Utilization. MITRE, Center for Advanced Aviation System Development
460 McLean, Virginia.
- 461 Coelli, T.J. Prasado, D. S. Rao, C.J. O'Donnell, & Battese, G. E. (2005). *An Introduction to efficiency*
462 *and productivity analysis*. 2nd Ed. New York: Springer.
- 463 Fisk, R. P. Brown, S. W. & Bitner, M. J. (1993). Identifying service gaps in commercial air travel: The
464 first step toward quality improvement. *Transportation Journal*. 31(1), 22-30.
- 465 Forsyth, P. (2002). Privatization and regulation of Australian and New Zealand airports. *Journal of Air*
466 *Transport Management*. 8, 19-28.
- 467 IATA, ACI, ATAG, (2003). *Airport Capacity and Demand profiles*. IATA: London.

- 468 MDCAD - Miami-Dade County Aviation Department (2003). *Financial statements and other*
469 *supplementary information*. September 30, 2003 & 2002. Miami: Miami-Dade County Aviation
470 Department.
- 471 Oduwale A.O (2014) Analysis of Operational efficiency and Capacity Utilisation of Nigerian Airports.
472 Being an Unpublished Ph.D Thesis, Department of Geography and Regional Planning, Olabisi Onabanjo
473 University, Ago-Iwoye.
- 474 Oum, T.H. Zhang, A. & Zhang, Y. (2004). Alternative forms of economic regulation and their efficiency
475 implications for airports. *Journal of Transport Economics and Policy*. 38, 217-246.
- 476 Oum, T.H. Yu, C. & Fu, X. (2003). A comparative analysis of productivity performance of the world's
477 major airports: summary report of the ATRS global airport benchmarking research report- 2002. *Journal*
478 *of Air Transport Management*. 9, 285-297.
- 479 Oyesiku, O. K. (1994). Information and data management in the Maritime transport sector with reference
480 to the use of computer. In Badejo, B.(Ed), *Readings in Nigeria Maritime Transport* (pp. 75-84). Lagos:
481 Fair-weather Publishers.
- 482 Oyesiku, O. K. & Oduwale, W. (2004). Determinants of distribution of investment infrastructure: The
483 case of spatial distribution of airports in Nigeria. *Paper presented at the 8th International World*
484 *Conference of the Air Transport Research Society, on Emerging Roles of Major Airports in Airports in*
485 *Air Transport System and Economy*, held at Istanbul Technical University, Istanbul, Turkey, 1st – 3rd July.
- 486 Oyesiku, K. Onakoya, A. & Folawewo, A. (2013). An empirical analysis of transport infrastructure
487 investment and economic growth in Nigeria. *Social Sciences*. 2, (6), 179-188.
- 488 Salazar de la Cruz, F. (1999). A DEA approach to the airport production function, *International Journal*
489 *of Transport Economics*. 26, 255-270.
- 490 Senguttuvan, P.S. (2006). Economics of the Airport Capacity System in the Growing Demand of Air
491 Traffic – A Global View. *Paper presented at the Transport Research Annual Forum, New York*
492 *University, March 2006*
- 493 Starkie, D. (2001). Reforming UK airport regulation. *Journal of Transport Economics and Policy*. 35,
494 119-135.
- 495 Starkie, D. (2002). Airport regulation and competition. *Air Transport Management*. 8, 63-72.
- 496 Starkie, D. & Yarrow, G. (2000). *The single till approach to the price regulation of airports*. Civil
497 Aviation Authority, London, U.K., (available at www.caaerg.co.uk).
- 498 Turner, N. K. (2003). Airline survival kit. Aldershot: Ashgate.
- 499 Transportation Research Board (TRB) (2003). *Airport research needs: Cooperative solutions*. Special
500 Report 272. Washington, D. C.: Transportation Research Board.

- 501 UNCTAD, (1975). Development of ports-improvement of ports operations and connected utilization.
- 502 Vaze, V. (2009). Simulating airport delays and implications for demand management. Cambridge:
- 503 Massachusetts Institute of Technology (MIT)
- 504 Zografos, K. G. Andreatta, G. & Odoni, R. A.(Eds.) (2013). Modelling and managing airport
- 505 performance. West Sussex: John Wiley & Sons Ltd.