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Analysis of Airport Stakeholders

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Abstract— Airports are of significant economic importance to regional businesses and to the quality of life of residents by providing access to safe, secure, rapid, affordable air transportation services. At the major U.S. airports, regional airport authorities operate the airports as public utilities providing infrastructure to service providers and their supply chain under “revenue neutral” financial regulations. As public entities with no stockholder profit motives, the airport authorities are obliged to work to balance the interests of all of their stakeholders to build the airport infrastructure, lease space to service providers, and ensure that the service providers collaborate to provide seamless, safe, secure service to the consumers of air travel services. A review of published airport benchmarks revealed that they are largely ambiguous on stakeholders and stakeholder boundaries.

This paper identifies:

- 1) Airport stakeholders and their objectives for the airport
- 2) The relationships between the stakeholders
- 3) Conceptual boundaries around the airport at which comprehensive and comparative benchmarking could be performed
- 4) Reinforcing loops through the airport stakeholder relationships
- 5) That the airport is a complex, collaborative service environment, and that some stakeholders have objectives for the airport whose fulfillment is not fully under the control of airport management

The implications of each of these items for comprehensive and comparative benchmarks of airport performance are discussed.

Index Terms—Airport, Stakeholders, Benchmarking, Objectives

I. INTRODUCTION

Airports provide access to air transportation services to regional residents and businesses. Airports operate as utilities providing infrastructure to service providers and their supply chain under “revenue neutral” financial regulations (Carney & Mew 2003) (p. 230). The service providers collaborate to provide seamless, safe, and secure service to the consumers of air travel services.

The challenge faced by airport operators is building the infrastructure, leasing it to the service providers, and managing the service providers to ensure that a quality service

is delivered to customers, and ultimately supporting the growth of the regional economy (Figure 1). To track performance and manage change and growth, airport operators must measure and benchmark airport performance and their service provider partners in a complex, collaborative service environment.

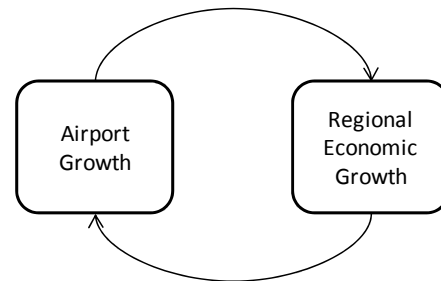


Figure 1 - Relationship between airport growth and regional economic growth

Published airport benchmarks of US airport performance (Bazargan & Vasigh 2003; Sarkis & Talluri 2004; Sarkis 2000; Gillen & Lall 1997) are ambiguous to stakeholders and stakeholder boundaries. Several stakeholders (e.g. the local residents) are ignored in these airport benchmarks. In addition, these benchmarks do not discuss whether or not differences exist between benchmarks of airports operating as public, not-for-profit utilities and benchmarks of for-profit enterprises, and if such differences exist, how they have impacted the benchmarking methodology choices in the studies.

The objective of this paper is to identify the stakeholders and the relationship between the stakeholders for the purpose of determining measures, metrics, and benchmarks for managing airports.

The focus of this paper is on the Operational Evolution Partnership (OEP) 35 airports in the United States. These 35 airports are commercial U.S. airports with significant levels of activity (FAA 2009).

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- 5) That the airport is a complex, collaborative service environment, and that some stakeholders have objectives

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for the airport whose fulfillment is not fully under the control of airport management

This paper is organized as follows: Section II discusses the airport's role as a public utility. Section III reviews airport finance. Section IV analyzes the stakeholders of the airport and their goals for the airport. Section V presents a system model of the airport stakeholders and their interrelationships. Section VI draws conclusions about this stakeholder model's impact on airport benchmarking.

II. THE AIRPORT AS A PUBLIC UTILITY

Utilities (e.g. electric distribution utilities) require high capital investments for system construction. Duplication of system infrastructure is considered inefficient and as a result utilities operate in some monopolistic form (White 1976; p. 14). For instance, the definition of an electric utility makes the distinction that it is a monopoly: An electric utility is "[a]ny organization, municipality or state agency with a monopoly franchise that sells electric energy to end-use customers" (Public Utility Research Center, University of Florida).

Utility ownership is either public (federal, state, or municipal) or private (Schap 1986; p. 3). In the cases of private ownership, strict regulation is in place to ensure that the monopolistic situation is not used to charge excessive prices (Hunt 1944; pp. 16-17). Utility regulation exists "to assure to ultimate consumers the best possible service at reasonable cost" (Hunt 1944; p. 17). For example, quality electricity distribution service is defined as "the uninterrupted flow of current and [...] the ability to maintain constant frequency voltage within the limits that will ensure satisfactory performance of the consumer's equipment and appliances" (White 1976; p. 9).

Public utilities have a number of different stakeholders, including shareholders/creditors (if applicable), government regulators, and customers. Given this operating situation, a utility's performance of its mission cannot be gauged only by its ability to generate profits. Instead, the interests and considerations of all of the utility's stakeholders must be considered in evaluating the utility's performance, in particular in the cases where utilities are under some form of government ownership.

Similarly, airports exist to provide a quality service to regional businesses and residents at a reasonable price, while generally operating in a monopolistic (or semi-monopolistic) environment. All major airports in the United States are publicly owned enterprises financed by a combination of public and private funds, and are barred from generating a financial surplus (Carney & Mew 2003; p. 230). Rather than comparing profitability, airports' performance must, similar to other public utilities, be gauged by their ability to meet the interests of all of its stakeholders.

III. AIRPORT FINANCE

Airports are dependent on capital funding for infrastructure development and on revenues for covering the cost of operations, depreciation, and interest costs. This section discusses sources and types of capital funds and airport revenues.

A. Airport Capital Funding

Airports require access to sources of capital funding for infrastructure development projects. Projects such as runway additions, terminal expansion projects, and purchase of capital-intensive equipment (e.g. fire trucks) are considered capital improvement expenses (Wells & Young 2003; p. 311). In their role as public utility-like entities, airports interact with several different stakeholders that provide capital funding.

Five key sources of capital funding exist for the airport:

- 6) FAA Airports Improvement Program (AIP) (G. Hamzaee & Vasigh 2000)
- 7) Bonds (G. Hamzaee & Vasigh 2000)
- 8) Airport operating surplus (G. Hamzaee & Vasigh 2000)
- 9) Passenger Facility Charges (PFCs) (G. Hamzaee & Vasigh 2000)
- 10) State and local funding (Airports Council International - North America 2009) (p. 22)

Figure 2 shows the average capital funding source breakouts for large hubs¹.

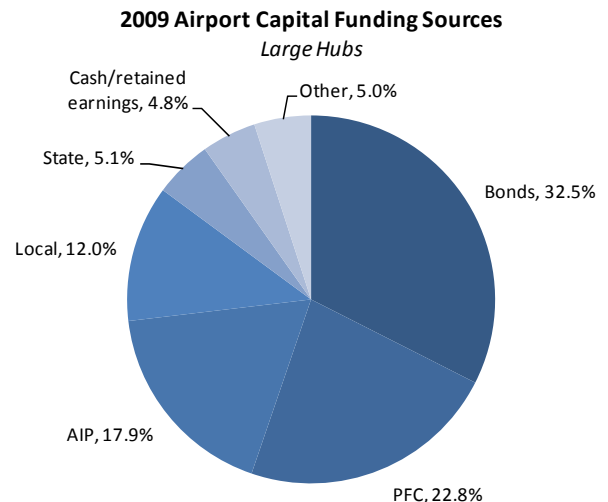


Figure 2 - Airport capital funding sources for large hubs (Airports Council International - North America 2009; p. 10)

B. Airport Revenues

Airport revenues come from different sources and are categorized as follows (Federal Aviation Administration 2001):

¹ Large hubs are defined as having at least 1% of total annual passenger boardings (Airports Council International - North America 2009; p. 22)

- 1) Aeronautical operating revenue: Including landing fees, terminal rental fees, apron charges, FBO revenue, cargo and hangar rentals, and aviation fuel taxes.
- 2) Nonaeronautical operating revenue: Including terminal revenue (including food and beverage and retail revenue), rental car revenue, and parking revenue.
- 3) Nonoperating revenue: Interest income, grants, and Passenger Facility Charges

The largest source of revenues for large hubs is aeronautical revenue, as shown in Figure 3.

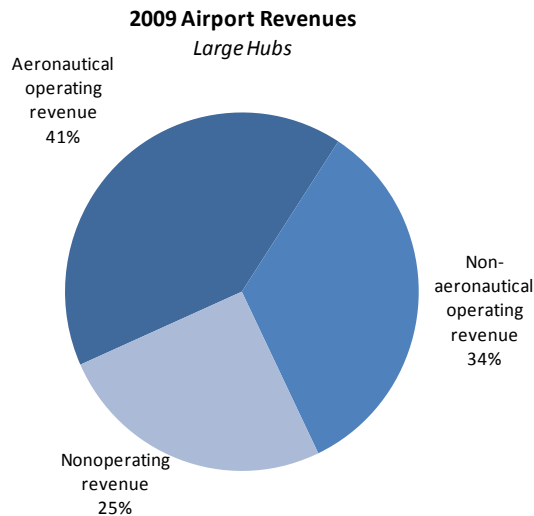


Figure 3 - 2009 airport revenues for large hubs (Federal Aviation Administration 2010)

IV. IDENTIFICATION OF AIRPORT STAKEHOLDERS

With the airport operating as a public utility, an inventory of airport stakeholders and their objectives is required to form the basis for evaluating the airport's performance.

For the purpose of this paper a stakeholder is defined as "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Mitchell et al. 1997; p. 856). Table 1 describes a comprehensive list of stakeholders generated through a review of the literature.

TABLE 1

AIRPORT STAKEHOLDERS

Stakeholder Group	References Citing Group
Passengers	(Upham 2003; Rhoades et al. 2000; Neufville & Odoni 2003)
Air carriers	(Upham 2003; Rhoades et al. 2000; Offerman; Neufville & Odoni 2003; Sarkis & Talluri 2004)
General aviation users	(Rhoades et al. 2000)
Airport organization	(Upham 2003; Rhoades et al. 2000; Offerman; Sarkis & Talluri 2004)
Investors and bond-holders	(Neufville & Odoni 2003)
Concessionaires	(Rhoades et al. 2000; Neufville & Odoni 2003)

Service providers	(Upham 2003; Rhoades et al. 2000; Neufville & Odoni 2003)
Employees	(Upham 2003)
Federal government	(Upham 2003; Offerman; Neufville & Odoni 2003; Sarkis & Talluri 2004)
Local government	(Upham 2003; Offerman; Neufville & Odoni 2003; Sarkis & Talluri 2004)
Communities affected by airport operations	(Upham 2003; Offerman)
NGOs, such as environmental bodies	(Upham 2003)
Business, commerce, tourism, arts, sports, and education organizations	(Upham 2003)
Parking operators and ground transportation providers	(Upham 2003; Neufville & Odoni 2003)
Airport suppliers	(Upham 2003; Neufville & Odoni 2003)

As the following section shows, the categories of "Business, commerce, tourism, arts, sports, and education organizations" and "Airport suppliers" share many features in common. These two groups will be treated jointly.

A. Analysis of Stakeholder Definitions and Goals

To examine the role of the airport stakeholders a precise definition of stakeholders and their goals for the airport is necessary. The purpose of this section is to identify the airport's goals from the point of view of each stakeholder group.

1) Passengers

For passengers, the airport provides a transition point between the ground and air transportation modes, or a connection point between two flights. Different sub-types of passengers have been identified (Neufville & Odoni 2003; pp. 610 - 611):

- 1) Arriving passengers
- 2) Originating passengers
- 3) Transfer passengers
- 4) International and domestic passengers
- 5) Charter and low-fare airline passengers
- 6) Shuttle/commuter passengers

These passenger types are not mutually exclusive; rather, an individual passenger may be a member of more than one sub-type of passenger categories. Arriving and originating passengers are commonly referred to as origin and destination (O&D) passengers.

Independent of the passenger classifications according to the above attributes, the passengers may be viewed in two different capacities in the context of this analysis. First, passengers can be viewed as participants in the economic system, either as business travelers or as tourist/leisure travelers, purchasing services from airport service providers and interacting in different ways with local businesses and the local community. Second, passengers can be viewed as individual travelers that have expectations about receiving quality services, and passing through the airport system in a convenient manner. These two perspectives have different

implications on the goals for the airports and will be treated separately in the following subsections.

a) Passengers as Economic Participants

Passengers may participate in the economic system in one of several ways:

- 1) As origin leisure/personal travelers: These are passengers from the local community that use the airport as their departure point for leisure or other personal travel.
- 2) As origin business travelers: These are travelers representing local businesses, using the airport as their departure point.
- 3) As destination leisure/personal travelers: These are visitors to the region, for tourism or other personal purposes.
- 4) As destination business travelers: These are business travelers coming to visit local businesses.

Each type of passenger has a different impact on the local region, as will be discussed in section IV.A.2).

If the airport's traffic is heavily geared toward O&D traffic, then demand at the airport is more heavily dictated by the local economy. In contrast, significant connecting (transfer) passenger levels are less sensitive to the performance of the local economy, but those traffic volumes may represent a vulnerability for the airport since they are to a greater degree dictated by a carrier's viability and route decisions (Forsgren 2007; p. 2).

Passengers contribute toward the financing of airport capital improvement projects through Passenger Facility Charges (PFCs) of up to \$4.50 per passenger. PFCs are paid directly by passengers through airline tickets and proceeds must be used for capital improvements at the airport that collected them (Wells & Young 2003; p. 79).

The goals for passengers as economic participants relates to the cost of travel: Providing access to low fares is a key objective for the airport in the view of air passengers (Michael Cintron, International Air Passengers' Association 2009). The role of passengers in the economic system is further discussed in sections IV.A.2) and IV.A.11).

b) Passenger as Travelers

When considering the passengers as travelers as a stakeholder group, the focus is on the passenger as an individual. The goal of the airport from the individual passenger viewpoint is "moving passengers quickly and conveniently to where they need to go" (Michael Cintron, International Air Passengers' Association 2009). This view considers the airport as a transit point from one mode of transportation to another, or as a connection point between two different flights. Ensuring on-time performance was raised as the most important aspect to achieving this objective.

2) Business, Commerce, Tourism, Arts, Sports, and Education Organizations

The organizations that in various ways are customers of the airport have been summarized as "business, commerce, tourism, arts, sports, and education organizations" (Upham 2003). Figure 4 proposes a means for categorizing these organizations based on the type of use they derive from the airport: Some organizations are direct users of the airport by importing or exporting services (i.e. business travelers) and goods (raw materials or finished goods). Other organizations are indirect customers of the airport as a result of their customers (e.g. tourists) traveling through the airport. The term "organizations" is used to encompass both for-profit and not-for-profit organizations.

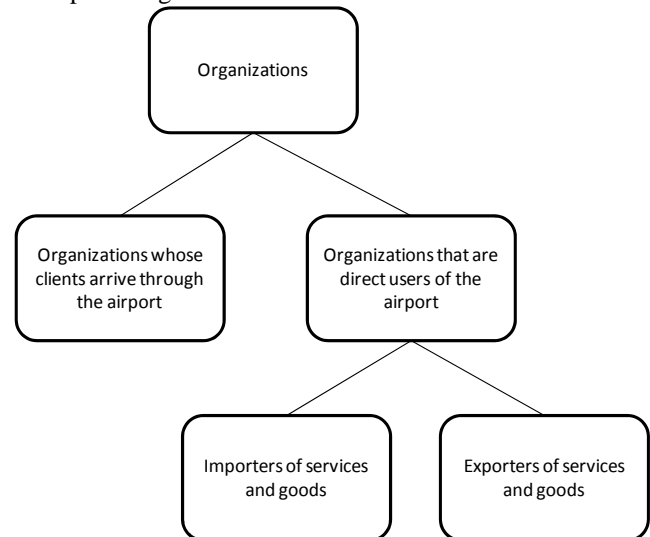


Figure 4 – Organizations as customers of the airport

The airport serves as an engine of business activity for the organizations in the region. The airport drives and supports economic activity in several different ways, including both through business activities directly at the airport and through business activities throughout the regional economy (Button & Stough 2000). These types of economic activity are described in greater detail in section IV.A.11). Underlying goals for maximizing this economic activity include maximizing passenger volumes and traffic at the airport as well as maximizing the number of destinations served and the frequency of those services (Matt Erskine, Greater Washington Board of Trade 2009). As a result of the different types of use of the airport described in the previous paragraph, the priority of one goal over another varies between organizations.

3) Air Carriers

Air carriers provide the air transportation service from the airports. Air carriers include both passenger and cargo carriers and are classified into three subcategories (Environmental Protection Agency 2000; p. 14-26):

- 1) Large certified carriers: These carriers have a certificate to carry 61 passengers or more, payload equal to or greater than 18,000 pounds, or conduct international operations

- 2) Small certified carriers: These carriers fly aircraft that carry less than 61 passengers, carry less than 18,000 pounds, and do not conduct international operations.
- 3) Commuter carriers: These are air taxis with a published schedule of at least five weekly round trips between at least two airports.

Air carriers select airports based on the passenger demand for service to/from the airports (i.e. revenue generation potential) and based on the cost of operating at the airport. The airlines have the objective of achieving high yields, (Doganis 2002; p. 16). Airports serve the role of providing access to high yield markets. Attractive airports ensure low cost of air carrier operations at the airport. This includes both minimizing direct fees charged to air carriers through the maximization of non-aeronautical revenues (Dallas Dawson, Tampa International Airport 2009) and minimizing costs incurred by air carriers through delay on the ground (Peter Stettler, Ricondo and Associates 2009).

An airport may serve either as a hub for a carrier, with a high portion of that carrier's flights operating to/from the airport, or as a non-hub airport with a lower portion of flights for a given carrier (Belobaba et al. 2009; pp. 162-163). In either situation, the airport should act as an efficient hub/connection point, contributing to ensuring air carriers' on-time performance (Pat Oldfield, United Airlines 2009).

In addition, it is the expectation of air carriers that airports ensure safety of operations on the airport surface (Kurt Krummenacker, Moody's 2009).

4) General Aviation Users

General aviation encompasses many types of aviation outside the air carrier definition, including (Wells & Young 2003) (p. 386):

- 1) Air taxi operators (except those air taxi operators listed in section IV.A.3))
- 2) Corporate-executive transportation
- 3) Flight instruction
- 4) Aircraft rental
- 5) Aerial application
- 6) Aerial observation
- 7) Business
- 8) Pleasure

Several of the goals listed for air carriers in section IV.A.3) also apply to general aviation in terms of on-time performance, low costs, and safety. However, a representative of a business aviation organization defined the primary goal of airports as serving as access point to the national air transportation system by providing good availability and high capabilities in terms of instrumentation and services (Jeff Gilley, National Business Aviation Association 2009).

5) Airport Organization

The airport organizational structure varies (Neufville & Odoni 2003; p. 225) and can be comprised of an individual

airport such as Dallas Fort Worth Airport (DFW) (DFW Airport 2009) or as a group of airports managed by the same organization, such as the Metropolitan Washington Airports Authority (MWAA) (Metropolitan Washington Airports Authority 2009). The airport organization is overseen by a board appointed by local governments, as described in section IV.A.11).

In larger airports or systems of airports, a common feature is that the organization includes a separation of operating units which carry out on-going management of airport operations, and they are separate from staff units which have responsibility for (among several other areas) infrastructure development (Neufville & Odoni 2003; p. 226-227).

The airport itself pays for some capital infrastructure projects, as shown in section III. Airport operating revenues come from sources such as landing fees, terminal leases and proceeds from concessions sales. This revenue is used to pay for the airport's operating expense, but any surplus can be used to contribute toward capital improvements (Dillingham; p. 9).

A set of goals for the airport organization can be derived from studying airports' strategic plans and objectives and from interviewing airport management experts.

The primary objective (sometimes referred to as the "mission") of the airport is to provide access to high quality air services to its region. Other goals, such as ensuring strong financial performance and high operational efficiency, are considered as "means to an end" in that they enable the airport to achieve this overarching goal (DFW Airport 2008; p. 2; Hillsborough County Aviation Authority 2006; p. 5; Jim Wilding, formerly with MWAA 2009).

A summary view of the airport's goals is presented using the structure of Denver International Airport's strategic plan (Denver International Airport 2009):

- 1) Excel in airport management: This goal includes:
 - a) Achieve high security and safety (City of Cleveland, Department of Port Control 2007; p. 6; Denver International Airport 2009; p.8; Hillsborough County Aviation Authority 2006; p. 5)
 - b) Grow revenue and manage costs (City of Cleveland, Department of Port Control 2007; p. 14; Denver International Airport 2009; p.8; DFW Airport 2008; p. 3; Hillsborough County Aviation Authority 2006; p. 5)
 - c) Drive economic growth (Denver International Airport 2009; p.8)
 - d) Grow passenger numbers (City of Cleveland, Department of Port Control 2007; p. 14; Denver International Airport 2009; p.8)
 - e) Provide access to a high number of destinations and a high frequency of service (Denver International Airport 2009; p.8). This goal relates immediately to the primary objective of the airport described above.

Airport management must also achieve a balance where sufficient infrastructure capacity exists for handling traffic while capacity is at the same time not over-built (Paul McKnight, Jacobs Consultancy 2009; Frank Berardino, GRA Inc 2009). Additionally, a key objective for airports is to maximize non-aeronautical revenues since that provides diversified revenues and allows for keeping usage charges to air carriers low, thereby potentially attracting more traffic (Chellie Cameron, MWAA 2009; Peter Stettler, Ricondo and Associates 2009; Seth Lehman and Emma Walker, Fitch Ratings 2009).

- 2) Provide high levels of customer service: This goal includes ensuring a good experience for both passengers and other customers (City of Cleveland, Department of Port Control 2007; p. 7; Denver International Airport 2009; p. 9; DFW Airport 2008; p. 3; Hillsborough County Aviation Authority 2006; p. 5).
- 3) Develop environmentally sustainable practices and minimize noise: This goal includes minimizing emissions, energy consumption, etc., within the airport (Denver International Airport 2009; p. 10; City of Cleveland, Department of Port Control 2007; p. 14). Some airports, such as Sea-Tac, are also beginning to expand their focus by considering greenhouse gas emissions not only from the airport-controlled operations but also from airlines and other tenants as well as the public (Port of Seattle, Sea-Tac Airport 2007; p. ES1). Related to this is the goal of minimizing airport-related noise (Neufville & Odoni 2003; p. 167-170).
- 4) Develop high-performing employee teams: This goal relates to developing effective and skilled employees (City of Cleveland, Department of Port Control 2007; pp. 5, 15; Denver International Airport 2009; p. 12) and maximizing employee engagement (DFW Airport 2008; p. 3).
- 5) Enhance competitive advantage: This goal includes providing competitive user rates and protecting the airport's physical infrastructure (Denver International Airport 2009; p. 14; City of Cleveland, Department of Port Control 2007; p. 13).

Some of these goals may be in competition with each other. For instance, the goal of maximizing non-aeronautical revenue can conflict with the goal of developing environmentally sustainability and providing a good experience for passengers: The latter two goals would be aided by promoting and developing access to public transportation access modes to the airport such as bus or rail. However, the goal of maximizing non-aeronautical revenue is better served by maximizing revenue-generation in the form of parking revenue from private vehicles. In such instances, airport management must balance the competing priorities in order to accomplish the goals of the airport.

6) *Investors and Bond-Holders*

The majority of airport debt is of the general airport revenue bond (GARB) type. GARB means that the bond is backed by revenues generated from airport operations and not backed by any government funding source. The credit ratings agencies Moody's, Standard and Poor's, and Fitch Ratings participate in this system by assigning grades of investment quality to the airports' bonds. The ratings agencies' ratings affect the interest rates and terms of the bonds (Wells & Young 2003; p. 336-339). A large number of factors impact the bond ratings, including (Forsgren 2007; p. 2):

- 1) Historical and projected population growth
- 2) Historical and projected employment expansion and mix
- 3) Passenger growth
- 4) Airport utilization trends
- 5) Portion of origin and destination (O&D) traffic
- 6) The importance of the facility to the overall US system of airports
- 7) Whether the airport is in a favorable geographic location (e.g. is it a natural hub location?)
- 8) Airfield capacity and attractiveness of facilities
- 9) Debt burden and carrying costs
- 10) Financial strength of carriers with a lot of connecting traffic, and their level of commitment to the airport
- 11) The role of the airport in the dominant carrier's network
- 12) The level of legal flexibility for the airport to change the rates it charges air carriers

7) *Concessionaires*

Airport concessionaires operate passenger services in terminal buildings and may include food and beverage services, retail services, and hotels. Concessions operators pay the airport organization a fixed annual fee and/or a percentage of gross revenues (Wells & Young 2003; p. 324). Considering the concessions operators' objective of maximizing profits, the goals of the airport for these operators are deduced to be maximizing passenger volumes and minimizing the fees paid to the airport organization.

8) *Service Providers*

The service providers are private operators that offer services to air carriers and general aviation users. Independent operators may supply these services (e.g. fixed-base operators, FBOs), but some of the services may also be provided by the airport operator, the airline itself, or by another airline. Services provided include (Neufville & Odoni 2003; pp. 268, 278):

- 1) Supply of aviation fuel and oil
- 2) Baggage handling and sorting
- 3) Loading and unloading of aircraft
- 4) Interior cleaning of aircraft
- 5) Toilet and water service
- 6) Passenger transport to/from remote stands
- 7) Catering transport
- 8) Routine inspection and maintenance of aircraft at the stands

- 9) Aircraft starting, marshalling, and parking
- 10) Aircraft de-icing
- 11) Passenger handling (e.g. ticketing and check-in)
- 12) Cargo and mail handling
- 13) Information services
- 14) Preparation of handling and load-control documents
- 15) Supervisory or administrative duties

Similar to concessionaires, independent service providers pay a fee to the airport organization which is typically a percentage of gross revenues (Neufville & Odoni 2003; pp. 268, 279). In a parallel to concessionaires, service provider goals for the airport would include maximizing traffic volumes and minimizing the fees paid to the airport organization.

9) *Employees*

The employee category includes both direct employees of the airports organization as well as employees of companies operating at the airport, such as concessions operators. Some employees are organized into unions, such as the Service Employees International Union (SEIU USW West 2009) and Unite Here (Unite Here 2009). The objective of the airport from the perspective of those unions is to provide secure jobs, wages, and benefits (Unite Here 2009).

10) *Federal Government*

The federal government participates in the airport system in three different roles: As a bill-payer, as an operator, and as a regulator. Each of these roles will be addressed in this section.

In terms of the government's role as a bill payer for the system, the Airports Improvement Program (AIP) is administered by the FAA and its funding comes from the Airport and Airway Trust Fund, which in turn is funded by user fees and fuel taxes. AIP funds can be applied toward projects that "support aircraft operations including runways, taxiways, aprons, noise abatement, land purchase, and safety, emergency or snow removal equipment" (Kirk 2003; p. 3). In order to be eligible for AIP funding, airports must be part of the National Plan of Integrated Airport Systems (NPIAS), which imposes requirements on the airport for legal and financial compliance (Wells & Young 2003; p. 329).

The NPIAS has two goals: To ensure that airports are able to accommodate the growth in travel and to keep airports up to standards for the aircraft that use them (FAA 2008; p. v).

The government's role as airport operators includes three different agencies:

- 1) FAA: The FAA is the operator of ramp, ground, local, and departure/arrival air traffic control services (United States Code of Federal Regulations 2010).
- 2) Transportation Security Administration (TSA): The TSA provides passenger and baggage security screening services. The TSA states that it is the goal for its baggage screening operations to screen for explosives and other dangerous items while maximizing efficiency (Transportation Security Administration 2009). This can

be translated to state that it is the goal for the airport to ensure secure transportation of people and goods while minimizing the impact of security measures on legitimate travelers and goods.

- 3) Customs and Border Protection (CBP): The CBP is responsible for operating passport control and customs inspections at international airports. The CBP states that it is its mission to protect "our nation's borders from terrorism, human and drug smuggling, illegal migration, and agricultural pests while simultaneously facilitating the flow of legitimate travel and trade" (Customs and Border Protection 2009). Just as for the TSA, this can be translated to state that it is the goal for the airport to ensure secure transportation of people and goods while minimizing the impact of security measures on legitimate travelers and goods.

Lastly, the federal government is a regulator of the airports system. Airports that are included in the NPIAS are subject to a number of federal regulations that are enforced by the FAA and the Transportation Security Administration. The regulations apply to both the airport infrastructure as well as to service providers within the airport systems. The purpose of these rules is to ensure the safe and efficient operations of public-use airports (Wells & Young 2003; pp. 19-22).

11) *Local Government*

US airports are with few exceptions not private, profit-making enterprises. Instead, airports are typically owned and operated by public entities such as cities, counties, or local airport authorities (Neufville & Odoni 2003).

For instance, Washington's Dulles and National airports are owned and operated by the Metropolitan Washington Airport's Authority (MWAA). The MWAA is officially a body independent of the local government but its board is appointed by the Governor of Virginia, the Mayor of the District of Columbia, the Governor of Maryland and the President of the United States).

Similarly, Newark, LaGuardia, JFK, Stewart International, and Teterboro airports in metropolitan New York City are owned by the Port Authority of New York and New Jersey (The Port Authority of New York and New Jersey 2009). Dallas-Fort Worth Airport is jointly owned by the City of Dallas and the City of Fort Worth (DFW Airport 2009).

The government owners in the form of city and local governments are represented by an airport board which is responsible for the strategic direction of the airport and for appointing airport management (Wells & Young 2003; p. 35).

The local government is supported in an advisory role by federally funded Metropolitan Planning Organizations (MPOs) who are charged with assisting in planning for aviation and other transportation infrastructure for the local region (Association of Metropolitan Planning Organizations 2010).

State and local government also contribute as bill-payers for capital improvement projects (Airports Council International - North America 2009).

The objectives of the airport from the point of view of the local government is representative of those of the local community it represents and involves both maximizing its positive effects while minimizing its negative effects as described in the subsequent paragraphs.

One form of positive impact of the airport is in the shape of economic effects. There is significant literature on the economic impact of airports. However, many studies are sponsored by the airports authorities themselves, making them “more political than analytical” (Cooper 1990). Although there may be no definitive measure of the economic impact of airports, a structure for the types of impacts of airports to their regional communities has proposed (Button & Stough 2000):

- 1) Short-term impact from construction, expansion, and renovation of airports
 - 2) Sustained impact in the form of jobs at the airport (direct impact) and off-airport jobs that result from the “multiplier effect” of the income generated by employees at the airport
 - 3) Stimulus of the local economy as a result of firms and individuals having air transportation services at their disposal
 - 4) Spurring other economic development by crossing thresholds for economies of scale, scope, and density.
- The authors note that this last form of impact is very difficult to quantify.

Related to the objective of maximizing economic effects is providing maximum access to air services that connect the region to the country and the world. This involves maximizing the number of destinations served and the frequency of those services (Jim Wilding, formerly with MWAA 2009; Kurt Krummenacker, Moody's 2009; Chellie Cameron, MWAA 2009; Matt Erskine, Greater Washington Board of Trade 2009).

As described for airport management in section IV.A.5), the objective of the local government is also to minimize the negative impact of the airport in the form of noise and emissions.

12) Communities Affected by Airport Operations

The interest of communities affected by airport operations is represented by the local government which was elected by the constituents of those communities. Hence, the goals of the airport for these communities are broadly aligned with the goals described for the local government in the preceding section, including maximizing economic impact, maximizing destinations served and frequency, and minimizing emissions and noise.

However, it should be noted that for individual groups of community members, the objectives of the airport may be different for others. According to Smith (Smith 1979; p. 47),

“how much people suffer from this growing nuisance depends largely on where they live, which may have no bearing on how much they benefit from the airport.” From this reasoning, residents near the airport can be considered a particularly significant subset of the overall group of communities affected by airport operations.

The adverse effects of airports result from several sources, including air traffic, ground vehicles on the airport, and vehicles providing ground transportation to travelers (Wells & Young 2003; pp. 354-361). The adverse effects include:

- 1) Noise
- 2) Air quality
- 3) Water quality
- 4) Hazardous waste emissions
- 5) Other externalities, including increased automobile traffic congestion

13) NGOs, such as Environmental Bodies

Non-governmental organizations, such as environmental bodies, fall in the category of “airport interest groups”. Although they state that “there are many national organizational and regional organizations that are deeply interested in the operation of airports”, Wells and Young (Wells & Young 2003; pp. 22-24) only list NGOs that can be considered “pro-aviation”, such as the Aerospace Industries Association, the Airports Council International – North America, and the International Air Transportation Association.

However, interest groups with other interests also exist, such as environmental bodies (Upham 2003). The US-Citizens Aviation Watch is such an organization, which is “dedicated to protecting the health, safety and welfare of individuals and communities that are affected by the air transport industry” (US-Citizens Aviation Watch 2009).

This indicates that there is no general description of the goal of airports representing all NGOs.

14) Parking Operators and Ground Transportation Providers

Ground transportation providers include rail service, taxicabs, buses, shuttles, rental cars, and limousines, while parking services may be provided both on and off the airport, and either by the airports organization or by private enterprises. From airport management’s point of view, the desirable distribution between different modes of transportation will vary dependent upon the individual airport’s context (Wells & Young 2003; pp. 229-241).

Similar to concessionaires and airport service providers, the revenues for parking operators and ground transportation providers will be maximized through high passenger volumes and (where applicable) low fees paid to the airport.

15) Airport Suppliers

Airport suppliers have the airport itself as the end customer. These include for instance various contractor and consulting firms and equipment suppliers (Upham 2003). Similar to concessions, airport service providers, and ground

transportation providers, these suppliers benefit from growth in traffic volumes.

B. Summary of Stakeholder Definitions and Goals

The discussion in section IV.A of stakeholders, definitions, and their goals for the airport is summarized in TABLE 2.

TABLE 2

DESCRIPTION OF AIRPORT STAKEHOLDERS AND GOALS

Stakeholder Group	Definition	The Stakeholder 's Goals for the Airport
Passengers	O&D and transferring passengers	<ul style="list-style-type: none"> - Move passengers quickly and conveniently - Ensure on-time performance - Provide access to low fares
Organizations	Organizations in region	<ul style="list-style-type: none"> - Maximize passenger and traffic volumes - Maximize number of destinations served and frequency of those services
Air carriers	Passenger and cargo carriers	<ul style="list-style-type: none"> - Ensure on-time performance - Ensure low cost of operations - Ensure safety of operations - Provide access to high yields
General aviation	Air taxi, corporate transportation, business aviation, etc.	<ul style="list-style-type: none"> - Serve as access point to the NAS through good availability and high equipment capability
Airport organization	Individual airports or multi-airport systems, including management and staff, with responsibility for building and operating the airport	<ul style="list-style-type: none"> - Achieve high security and safety - Grow revenue and manage costs - Drive economic growth - Grow passenger numbers - Find opportunities for new destinations and increase service frequency - Ensure sufficient (but not excessive) infrastructure capacity - Maximize non-aeronautical
		revenues
		<ul style="list-style-type: none"> - Maximize customer satisfaction - Achieve environmental sustainability - Minimize noise - Develop employees - Enhance competitive advantage
Investors and bond-holders	Individuals/organizations holding bonds, and the credit ratings agencies	<ul style="list-style-type: none"> - Optimize performance in factors under consideration (see section IV.A.6))
Concessionaires	Operators of passenger services such as food and beverage and retail	<ul style="list-style-type: none"> - Maximize passenger volumes - Minimize fees paid
Service providers	Providers of services to air carriers, such as fuel	<ul style="list-style-type: none"> - Maximize traffic volumes - Minimize fees paid
Employees	Employees of the airport organization and airport tenants	<ul style="list-style-type: none"> - Provide secure jobs, wages, and benefits
Federal government	Bill-payer for infrastructure (AIP), operator of air traffic control and security, and system regulator.	<ul style="list-style-type: none"> - Ensure that airports can accommodate growth - Keep airports up to standards - Ensure safety, security, and efficiency of operations
Local government	Local entities such as counties or cities which own airports.	<ul style="list-style-type: none"> - Maximize economic impact - Maximize number of destinations served and frequency of those services - Minimize noise and emissions
Communities affected by airport operations	Residents in region, and in particular residents near the airport	<ul style="list-style-type: none"> - Maximize economic impact - Maximize number of destinations served and frequency of those services - Minimize noise and emissions
NGOs, such as environmental bodies	Airport interest groups	<ul style="list-style-type: none"> - Varies depending on the interest group
Parking operators and	Rail service, taxicabs, buses, shuttles, rental	<ul style="list-style-type: none"> - Maximize passenger

ground transportation providers	cars, limousines, and on and off airport parking services	volumes - Minimize fees paid
Airport suppliers	Suppliers of contractor and consulting services and equipment	- Maximize traffic volumes

responsibilities/needs of each stakeholder and their primary points of interactions. This section describes such a model.

A. Airport Stakeholder Model Overview

The stakeholder model is shown in Figure 5. At the center of the diagram are the airport organization and the physical airport infrastructure. The diagram shows that the service providers are the primary entities that interact with the airport infrastructure and that the end users in the form of passengers interact with the service providers.

V. A MODEL OF AIRPORT STAKEHOLDER RELATIONSHIPS

Using the knowledge from section IV, a diagram of the airport stakeholders and their interrelationships can be constructed based on the descriptions of the

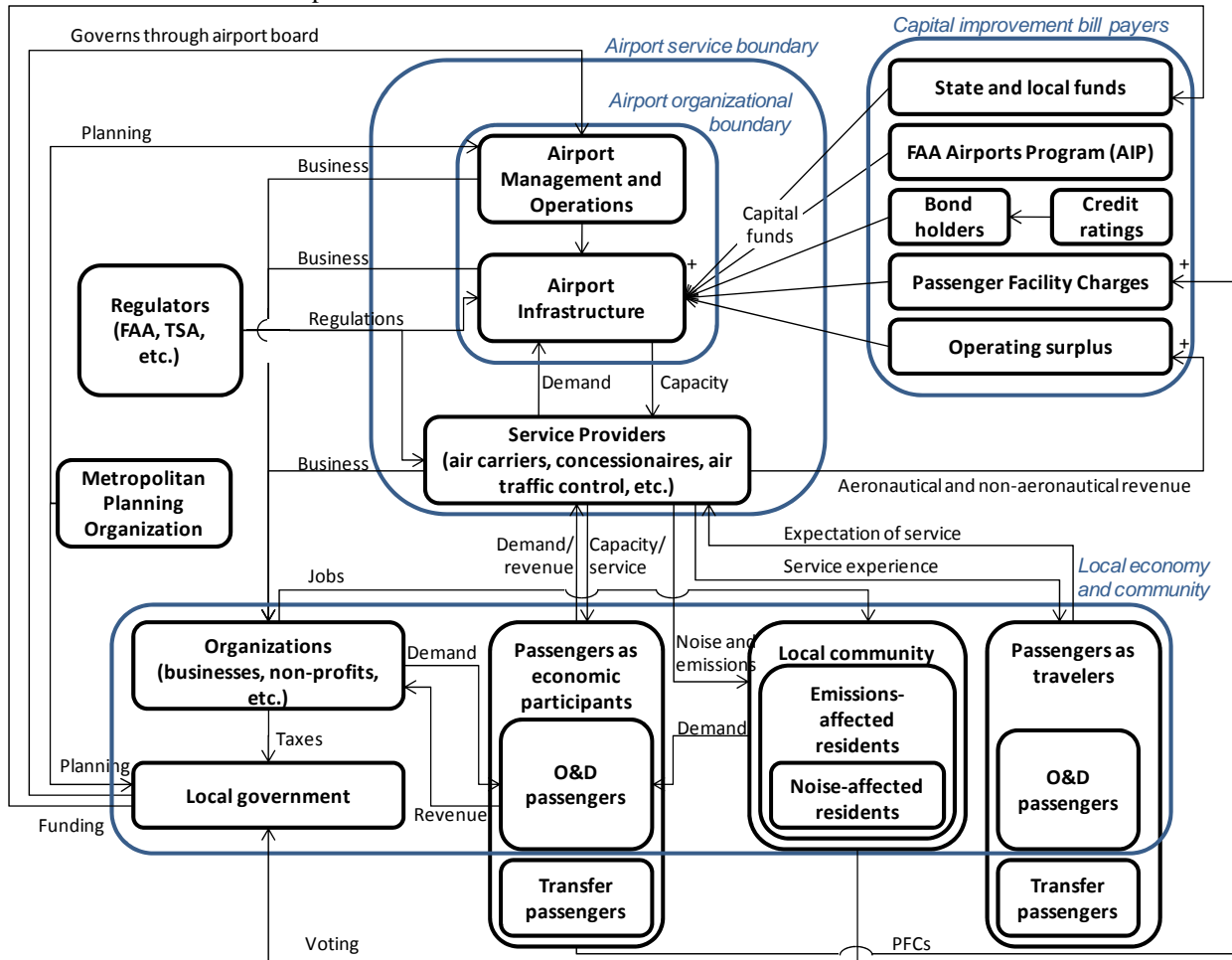


Figure 5 – Financial, customer, and other relationships between airport stakeholders

B. Airport Boundaries

Two different boundaries around the airport are identified in the diagram: The airport organizational boundary and the airport service boundary. In addition, grouping boundaries are identified around the capital improvement bill payers and around the local economy and community.

The airport's organizational boundary shows the limits of what is controlled by airport management. The boundary shows that airport management, and by extension, the airport

board, can only control matters that relate to the design and configuration of airport infrastructure and the operational procedures and efficiency of its own organization. By contrast, the airport has limited control over the services provided at the airport such as the volume and types of air service and the types and quality of airport concessions.

This limited control is of relevance when contrasted with the airport service boundary. The airport service boundary represents the service of the airport as a function irrespective of the organizational responsibility for provisioning that service. For stakeholders outside the airport organization, the

airport's performance may be judged not only on parameters within management's control, but also by factors such as what aircraft delays are or the frequency of services at the airport.

The arcs crossing the airport service boundary can be considered inputs to and outputs from the airport system. One can consider the concept of attaching "sensors" at these intersection points to measure the broader performance of the airport service in terms of generation of jobs, output of pollution and noise, service to passengers, etc.

C. System Loops

Within the diagram, several loops can be identified. These are either positively reinforcing loops where increased activity in one node propagates to increased activity in other nodes, or negatively reinforcing loops where increased activity in one node propagates to limitations in activity in other nodes. Depending on the nature of the loop, the timing of the impact of the loop effect will vary.

The loops in the system include:

- 1) Airport traffic and infrastructure capacity positively reinforcing loop: Increases in traffic at the airport results in increased revenues for the airport in various forms. That in turn provides funding for capacity increases, and those capacity increases permit further growth. The planning horizon for airport infrastructure is lengthy and is dependent on projections about future growth in airport traffic. A typical time horizon would be 10 to 20 years (Neufville & Odoni 2003; p. 70). This loop is highlighted in red in Figure 6.

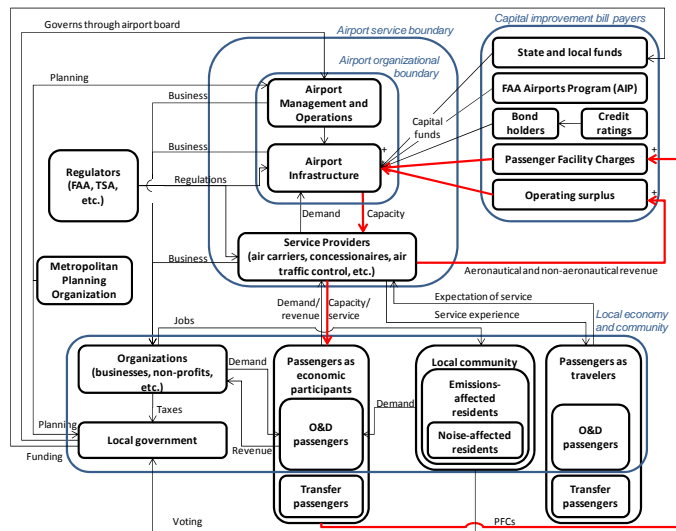


Figure 6 - The airport traffic and capacity loop (outlined in red)

- 2) Airport noise and emissions negatively reinforcing loop: From increases in airport traffic comes increased noise and emissions from airport operations and service providers. That has a negative impact on the local community, which may result in limitations on future growth in capacity and restrictions on operations at the

airport, thereby constraining the opportunity for further growth of the airport. Operational restrictions on the airport arise as a result of decisions within the local jurisdiction precipitated by community reactions to airport activity and this has a time horizon of several years, in order to go through the process of a Notice of Proposed Rulemaking (Wolfe & NewMyer 1985; pp. 83-85). In contrast, the constraining impact on capacity increases at the airport shares the same time horizon as the positively reinforcing loop described in the previous bullet of 10 to 20 years (Neufville & Odoni 2003; p. 70). This loop is highlighted in red in Figure 7.

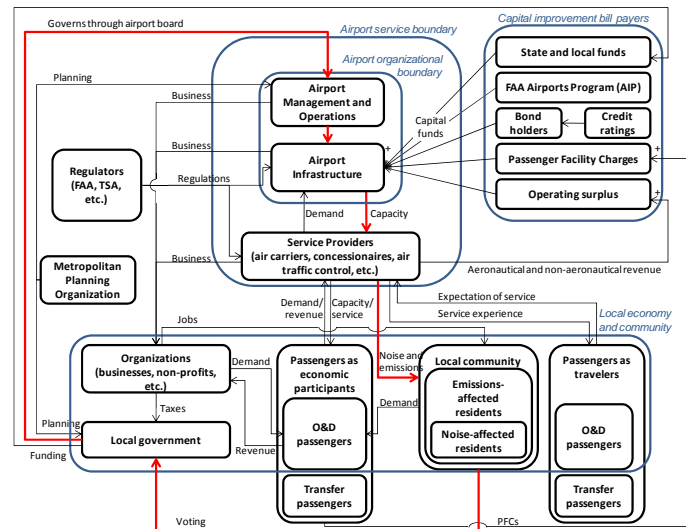


Figure 7 - The airport noise and emissions loop (outlined in red)

- 3) Economic activity positively reinforcing loop: Increased passenger and cargo volumes results in economic growth. In return, greater economic growth results in increased passenger and cargo volumes. Conversely, fluctuations in the regional, national, and international economy will also cause fluctuations in passenger and cargo volumes at the airport. The timing of this effect can be characterized as on-going as it is a continuous and reinforcing effect (Figure 1) and is supported by Engel's law which states that as individual income increases, the percentage of income spent on items such as recreation rise rapidly (Wyand 1938; pp. 220-221). This loop is highlighted in red in Figure 8.

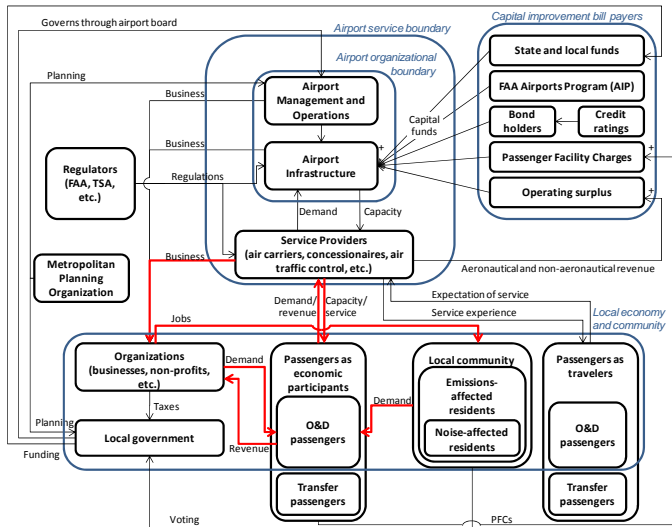


Figure 8 - The economic activity loop (outlined in red)

VI. CONCLUSIONS: IMPLICATIONS ON AIRPORT PERFORMANCE BENCHMARKING

Comparative benchmarking of airports is used for measuring their success in meeting their established goals. The purposes of benchmarking include (Elmuti & Kathawala 1997):

- 1) Performance assessment: Identifying areas of weakness that can be targeted for improvement.
- 2) Growth potential: Conducting a comparison to identify opportunities for growth.

Published airport benchmarks (e.g. Bazargan & Vasigh 2003; Sarkis & Talluri 2004; Sarkis 2000; and Gillen & Lall 1997) do not account for the fact that US airports function as public utilities and must address multiple stakeholder concerns. Benchmarking of US airports should be grounded in the goals of their stakeholders. As the analysis in section IV shows, the goals for the airport vary depending on the stakeholder. In fact, the analysis shows that stakeholders sometimes have conflicting goals. For instance:

- 1) Passengers want access to low fares while air carriers want access to high-yield markets.
- 2) Residents in the local community want a minimum of noise and emissions but a number of other stakeholder groups want traffic to be maximized.

This paper identifies the airport stakeholders, their objectives for the airport, and the relationships between the stakeholders.

The analysis identifies two conceptual boundaries around the airport: 1) A boundary around the airport organization; and 2) a boundary around the airport service, which also includes service providers such as air carriers. The analysis shows that stakeholders who are located outside the airport service

boundary have objectives whose fulfillment is not fully under the control of airport management.

As US airports are public utilities, benchmarking of airport performance must be based on the goals of one or more airport stakeholders, and depending on the stakeholders included in the analysis conflicting goals may exist. Airport management must balance these sometimes opposing objectives for their stakeholders in determining performance goals.

The analysis also shows that not all aspects of stakeholders' performance goals for the airport are under the control of airport management. This is an important consideration in determining the right performance metrics for an airport performance benchmark and in interpreting the results of the airport benchmark.

A stakeholder-driven benchmark of airport performance can be a useful tool for determining in which airport improvement investments should be made since it can determine where the greatest benefits can be generated. The analysis shows that such a benchmark should be based on the goals of a number of airport stakeholders, and that it should not only be limited to factors within the direct control of airport management.

Similarly, benchmarks can be used to guide financial decisions about where to add or drop services for airport service providers. Such benchmarks must also be founded in the goals of those service providers when performance metrics are selected.

Future work should evaluate the degree to which all stakeholders' airport objectives are addressed by existing benchmarks. Where gaps exist, the appropriate performance metrics should be identified and benchmarks should be conducted.

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