

Creating an Effective Aerotropolis Master Plan

John D. Kasarda and Michael H. Canon

ABSTRACT

Aerotropolis master plans to date have consisted mainly of elaborations of proposed commercial land use and urban design renderings along with recommendations for improved airport region surface transportation infrastructure. Much less attention has been given to the strategic, economic, and real estate investment issues that determine whether proposed aerotropolis commercial development would actually occur. Thus, in addition to land use and transportation planning and urban design (including environmental and community elements), an effective aerotropolis master plan must also be both an economic plan and a strategic plan that articulates the drivers of and barriers to aerotropolis development, as well as provide data-based assessments of commercial real estate demand for various aerotropolis functions and sites. Five planning requirements are focused upon: (1) local and regional market demand for air commerce, (2) sufficiency and efficiency of air and ground connectivity, (3) incorporating customers' and stakeholders' wants and needs, (4) the management of commercial real estate development, and (5) attracting investors and investment. Since the fifth factor is so essential for aerotropolis development success, planning strategies and actions to attract investors who make financially viable commercial real estate investments receive greatest attention.

Numerous metropolitan regions around the world are currently planning and implementing the aerotropolis model (see www.aerotropolis.com). This relatively new urban economic development model has both spatial and functional components. Its spatial components consist of an airport-based multimodal commercial core (Airport City) and outlying corridors and clusters of businesses that feed off each other and their accessibility to the airport. Its functional components utilize the airport and its integrated surface transportation infrastructure to efficiently connect time-sensitive goods processing and business services firms throughout a metropolitan region to their distant suppliers, customers, and enterprise partners, as well as to draw and serve tourists and other leisure travelers.

Most aerotropolis development until the past decade was basically organic, shaped largely by market forces, public infrastructure provision, and unguided, site-specific decisions by businesses and the commercial real estate community. Some resulted in overall positive outcomes for firms and places; others in haphazard, economically inefficient and unsightly development with less than the desired results for business, airport area residents, and the competitiveness of the larger metropolitan region.

With growing numbers of firms gravitating to airport areas, governments recognized that formal aerotropolis planning could contribute to more efficient, attractive, and sustainable development. It was also correctly surmised that such planning could make airport area firms and places more competitive, not only attracting greater business investment and tourists, but also making these areas more appealing to talented labor.

Requests for proposals (RFPs) for aerotropolis master plans were therefore solicited from consulting firms, which readily responded. Those securing the contracts assigned mainly land-use and transportation planners, architects and urban designers, and airport infrastructure/operational planners to the consulting team. Very few teams contained the mix of economists, commercial real estate specialists, and financial experts who understood in detail the complex of factors that are involved in business site selection and investment decisions.

As a result, many final reports transpired to be not much more than extensive written elaborations of attractive architectural and urban design renderings along with conceptual land-use diagrams and surface transportation maps recommending that “this business cluster should go here”; “that industrial cluster there,” and that “these roadways/rail lines should be built or improved”. The master plan teams rarely embraced the fundamental principle that they were taught in graduate school: form follows function. Since creating form was the primary objective of much of their training and work, most gave insufficient attention to the economic logic and business-related real estate strategies that underlie airport city and aerotropolis form: investments in financially viable commercial functions.

Part of the reason for this deficiency rested with an inadequate scope of work presented in the RFP. RFPs were often prepared by competent airport professionals, planners, and government officials but who otherwise lacked the experience and knowledge of the factors determining business site selection and investment upon which successful aerotropolis development depends. As a result, the RFPs focused primarily on traditional land use, transportation, and urban planning, sometimes accompanied with airport planning elements such as aviation forecasting.

We certainly do not wish to denigrate or otherwise imply that land use and transportation planning or architectural and urban design are not instrumental components of a good aerotropolis master plan, which they assuredly are. Rather, we recommend that these essential elements should be grounded on, or at least complemented by airport economy strategies, local market analysis, and data-based assessments of commercial real estate demand for various aerotropolis functions and sites. An effective aerotropolis master plan, in short, must also be a strategic plan that articulates the key economic factors underlying business site selection and investment. The purpose of this article is to describe the major economic and strategic components of an aerotropolis master plan.

Commonalities and Challenges in Aerotropolis Strategic Planning

An effective aerotropolis master plan optimizes a metropolitan region’s aviation-oriented assets through appropriate design, investment, and development criteria. It must include the vision, mission, strategies, and tactical action plans to execute the strategies.

A key objective is to make the airport and its surrounding areas more attractive to airlines, passengers, logistics operators, time-critical manufacturers and their supply chains, and supporting commercial and high-end business services, which are the primary drivers of aerotropolis development. There are a related set of investments that come in the form of

hotels, office buildings, convention, trade and exhibition complexes, retail, food and beverage establishments, and from health, wellness, entertainment, leisure, and education facilities. Making aerotropolis sites appealing to investors and end-users of this diverse set of functions is a complex task that requires overarching strategic planning along with real estate and business acumen.

Further complicating matters is the fact that airports and their surrounding areas differ widely in terms of factors such as air transportation hub status, economic bases, land available for new commercial activities, ownership, surface connectivity, and the politics of land development. Those factors shape the appeal of the country (including the enforceability of contracts, logistics capability, infrastructure, fiscal rules, control of capital, etc.)^{1,2}, the airport region, and the project to potential aerotropolis investors and end-users.

Strategic planning (and the overall aerotropolis master plan) will always be influenced by country differences and local conditions. Yet, there are common elements of an aerotropolis strategic plan that, at the very least, address the following:

- Market demand for air commerce,
- Sufficiency and efficiency of air and ground connectivity,
- Customers' and stakeholders' wants and needs,
- The management of commercial real estate development, and
- Attracting investors and investment.

These common elements are inextricably interwoven and the master plan must reflect this. Without a strong local market, adequate air service will be difficult to attain. Without sufficient air and ground connectivity, the attractiveness of a site for commercial development is diminished. Without meeting investors' and customers' needs and achieving long-term commitments of primary stakeholders (public and private), development plans will never be implemented. Without spatially guiding real estate development, aerotropolis goods-processing industries and producer (business) service firms are unlikely to be located at highest and best use sites. And, if the aerotropolis does not have adequate infrastructure financing, project financing, and business support services along with labor skills that firms require, developers and potential end-users of constructed facilities will seek other sites in which to invest.

The last factor is especially important. Because of the substantial public and private investment required to develop an aerotropolis, an effective master plan would include a focus on how to optimize governments', investors', developers', and commercial facility end-users'

¹ World Bank Group (2014). *Doing Business 2015: Going Beyond Efficiency*. Washington, DC: World Bank. doi:10.1596/978-1-4648-0351-2. License: Creative Commons Attribution CC BY 3.0 IGO

² Arvis, J.-F., Saslavsky, D., Ojala, L., Shepherd, B., Busch, C., & Raj, A. (2014). *Connecting to Compete: Trade Logistics in the Global Economy The Logistics Performance Index and Its Indicators*. World Bank Group. Retrieved 25 October 2016 from <http://www.worldbank.org/content/dam/Worldbank/document/Trade/LPI2014.pdf>

returns on their investments. Simply put, the master plan should also be an economic plan that is “bankable” (i.e., investment worthy).

There are multiple examples of aerotropolis master plans that did not address the bankability component and a number of other success factors we noted. The result has been the sub-optimization of the planning effort and capital investments, delays in aerotropolis development, and failures even to get a proposed aerotropolis off the ground.

In the sections that follow, we elaborate the above issues by focusing on the five common elements of an aerotropolis strategic plan that were identified. Within our discussion, we will refer to some concrete examples as well as highlight differences among various airport regions (and the air routes that serve them), which must be taken into account in producing an effective aerotropolis master plan.

Market Demand for Air Commerce

Aerotropolis planning must start with a detailed understanding of the existing economic base of the airport’s catchment area, the reasons for its current status, and its growth potential. Which industries are already located there? Are there time-sensitive manufacturers and distribution firms? How are local manufacturers’ supply chains provisioned both upstream and downstream? Are they users of air transportation? What is the mix of shipments (by harmonized code, weight, value, destination, and shipment frequency) that make up the airport’s cargo volumes? What are the operational impediments aviation-oriented firms face that can be resolved in conjunction with the airport, the community, the private sector, and government?

Along with assessing the existing goods-production facilities and their supply chains, the planning team should assess producer (business) services (e.g. auditing, consulting, corporate law, finance, marketing, etc.) and other air travel-intensive service sectors such as administrative headquarters functions and tourism. For example, what levels of executives and managers are located in the airport’s catchment area? Are they corporate headquarter-level managers, regional managers, or local production managers? What are their travel tendencies? What leisure air travelers/tourists does the area attract and dispatch? Here, it should be determined from where incoming leisure travelers are originating (tourist authorities often gather this information) and, through airport surveys and personal interviews, determined for outgoing tourists and other leisure travelers the most common air transportation destinations and frequency of their trips.

In addition to assessing air commerce-related features of the economic base, the planning team should determine if the local labor force has the skills that will be required by the proposed aerotropolis business sectors. If not, it should suggest action steps to be considered to attract the talent required. Similarly, does the area possess the number and quality of universities that can support aeronautical, biomedical, life science, information and communications technology, high-tech manufacturing, and knowledge-based business services clusters often proposed? Finally, is the social environment sufficiently appealing to attract and retain younger professionals and other well-educated employees in these often-sought-after business sectors?

This detailed information will give the aerotropolis management team (“the client”) a clearer picture of where the proposed aerotropolis currently stands in terms of market demand for air commerce and its prospects, including the limitations and constraints that need to be addressed for the aerotropolis effort to succeed. It will also help the client understand the upstream supply chains and downstream customers of the area’s firms and how the aerotropolis might leverage these into future flights, passengers, cargo, and business cluster development.

Connectivity

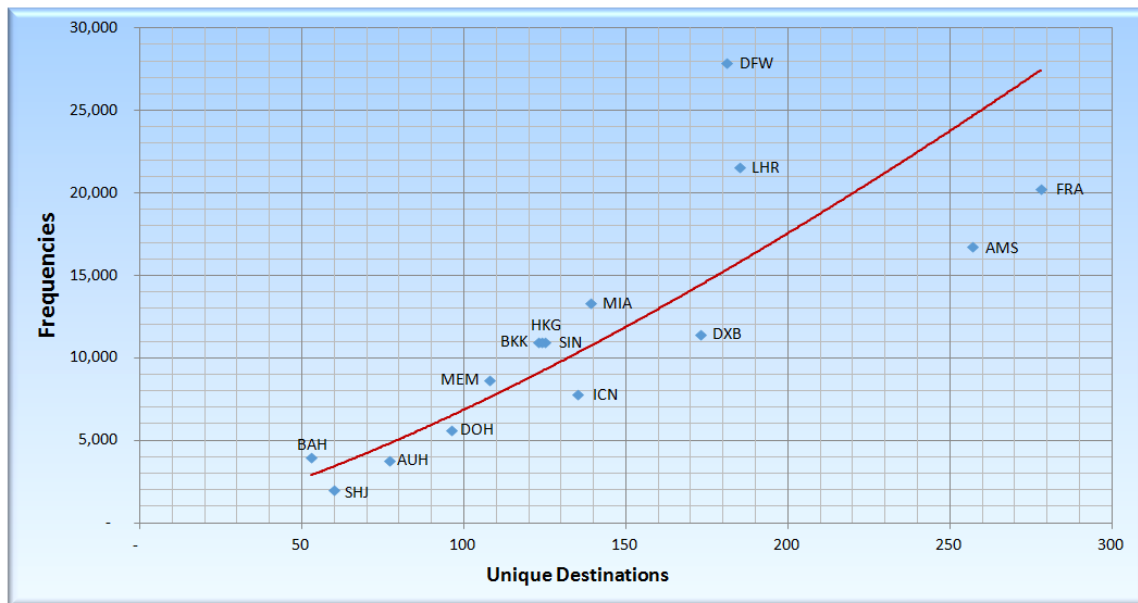
Businesses are attracted to an airport area because of the quality of its connectivity, both air and ground. Good multimodal connectivity enables aerotropolis firms to economize on time in interacting with their suppliers, customers, and enterprise partners, especially those at distant sites. Investors, commercial real estate developers, and facility end-users, often in consultation with site selection firms, inevitably examine the airport area’s local and longer-distance physical connectivity prior to making decisions about investing in or locating new operational facilities there. The aerotropolis development team must therefore be prepared to explain the airport region’s multimodal connectivity and its advantages over other investment sites. In addition to providing the specifics for this explanation, the master plan should articulate the steps and strategies that will further improve the airport region’s air and ground connectivity.

Air Connectivity

A basic measure of air connectivity is the number of destinations (markets) served by an airport and the frequency of flights to those destinations (represented by the Airport Power Curve in Figure 1).³ The size of the markets served is also sometimes included in indexes of air connectivity as is the amount of non-stop service to global hubs, the latter often permitting one-stop air connectivity to most parts of the world.

³ Allroggen, F., Wittman, M. D., & Malina, R. (2015). How air transport connects the world – A new metric of air connectivity and its evolution between 1990 and 2012. *Transportation Research Part E: Logistics and Transportation Review*, 80, 184-201.
doi:[10.1016/j.tre.2015.06.001](https://doi.org/10.1016/j.tre.2015.06.001)

Figure 1. The Airport Power Curve: Selected Airports



Which airports are considered to be the most powerful drivers for airport city and aerotropolis development? Look at the right hand side of Figure 1. With the exception of land-constricted Heathrow Airport, the airports with the highest number of destinations and frequencies to those destinations are in superior positions. Not coincidentally, they have generated some of the most successful airport cities and aerotropolises. They are also major hubs and international gateways served by a substantial number of long-haul, wide-body flights efficiently connecting local residents, businesses, and business people to global markets.

Since air connectivity is typically critical to attract global business, aerotropolis master planners must assess the airport's relative connectivity and deliver recommendations for its improvement. Suggested air services improvement plans must recognize that airlines serve markets, not airports. That is, airlines will be very hesitant to add routes and frequencies unless there is growing local passenger and cargo demand. To assist the airport and local governments in negotiating with airlines, the master plan must offer arguments utilizing data described in the above section on market demand for air commerce.

Airlines, however, almost always hold negotiation advantage in such discussions. Even if they show an interest, the airport and local governments can expect airlines to seek guarantees of "future seats booked" or other incentives before they will begin serving new destinations or increasing frequencies to existing destinations from the local airport. The master plan should contain a thorough review of incentives effectively employed elsewhere. Some plans address "induced demand," arguing that passenger and cargo growth will be stimulated by new routes to attractive destinations. This rarely works because airlines tend to be reactive to existing passenger and cargo demands rather than pro-active catalysts of future demand. Fundamentally, airlines are risk adverse.

Because airports vary widely in their connectivity, not all paths to successful aerotropolis development will be similar. Most airports will never become international

gateways or hubs, nor will they be able to support a major aerotropolis. This reality, however, does not mean that the airport region cannot benefit from implementing a number of aerotropolis development principles. The key is to manage development according to a plan that identifies and recognizes the strengths and weaknesses of the airport and its surrounding region and also identifies the appropriate opportunities to leverage the aerotropolis model.

The first thing to understand, as we have stressed, is the inherent aviation demand the aerotropolis possesses. This is why the value chains of the industries and business services firms that are the principal users of air transportation should be mapped, a point we will elaborate later. The other two pertinent travel groups are tourists, and friends and families. These data become important ingredients for the master plan's projections of passenger and cargo growth.

If there are economic development agencies proactively seeking new industries that will boost future cargo and/or passengers, then a discussion of those efforts should be included in the master plan. If specific companies are attracting their upstream suppliers or producer service firms, that too should be noted. If the airport is not, but should be, a part of the efforts to attract new companies to the area, this should be acknowledged with a recommendation as to how airport management can contribute to future business-recruitment efforts.

The master plan should include assessments of all shipments of local products that utilize an air cargo mode at some point in their transit, even if the shipment from the local area is by truck. This will help identify cargo leakage (local products that could be shipped by air from the local airport but are trucked to other airports) and potential solutions for those air shippers who choose not to use the local airport. Passenger "leakage" via local residents driving to an airport out of the metropolitan region for flights should be examined as well, with corresponding recommendations to reduce this leakage.

Operational aspects (including limited air connectivity and the type of aircraft serving the market) of the airport often play a role in passenger and cargo leakage. The master plan should utilize passenger surveys and other means to determine the main reasons for passenger leakage. The master plan should also identify logistics companies that serve the airport and their customers. An interview with each of these companies will reveal the operational quality of the airport and what needs to improve to reduce cargo leakage.

Passengers and cargo produce revenue for both the airlines and the airport. But, aeronautical fees charged by the airport are costs to the airline and airport users. The aeronautical costs of the airport must be examined and a strategy for the reduction of those costs through operational changes and the generation of non-aeronautical revenue must be developed.

Non-aeronautical revenue generation is a common theme at airport city and aerotropolis conferences. Although most airports are already addressing boosting non-aeronautical revenues, it must be included in the master plan. This is because such revenue not only allows for airport facility and infrastructure upgrades, but through cross-subsidization, it can also lead to lower airport charges to airlines, making the airport more competitive for additional air service. Dallas-Ft. Worth International Airport, for example, has a long-term goal

of zero aeronautical charges to airlines to be enabled by growing revenues from airport commercial development, including car parking and leasing of land to energy production firms.

If there is a demonstrated market demand for additional air services and if the aeronautical costs are lower than the competition, then the chances of adding flights and destinations increase. If the number of flights and destinations increase, then the relative strength of the airport increases as it rises along this airport power curve. The aerotropolis that the airport serves then becomes a much more attractive investment site.

For non-hub airports, the need for passengers and cargo to transfer through distant hubs to reach most destinations is a negative characteristic for their aerotropolis firms to overcome. Corporate executives, in particular, desire non-stop flights. This may be why a survey of the headquarter locations of U.S. Fortune 500 firms (the 500 largest in terms of annual revenues) found that over half of them were located within 10 miles of a hub airport⁴.

For air cargo shipments, the desire for a non-stop (or direct) flight can be even greater. The transfer of cargo between aircraft on the airport tarmac is an exercise fraught with risk. Many things outside of a clean transfer can occur and all of these possibilities are bad. A shipment can be delayed, lost, or damaged in the transfer process and no shipper wants this to happen. A well-organized plan for non-hub airport aerotropolises will include strategies to assuage companies' concerns regarding additional cargo handling at transfer hubs.

Ground Connectivity

In the aerotropolis model, the fundamental planning metric is neither space nor distance, but the time and cost of connecting to the airport and other key nodes. For connection to distant sites, air travel time is important. Total transit time (ground and air) is even more important, especially for mid-distance (500 km to 1500 km) passenger and cargo flights, which make up the majority of commercial air movements.

Efficient aerotropolis operation therefore requires efficient highway connections offering quick airport access to the region's economic, residential, and leisure assets. Rapid passenger rail access between the airport and the central business district and to other major metropolitan clusters can be a critical success factor as well. This is why having good transportation planners' expertise on the master plan team is so valuable.

The master plan needs to assess thoroughly the existing surface transportation infrastructure and vehicle flows as a baseline for recommended improvements. It should also measure any variation in transit time. For time-sensitive businesses, chokepoints and other surface transit inefficiencies can be costly. If delivery of a firm's supply chain sale to a distant customer assumes a specific transit time and, because of highway congestion, the risk that the supply chain manager will not know if the shipment will make the airline's cutoff is great, there

⁴ Stilwell, Justin D. and John Hansman, "The Importance of Air Transportation to the U.S. Economy: Analysis of Industry Use and Proximity to Airports." ICAT-2013-03. MIT: International Center for Air Transportation, May 2013. Retrieved 25 October 2016 from <http://hdl.handle.net/1721.1/78908>

are two options: miss the sale that that shipment represents, or, in the future, add inventory to the pipeline. Neither of these is desirable.

Highway congestion disrupts the lives of passengers and shippers alike and diminishes the appeal of the aerotropolis for business investment. Hence, it is necessary to assess traffic flows, especially during peak hours, and to plan accordingly for both predictable and unpredictable disruptions in surface movement. In so doing, the consultants should study the absolute transit time (and the variation) from key metropolitan nodes to the airport via various surface routes and mode alternatives. If this transit time is not fast enough for the customers and predictable enough to schedule around, then the master plan should suggest solutions to handle projected surface flows efficiently. This may require recommending a separation of truck traffic from passenger traffic in airport areas using dedicated truck lanes to relieve congestion. More-traditional recommendations involve the expansion of existing highways, the construction of new highways, or the addition of rail service. Since large infrastructure investments may be needed, the plan should take this into account, providing first-order estimates of the capital costs.

To facilitate ground flows of aviation-based trade, an effective aerotropolis master plan will also assess the soft infrastructure, such as Customs and the regulatory environment. The International Air Transport Association (IATA) estimated that in 2014, 35% of the value of global goods trade moved by air⁵. When a passenger can arrive at almost any destination in the world within 24 hours, but international air cargo takes, on average, six days traveling on the same aircraft (again according to IATA data), where is the problem? It is on the ground, usually with inefficient and often unnecessary cargo inspections, excess paperwork, and other regulatory delays. The master plan should highlight these problems where they exist so that appropriate government actions can be taken.

Limited Customs operating hours, insufficient inspection personnel, burdensome paperwork, slow Customs service, or corruption not only impede cargo flows, but also damage the reputation of the aerotropolis as a business location. If there is a culture of corruption that is engrained in the fabric of the country, the challenge can be great. This usually requires planners generating information that will put pressure on the government to act on the problem, often through implementing modern Customs clearance technology that takes human decisions out of the process. Consultants can assess the problem through interviews with current users of Customs and other regulatory services. The problem, in fact, may not be corruption. It might be a lack of resources. It also might be a lack of appropriate orientation conveyed by government leadership to the Customs officers and other regulatory authorities on the importance of speedy clearance of imports and exports to the national economy. “Protect the interests of the country while you facilitate trade” is the mantra suggested by the

⁵ International Air Transport Association (2016). Air Cargo. Retrieved 25 October 2016 from <http://www.iata.org/whatwedo/cargo/pages/index.aspx>

World Customs Organization.⁶ Unfortunately, the facilitation of trade commitment is often not heard or, if heard, not embraced by Customs and other regulatory authorities.⁷

Aerotropolises that have become fast, agile, and well- connected have done particularly well in attracting business. Singapore represents an island-wide functional aerotropolis in which speedy, predictable connectivity has brought enormous economic benefits. This city-state operates as an entrepôt in which goods arrive by sea and by air and are stored, sorted, delivered locally, or re-exported via sea and air. Although it now has very little manufacturing, Singapore has become an economic force by emphasizing speedy ground handling of goods as well as passengers.

At Singapore's Changi Airport, cargo aircraft park on the ramp near bonded distribution facilities. The cargo is off-loaded, sorted, and transferred to other flights or loaded onto trucks for local delivery. The air waybills of the individual shipments destined for Singapore that require Customs clearance are entered into the Customs software and, according to automated selection criteria, a small sample of shipments (usually under 5%) is physically examined. As the trucks leave the bonded area, the only ones that are stopped at the gate are the ones carrying shipments selected for inspection. All the others proceed out the gate for delivery. This accelerates delivery for 95% of the shipments and avoids the extra costs to the government and Singapore's economy associated with the unnecessary inspection of all shipments.

Likewise, recognition by airlines and shippers that Customs operations in Brazil were seriously impeding its aviation-oriented trade resulted in a major project to identify the chokepoints for the clearance processes, both inbound and outbound, and to implement more efficient clearance processes.⁸ The effort was led by a public-private partnership involving industry organizations, Brazil Customs, exporters and importers, the air express industry, and the Ministries of Finance and Health, as well as the office of the President. Considerable progress was made in reducing shipment delays (and corruption) via recommended direct government intervention that resulted in the introduction of an automated (electronic) Customs environment that removed most subjective (human) valuation of cargo from the clearance process.

To sum up, efficient air and ground connectivity is pivotal to successful aerotropolis development. Shippers and their supply chain managers pay significantly more to use airfreight than other modes. Speed to distant markets means they can reduce inventory in the logistics

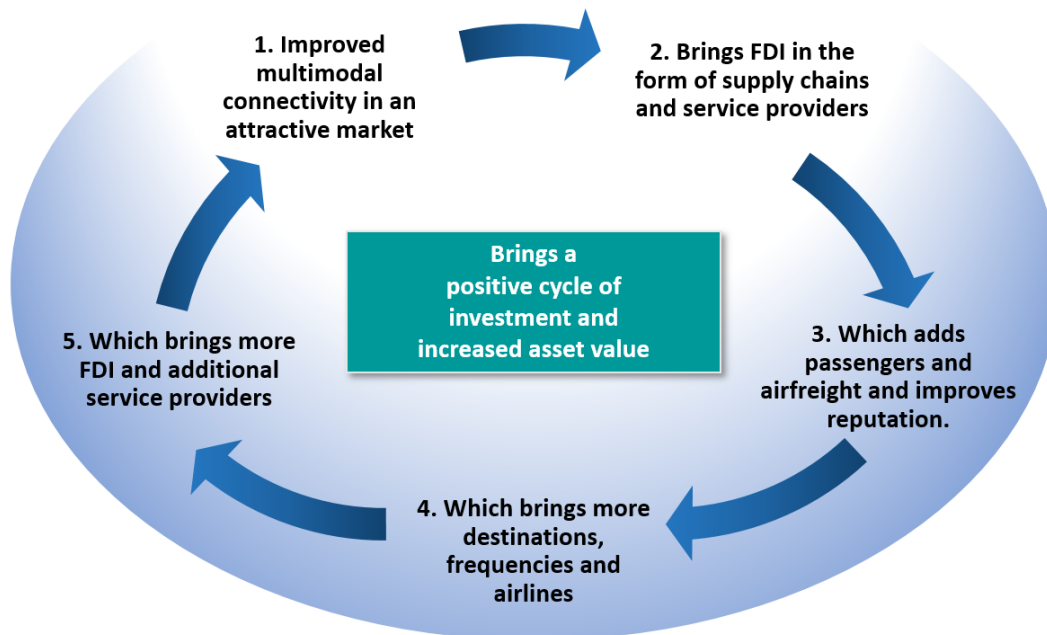
⁶ World Customs Organization (2015). Coordinated border management: Facilitating trade through communication, cooperation and coordination. Retrieved 25 October 2016 from <http://www.wcoomd.org/en/topics/wco-implementing-the-wto-atf/~media/2EAA71DD69EC4F91B4F4FD0162F997AF.ashx>

⁷ Karlsson, L. (2005). *The Stairway®: Management of an Authorised Secure Supply Chain: Capacity Building for a Customs Environment in a Changing World*. Tullverket.

⁸ Mein, J. E. (2014). Customs-private sector partnership: Not just wishful thinking. *World Customs Journal*, 8(1), 129-135. Retrieved 25 October 2016 from [http://worldcustomsjournal.org/Archives/Volume%208,%20Number%201%20\(Mar%202014\)/0%20Complete%20Issue%20WCJ_Volume_8_Number_1.pdf#page=136](http://worldcustomsjournal.org/Archives/Volume%208,%20Number%201%20(Mar%202014)/0%20Complete%20Issue%20WCJ_Volume_8_Number_1.pdf#page=136)

pipeline, respond with greater agility to shifts in customer demand to boost sales, and, in many cases, lower their total costs of delivery. Yet, hard and soft infrastructure inefficiencies on the ground can undermine the speed advantages air connectivity offers and thus the value of an aerotropolis site for business. If multimodal surface connectivity and ground operations constraints are resolved, then the aerotropolis becomes more attractive to investors, developers, and their aviation-oriented commercial tenants. Once this happens, the economic impacts of an infrastructure investment will create a self-reinforcing development cycle as is illustrated in Figure 2.⁹

Figure 2. Multimodal Connectivity and its Positive Feedback Loop



Voices of the Customers and Stakeholders

Customers and stakeholders ultimately determine if planned aerotropolis development will occur. In order to obtain critical information to successfully plan and execute the development of an aerotropolis, the consulting team must interview its major customers and stakeholders, gathering information on their wants, needs, and concerns. There should be a formal process for obtaining extensive feedback from both groups, and action plans for improvement of conditions and processes that affect them should be recommended.

⁹ Shepherd, B., Serafica, R. B., Bayhaqi, A., & Jing, H. (2010). *The Economic Impact of Enhanced Multimodal Connectivity in the APEC Region*. APEC#210-SE-01.1. Singapore: Asia-Pacific Economic Cooperation Policy Support Unit & Asia-Pacific Economic Cooperation Secretariat. Retrieved 25 October 2016 from http://publications.apec.org/publication-detail.php?pub_id=1028

In producing the master plan, the distinction between customers and stakeholders can be specious. Customers, such as airlines, passengers, cargo and logistics companies, shippers, commercial real estate developers, investment funds, and business tenants are also stakeholders. The airport serves customers. The airport city and the aerotropolis do as well. Listening to the voices of customers and engaging stakeholders early in the planning process is a necessity and can be immensely beneficial in formulating the master plan.

At Dubai South (formerly Dubai World Central), the management team organized a “Customer Advisory Board” composed of fifty customers of the aerotropolis. From brainstorming sessions with them, a list of action item priorities was built and the management team proceeded to prioritize this list and to address its items one by one, beginning with the airport and proceeding outward to the greater Dubai South aerotropolis. It enlisted the aid of key private-sector customers and government leaders and also explained the benefits of Dubai South to them and to the Emirate. As a result, today the operations of Dubai South run relatively smoothly, public- and private-sector investment has grown substantially, and the investors and business tenants seem content.

Stakeholders beyond major customers have interests in the operation of the airport and can have a significant influence on the development of the aerotropolis. These stakeholders constitute a highly diverse group that may include the local community in the forms of neighborhood associations, environmental groups, and local politicians or those beyond the community in the form of regulatory authorities and other state and federal government agencies. The planning team must reach out to all these varied groups and solicit their input in producing the aerotropolis master plan because such groups create the environment in which any aerotropolis must operate. They are responsible for the generation of investment incentives, taxes, labor rules, development regulations, environmental requirements, community resistance, and infrastructure capital flows, among others. They can create public relations issues, chill or inspire investor enthusiasm, and can make the lives of the aerotropolis development team happy or sad. Many, including critics, can also provide helpful ideas and recommendations that can be incorporated into the master plan. As with listening to the voices of the customers, stakeholder engagement must be a priority in the aerotropolis planning process.

Stakeholder Alignment

Engaging stakeholders is one thing; aligning them is another, much more difficult task. Yet, without stakeholder alignment, execution of a planned aerotropolis development will face continuous barriers. Accordingly, the significance of this task in the aerotropolis master plan cannot be overstated.

Alignment will require the identification of the groups of key stakeholders and their interests (and concerns) in the project, their power to influence decisions regarding aerotropolis development, and how each stakeholder’s power can be engaged and leveraged to achieve aerotropolis objectives.

There is no consensus on who or what is a stakeholder. The broadest and most inclusive definition might be any individual, group, or public- or private-sector entity that can affect or is

affected by the aerotropolis development. While stakeholders can vary from aerotropolis to aerotropolis, they all are basically asking themselves the same question: “What’s in it for me?” or “What’s in it for the constituency or the entity whose interests I represent?”

Stakeholders are both internal to aerotropolis development and external to it. Airport stakeholders include the management and operational staff of the airport, service providers (airlines, concessionaires, air traffic control staff, caterers, the regulatory authorities, customs, immigration, ministries, or the police), and users (passengers, cargo shippers, and logistics companies). Those outside the affected airport, or with the power to influence aerotropolis development, may include local, regional, and federal governments, planning authorities, community action groups, local businesses, developers, and investors. Their interests and objectives should be identified and segmented into logical groupings in order to assess potential for future alignment.

Stakeholder alignment begins with finding common objectives around which all of the parties can agree on benefits to focus their limited time and energy. Many stakeholders frequently begin the aerotropolis planning discussion as skeptics. The consulting team must have one-on-one interactions with them to surmise their interests and concerns and what they believe an ideal plan would look like. Once consulted, the master planning team should itemize the interests, needs, and concerns of each stakeholder and prepare a grouping of the common objectives. For instance, all stakeholders might suggest that congestion on the main highway corridor leading to the airport be addressed, or that the wastewater treatment facility be located on an isolated aerotropolis land tract, or that new, bold initiatives are required to reignite or catalyze a slumping regional economy.

In the United States, Mayor Michael Hancock of Denver, Colorado took the lead in championing a Denver Aerotropolis. He soon faced pushback by communities from which the city of Denver had acquired land to construct the Denver International Airport (DEN). In originally providing the airport land (33,531 acres or 13,570 hectares), the surrounding communities wished to benefit economically. They signed a number of intergovernmental agreements with Denver and DEN, which restricted commercial development on airport property so that such development would primarily occur in the outlying communities. Twenty years later, DEN proposed to commercially develop 1,500 acres (607 hectares) of land on the airport. The surrounding community governments created an uproar and threatened to sue the City of Denver and DEN for breach of contract.

The political histrionics and the corresponding bad press had a chilling effect on development activity at and around the airport, stifling Mayor Hancock’s aerotropolis initiative. The mayor worked intensively with airport-area communities to find a resolution. This resolution ended up being a public referendum on whether airport property commercial development beyond the immediate passenger terminal area could occur with tax revenues from such development being shared with the surrounding communities. This referendum passed and the Denver Aerotropolis initiative continued. Resolving the stakeholder conflicts required strong leadership, a willingness to compromise, and a focus on the common objective of increasing revenues for all government entities (including the airport).

Antagonist stakeholders can emerge not only from the political structures of the airport region, but also from legitimate concerns of airport-area citizens and non-governmental organizations. Aircraft noise is the most frequent concern. After antagonistic stakeholders are identified and their concerns heard and carefully considered, the master plan should recommend a strategy for working with each group to move toward a resolution of concerns, or at least mollification of antagonism. It may be that neither is achieved, but serious outreach to antagonistic stakeholders must be part of the aerotropolis planning process.

Regulatory Authorities

Regulatory authorities at various levels of government constitute another key stakeholder group. If planned aerotropolis development requires the assemblage of many individually owned parcels over a large area for infrastructure and business development, rezoning of land and possibly eminent domain (forced acquisition of privately held property by the government for the greater public benefit) may be necessary. Both can result in long litigation periods with courts handing down final decisions on eminent domain. Municipalities and other local jurisdictions may also see flexibility in zoning adjustments as development favoritism preferring one community to another. Nevertheless, zoning regulations will frequently have to be changed to achieve highest and best aerotropolis land use. Without stakeholder alignment, this will be all but impossible to accomplish.

Federal, regional, or local authorities usually fund and control the use of roadways in aerotropolis planning areas, so their views must be considered and addressed. Some authorities may see development of the aerotropolis as having a major traffic impact on the highways they administer. If they do not believe they will have the budget to make the infrastructure investments required to handle the increased traffic that aerotropolis growth will bring, these authorities can create obstacles to its development. In virtually all cases, their input along with strategies to align their resources will be essential elements of an effective master plan.

Federal regulatory authorities can be a particularly influential stakeholder group since they not only provide substantial public infrastructure funding, but also approve international air routes and, in some countries, domestic air service as well. For airports that have international flights and consequently customs and immigration operations, these authorities can be valuable assets or a major headache. Their regulations and policies impact the speed of the clearance of cargo and passengers, establish operational criteria for ground handlers, and set height limits of commercial buildings on and near the airport. The aerotropolis master plan team should evaluate these regulations and policies after interviewing airport officials, airlines, cargo shippers, and developers. They should then make recommendations on appropriate ways for the aerotropolis management team to work with the pertinent regulatory authorities to satisfy the objectives and concerns of all groups.

Environmental Stakeholders

Any good aerotropolis plan will have a good environmental plan minimizing negative environmental impacts and fostering sustainable development. A superficial or limited environmental plan can return to hinder the progress of aerotropolis development as critics

seize upon its limitations. The elements of a good environmental plan are not in the purview of this article. Suffice it to say that from a stakeholder's standpoint, environmentalism is quickly becoming a major force shaping aviation, airport, and aerotropolis development policies.

In addition to assessing the environmental impact of the proposed aerotropolis, the master plan should provide an action plan for engaging environmentalist stakeholders along the lines discussed previously. This is an important strategic issue that – if the history of economically advanced nations is any indication – will eventually become more prominent in developing countries. When Western Europe and North America's level of environmental consciousness arrives in less-developed nations, any aerotropolis planning that takes the attitude of "Don't worry about it" will be regretted.

Real Estate Development Management

The management of the real estate development in an aerotropolis is an essential yet complex challenge that requires a long-term planning perspective, specific skills and experience, and a willingness to adjust to the needs of investors, developers, and their business tenants. The aerotropolis master planning team must consider how to incorporate existing economic clusters into the plan, identify the zoning regulations that need to be changed, and, if pertinent, suggest a land acquisition strategy. The team must also assess infrastructure costs and funding mechanisms along with site planning and suggestions for marketing specific aerotropolis sites to investors, developers, and tenants. Historically, planning teams have not had the expertise on their rosters to address all of these adequately. Furthermore, the integration of this planning effort with the community is critical. Is the development plan in harmony with those of the rest of the community? Will there be a dispute over the allocation of limited resources? Will the local tax base provide the funds for needed infrastructure improvements that usually accompany new development? If not, what external funds may be available and how can these funds be obtained?

Real estate development management will reflect the variety of conditions it faces. As noted, the land around the airport may be mostly open or it may be largely built out. It may have a multitude of owners or just a few. It may have good highway access and utility connections to every major parcel or it might not. It might be zoned for aviation-oriented commercial development or it might not. Just like airports themselves, the features of their surrounding land are almost always different.

When a greenfield aerotropolis is planned around a new airport, there is usually ample open space for future development. The site planning exercise is more complicated when situated around an old airport with many decades of surrounding development that is functionally inconsistent with the aerotropolis model. In either case, however, the outlying land that is available, or that can be repurposed, must be carefully allocated to specific functions predicated on market demand, physical and environmental constraints, highest and best use of sites, and aerotropolis operations identified in the master plan. If zoning conflicts with highest and best land use, then a negotiation strategy with the local authorities to rezone the land should be recommended in the aerotropolis master plan.

The management of real estate development must also take into account likely longer-term contributions of certain commercial functions and firms to aerotropolis success, including the business realities under which they operate. Logistics companies, for example, operate as low-margin businesses and often require facilities within a short drive time to the cargo dispatch area of the airport. Proximity to the airport usually correlates with higher real estate prices. To charge a logistics company what the market will bear may have two negative consequences: 1) the logistics firm will likely move to more affordable real estate, perhaps well-outside the aerotropolis planning area and 2) the airport area will be less desirable for time-critical shippers because an essential component of the operations upon which they depend for efficient supply chain operations will not be conveniently located.

Even should an airfreight shipper have no manufacturing in the area and only uses the airport for cargo transfers, if the logistics companies are not there to efficiently handle shipper transfers, shipper costs increase. At the end of the day, the logistics companies will determine which airline their clients' shipments are consigned and at which airport transfers are made. The logistics companies, often third-party logistics service providers, make the decisions, not the shippers (e.g., manufacturers). In a well-planned aerotropolis, areas near the airport with good highway access would be reserved for logistics companies at accommodating prices.¹⁰ However, they should be located in such a way as to not conflict or detract from more upscale commercial development reserved in the airport area or passenger traffic flows.

Whatever the sector, the preparation of the site maps, albeit time consuming, is necessary. This is one of the essentials of an aerotropolis master plan for which urban planning and design firms are especially suited. These site maps, together with appropriate commercial assessments, are important building blocks in the preparation of the aerotropolis real estate product for the market.

In concert with the mapping process, the aerotropolis plan should include its review and assessment of the installed industrial, commercial, and hospitality real estate base. As we noted in our discussion of market drivers of air commerce, it should also be determined whether the existing occupiers of the business facilities are involved in the import-export of goods and services via air, the destinations and origins of their trade transactions, and the products and services they trade. For manufacturers, the master plan should also include a basic model of their supply chains. Understanding a manufacturer's upstream and downstream supply chain can be quite valuable for future business-cluster development.

In today's world, where many businesses seek sites that provide the lowest cost to process their product, it seems anomalous that concentrations of a specific industry or common supply chains would develop in a particular geographic area that are not low cost; yet, they do. Why should there be a U.S. biotech cluster in North Carolina's Research Triangle Park when India processes active pharmaceutical ingredients much more cheaply? Why should a cluster of companies that produce 35% of the world's orthopedic replacement joints arise and be sustained in Warsaw, Indiana, a small U.S. city with a population of only 14,000?

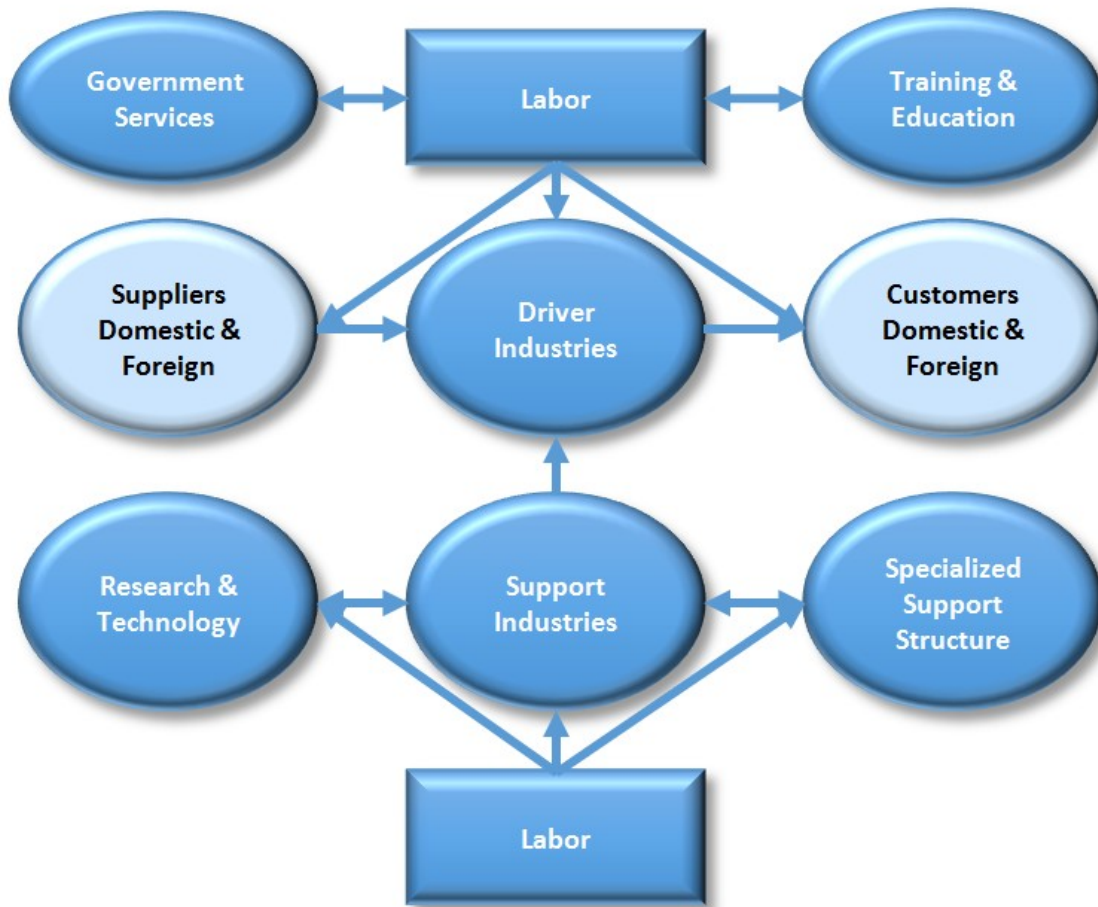
¹⁰ Sheffi, Yossi. (2014). *Logistics Clusters: Delivering Value and Driving Growth* (Reprint edition). Cambridge, Massachusetts: The MIT Press.

A location near others in the same industry or to the suppliers to these industries, as Michael Porter has shown¹¹, provides manufacturers with benefits they would not have at the lowest-cost site. Clusters bring access to innovation, greater efficiency in attracting talent, cross-fertilization of ideas within the cluster (knowledge spillover), spinoffs of new companies that improve and strengthen the cluster itself, and attraction of additional capital that would typically be absent had they located the production of their component parts at sites with the lowest costs. Thus, if a firm's suppliers and/or downstream firms can be recruited, then there is a likelihood that a geographic concentration (cluster) of interconnected companies will develop.

The general model of an industrial cluster presented in Figure 3 illustrates the informal organization of its component parts. A cluster's success is dependent upon the assets of its location and how well its component parts work together. Talented labor, a government that is business friendly, suppliers that cooperate with producers to innovate, and quality education, research, and technology bases all contribute to successful cluster development.

¹¹ Michael E. Porter, "Reshaping Regional Economic Development: Clusters and Regional Strategy." Harvard Business School: Institute for Strategy & Competitiveness, 2014. Retrieved 25 October 2016. <http://clustermapping.us/resource/presentation-video-reshaping-regional-economic-development-clusters-and-regional-strategy>

Figure 3. Generalized Concept of Economic Clusters



Source: Purdue Center for Regional Development

Along with mapping and assessing of pre-existing commercial real estate sites and the supply chains of these companies, the master plan should address the competitive position of the available (open) land for new commercial real estate functions. The potential for viable residential, retail, educational, entertainment, government, health and wellness, commercial office space, and industrial (including logistics and distribution) real estate products must be analyzed, particularly their demand drivers, such as good air and ground connectivity, appropriate labor, competitive costs, and export potential.

Each of the real estate segments mentioned are categorized into classes that need to be examined as well. Class A warehouses, for instance, have characteristics (floor to ceiling height, number and type of loading docks, HVAC systems, etc.) and rental rates that are different from the Class B warehouses. The same can be said for Class A and Class B office buildings and various types of residential real estate products. An accurate analysis of the competitive position of available land depends on correct assessment of all segments and classes within those segments.

As part of this analysis, the master plan should include the location for each of the types of proposed commercial real estate, with consideration given to the class, likely rental and occupancy rates, and the gap between what is available and what the demand is or is forecasted to be. It should also identify opportunities for the commercial developments most likely to succeed in the short term (i.e., “low-hanging fruit”). This is important because aerotropolis development needs momentum and nothing builds momentum like early commercial success stories.

The planning and management of aerotropolis real estate development is complex because of its scale and its many different participants. Participants include, among others, the owners of the land, third-party investors, developers, the government, architects, engineers, and construction companies. The aerotropolis master plan should identify the best potential partners for early stage development projects. An assessment of these potential partners’ reputations, past performances, and financial conditions can contribute to a positive jump-start for such projects.

A good source of early commercial investors, developers, and tenants can often be found in the airport’s metropolitan region. A marketing strategy should be prepared that will appeal to local companies to expand or establish new operations in the aerotropolis. At the same time, a communications and marketing strategy must be created, targeting national and global investors, developers, and tenants, a point to which we shall return.

Because real estate development success in the aerotropolis is inextricably linked to community assets (economic, environmental, institutional, and social), the attractions of the community should be included in the master plan. The real estate development management section should include an amenity gap analysis that shows what tenants, especially foreign firm tenants (and their expatriate employees), will expect in terms of residential, social, and institutional amenities and compare those expectations to what is present. Furthermore, the plan should advocate an ongoing relationship between aerotropolis management and community leaders so that their strengths and those of the community they lead can be leveraged to attract investors.

Rather than offering a field of dreams, the aerotropolis master plan should provide a realistic longer-term vision that describes what a prospective future state can actually look like. Far-fetched suggestions of commercial functions and land-uses that have little or no chance of being feasible should be avoided. And, because aerotropolis development is more of a marathon than a 100-meter dash, the execution of the vision and plans by the aerotropolis management team will require persistence, patience, and a focus on recruiting industries and business service sectors that benefit from air connectivity.

Throughout the development phases, the aerotropolis management team must therefore be highly selective in what businesses and industries it seeks to attract because the land surrounding the airport is a limited asset. With guidance from the master plan, they should make every effort to reject development that does not make economic sense or can potentially conflict with airport operations or its future expansion needs. Finally, the master plan must include a strategy to enhance aerotropolis real estate’s accretive value over time, since this is instrumental to attracting investors.

Attracting Investors and Investment

Aerotropolis investors encompass a wide gamut of companies and other entities: banks, private equity and investment funds such as real estate investment trusts (REITs), public-private partnerships, sovereign wealth funds, and multilateral financial institutions like The World Bank, along with governments of all levels. Without their investments, little or no development occurs. For this reason alone, strategies and recommendations for attracting investors and investment are necessary components of any effective aerotropolis master plan.

On the surface, attracting investors would seem fairly straightforward. A real estate product that fits investors' needs either exists or does not. The difficulty arises in the preparation of the product that meets both their needs and their investment decision-making criteria. The baseline "product" in the case of the aerotropolis is the land for development and the hard and soft (social, institutional, regulatory) infrastructure that supports it. In many cases, it will include completed commercial facilities. The product also encompasses the structure of the deal that will turn on the investment tap.

Along with assessing potential local investors, the master plan team should research investors active in aerotropolis markets elsewhere and segment them by common features, needs, and location decision-making factors. The team should then prepare briefs (investment memoranda) on each segment as a basis for an aerotropolis go-to-market strategy. These briefs incorporated into the master plan should elaborate the investor segment, its objectives, and most importantly, its site selection and investment assessment criteria. Where appropriate, specific potential investors may be suggested.

Consider private investment funds as an illustrative case. Private investment funds are corporatized entities that have become increasingly active investors in airport city and aerotropolis development projects. They primarily finance the construction and purchase of major commercial real estate assets. The funds' managers define where they will invest, in what types of assets they will invest, the acceptable risk of their investments, and the returns expected. They market the investment funds to individual or institutional investors (such as government or private sector pension funds) to obtain their financial resources and then search for the appropriate projects in which to place those resources.

Global financial firms have many options for their investment funds. They can go anywhere as long as their investment criteria are met. Investment fund managers are the stewards of their clients' money; they manage the risk of the investment for the clients. They sell their investment management services to their clients by defining the acceptable risks and returns to them in terms of country, industry, and project. If what a particular aerotropolis offers fits their criteria, then there is a chance that the aerotropolis will receive the investment. If not, the investment fund will reject it as a site.

Private investment funds vary considerably. There are differences between domestic and foreign investment funds in what locations and projects they are willing to consider. There are also differences in the asset types they are willing to accept. And certainly, there are differences in the risk-reward formula they find acceptable. These investors assess the risks mentioned earlier, all of which affect the appeal of the funding opportunity. Such risk factors

determine the capitalization rate (financial return) the funds require, which impacts the viability of the project and the overall aerotropolis development prospects.

Both Denver and São Paulo, for instance, may be trying to attract investors and developers to build apartment buildings near their airports to house airport-area workers. The risks associated with investing in those two cities are quite different and are reflected in the capitalization rate required by the investors. In Denver, the risk-adjusted rate of return is 6%, while in São Paulo it is between 17% and 20%. Calling on an investor who is comfortable with the Denver risk and trying to sell the São Paulo location without a corresponding higher capitalization rate is a losing proposition.

This is why an effective aerotropolis master plan will include potential investors and their investment criteria as part of the investment proposition in the recommended go-to-market strategy. With this task in mind, we now discuss how investors employ various investment criteria in evaluating aerotropolis projects and sites. This will be followed by our describing factors influencing the aerotropolis investment proposition in selling to investors and phased development strategies and actions that will optimize that proposition derived from the master plan.

Investment Criteria

Investors and investment funds generally prefer existing assets with long-term leases to quality tenants and with a satisfactory return on their investments. Many of these funds follow their developers and tenants to new markets. As one example, the Goodman European Partnerships' website describes itself as follows:

Goodman European Partnership (GEP or Partnership) (legal name: Goodman European Logistics Fund, FCP-FIS) is a perpetual life unlisted property investment vehicle which provides institutional investors with stable income returns driven from investments in logistics assets.

...with a stated investment strategy to invest in high quality logistics/industrial properties in recognized and emerging warehouse, distribution and logistics locations with access to major transport and infrastructure, located in the European Union (excluding the UK and Greece), Norway, Switzerland and Turkey.

If one of GEP's primary tenants were a logistics company that wanted a new operations facility in Germany, the fund would search for that property. Once locating it and determining that it would meet the functional needs of the logistics company, as well as its own investment criteria, the fund would purchase the property (either an existing facility or build to suit) with a pre-planned, long-term lease agreement with the tenant.

In terms of investment criteria, international funds like GEP typically have four components: financial, location, design, and the business skills of the developer or property manager. From the financial perspective, investors grade the investment opportunity on the amount of funds required, the risks to their capital, the likelihood of a growing income stream (cash flow), the percentage of ownership in the asset, the flexibility of the lease terms with the

tenant to match their portfolio, and the overall financial deal structure affecting their investment returns.

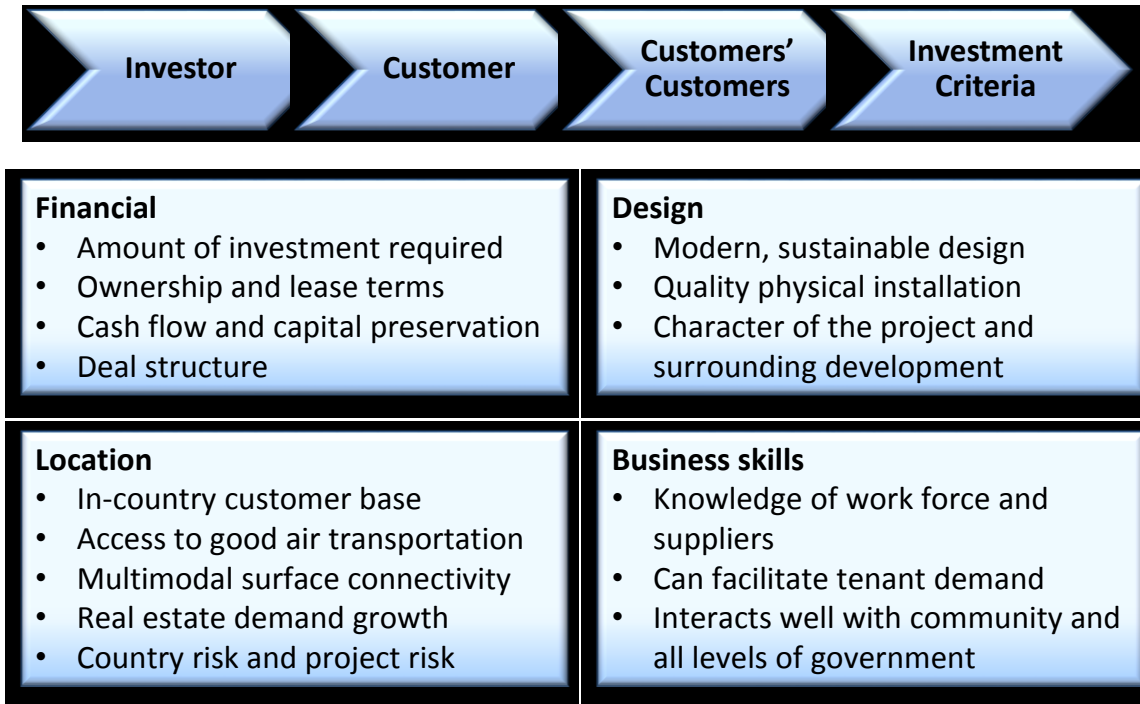
The location is important since investment funds consider the in-country presence of a traditional customer base, access to air transportation and its multimodal surface connectivity, commercial real estate demand and its growth prospects, access to an appropriately skilled workforce, availability of suppliers, the country risk, and the project risk (including construction and tenant risks).

With regard to design, when websites of investment funds list their criteria, they invariably mention environmental sustainability, since this has become a keen interest to them. They also seek a high-quality real estate product with modern design that has its own character and meets industry-standard physical installation requirements. And, they are especially sensitive to the type, quality, and overall appearance of nearby structures as well as environment disamenities. For example, aerotropolis investors in modern office buildings will not want them to be located in the vicinity of a belching cigarette manufacturing facility, fish processing plant, intermodal rail yard, or in zones with high aircraft noise.

Lastly, the investors examine the business skills and competence of the aerotropolis management team. They want them to have knowledge of the local market, including the availability of labor and the installed industry base, and to understand supply chains and the markets of the segments mentioned above. They also want the aerotropolis management team to be facilitators of future tenant demand by improving conditions that positively impact operations of the tenants. Furthermore, investors want strong aerotropolis management leaders who are politically integrated with the local community and all levels of government.

Investment funds evaluate sites in a fairly sophisticated manner. Once they have sold their investment criteria to their investors, they then look to the demands of their customers (tenants) who will occupy the facilities that they own. They know that their tenants have their own customers. The tenants will use the real estate asset to deliver products or services to their customers. Therefore, the investor will consider the needs of the customers of their customers in evaluating projects. For example, if a private equity fund that invests in logistics facilities in the Middle East has DHL as a client, it will know who DHL's customers are and the required characteristics of the property assets to facilitate DHL's service delivery to those customers. It is guidance from the voice of the customer's customer. This influences the investment criteria and specific evaluation factors as summarized in Figure 4.

Figure 4. Aerotropolis Investor and Investment Criteria



Selling to Investors

The launching of an aerotropolis requires a go-to-market strategy that is no small undertaking. The players are many and diverse. Because of aerotropolis scale and the range of customers and stakeholders impacted, the aerotropolis management team must be well prepared for its marketing initiatives. The aerotropolis master plan should be a key component of this preparation.

Once the aerotropolis is launched, potential domestic and foreign investors will need to be apprised of its competitive advantages and assets. The aerotropolis master plan should thus include a sales strategy that explains the positive differentiation of the aerotropolis's attributes for each of the commercial real estate product segments it seeks to attract.

The marketing process begins with the product, which, as every business school Sales 101 course stresses, should meet the needs of the investors, especially the risk-adjusted financial returns they seek. The aerotropolis master plan must therefore go beyond land-use renderings of commercial building locations to define, or at least outline, the real estate products' financial attributes. Such attributes might include the requirement for fee simple ownership of land and buildings as opposed to long-term leases, the type of deal structures the investors are comfortable with in that specific country, the forecasted accretive value of the asset over time, the minimum capitalization rate expected, and first-order estimates of cash flow of the real estate asset. Since neither all aerotropolises nor all investment funds are alike, an ideal aerotropolis master plan would match the attributes of the projects with the appropriate investment funds by asset type, demand drivers, rent growth, and yield. Figure 5 lists the features many investors seek within each of the four investment attribute categories.

Figure 5. Factors Influencing the Investment Proposition

Asset Type	<ul style="list-style-type: none"> ○ Office buildings, hotels, time-critical manufacturing and distribution, and other aviation-oriented commercial facilities ○ Well-located assets with high quality tenants who benefit by being near the airport
Demand Drivers	<ul style="list-style-type: none"> ○ Air connectivity strong and growing ○ Seamless multimodal surface connectivity ○ Regulatory efficiency (e.g., Customs) and legal transparency ○ Appropriate labor force ○ Competitive costs ○ Good export potential
Rent Growth	<ul style="list-style-type: none"> ○ Opportunity to purchase limited resource in key location at aerotropolis inception ○ Occupancy rate of existing space is high ○ Rent likely to increase at greater rate than inflation
Yield	<ul style="list-style-type: none"> ○ Investors can take advantage of promising long-term yields for aerotropolis properties ○ Even should rents stay relatively static, property value would still increase (asset accretive value will be protected)

As resources are invested in aerotropolis projects, the form and character of the aerotropolis will evolve. Its functional and spatial evolution may closely follow the aerotropolis master plan. But, it might not as future conditions change and opportunistic projects emerge. Rather than being fixed or immutable, the master plan should offer a flexible framework that can take advantage of development opportunities yet to be envisioned as they emerge in the future

Nevertheless, the master plan should advise the aerotropolis management team of what to offer, where to offer it, and, perhaps broadly, when to offer it under current known conditions. Should the aerotropolis master plan propose that initial commercial development be concentrated near the “airport fence” in order to more quickly and efficiently capitalize on infrastructure already installed, its evolving form would be different than should development be proposed further outward along airport access highways. The premium sites, such as on the primary highway corridor between the airport and the central city or next to a multimodal logistics complex, should be identified and, depending on function, a development model recommended. If, for instance, a likely early stage investor group is from the biomedical sector and they require special supporting infrastructure, such as temperature-controlled or cool-chain facilities, then the plan should address where and how these facilities should be accommodated. It would also suggest where future companies requiring similar supporting infrastructure would be sited.

Forecasting accurately where to put what and when is difficult and carries considerable risk. Forecasts are almost always wrong and they always change. That being the case, it is still possible to provide planning guidance to the aerotropolis management team, especially if the master plan consultants have conducted an appropriate demand analysis (including commercial space absorption rates) and also have surveyed the local real estate market, indentifying what

type of assets are available where and at what price. If there is a gap between what is available and what the demand is, then the aerotropolis master plan should guide the management team to recruit real estate products that fill that gap timed to calculated absorption rates and located at their highest and best use sites.

The gap analysis should likewise define how the aerotropolis products' competitive positions compared to similar product inventories elsewhere in the metropolitan region. As was shown in Figure 5, the aerotropolis master plan should compare its proposed product offerings by asset type, the demand drivers for these assets, the expected rent growth, and yield. It should identify the most active types of investors for real estate assets, both domestic and international, noting their investment criteria and general types of deal structures. If the aerotropolis management team envisions participating in certain development projects, the master plan should provide information on the preparation of the pro forma financial models with illustrative internal rates of return, cash flow, and participation percentage in joint ventures, special purpose vehicles, or other financial instruments that might be used.

A talent gap analysis should also be conducted. In addition to documenting the gap between local labor force availability and proposed aerotropolis business facility skill needs, the aerotropolis master plan should address the talent necessary for the aerotropolis management team to accomplish the financial and real estate analysis and marketing to attract investors and to execute the overall aerotropolis plan. This will require a potentially sensitive evaluation of the aerotropolis management team. If necessary talent is found lacking, the master plan should suggest a strategy to fill this gap.

Just as successful investors understand their customers and their customers' customers, so too must the aerotropolis management team understand what its primary customers (investors) are seeking. These investors are usually pursuing top-quality real estate assets in high-demand areas. "Top quality" refers to not only the building, but also its location and surrounding environment, including residential, economic, social, and institutional amenities nearby. Top-quality assets do not just preserve their value over time; they appreciate in value. In Western Europe, North America, and developed countries of the Asia-Pacific region, the competition for these types of assets might be greater than in developing countries. But, as we noted, the overall risks are less than in most developing countries.

Foreign investors, in particular, do not like the construction risks associated with bringing new real estate products to market in developing countries. The chain of title, the difficulties associated with the permitting process, and dealing with contractors that they do not know are all issues foreign investors would prefer not to face. They generally look for completed property assets.

For many developing countries, foreign investors are also concerned about the country's treatment of labor and how this might affect them or their foreign tenants in public relations back home. Furthermore, there are often concerns about the enforceability of contracts in the judicial system and political risks associated with large investments. Foreign investors will have legal counsel and financial experts who will have advised them on these risks, frequently dissuading them from investing in developing-nation aerotropolis projects.

To mitigate foreign business concerns for such investments, deals may have to be structured such that they are not subject to a developing country's jurisdictional laws. Contracts usually state that all real estate disputes are to be resolved in local courts. However, contracts can often be structured so that these disputes are resolved abroad under more-transparent international legal systems. If the aerotropolis being planned is located in a country with perceived problematic legal systems, the master plan should address this in the proposed marketing (sales) strategy.

Investment models are universal. However, investors often prefer a certain type of model (deal structure) for each of the different types of risks that are represented by the country, industry, and project. The aerotropolis management team needs to understand, given national and local market conditions and restrictions, which models will be preferred by each type of investor group.

Without understanding the various types of deal structures that are common among international investors, the aerotropolis management team will be at a recruitment and negotiation disadvantage. Given aerotropolis financial requirements, the master plan should define the deal structures that are best suited for various types of projects. Build-to-Suit, Sale-Leaseback, Build-Operate-Transfer, Build-Own-Operate, and Special Purpose Vehicles^{12, 13} are some of the options that have been effectively used for aerotropolis investments.

There is an investor and investment logic in the development of an aerotropolis and the master plan should clearly define what it is. Some of this logic will, as previously stated, be specific to the airport area. It will also depend upon the types of investors. For example, investors such as private equity companies or real estate investment trusts typically have planning horizons of seven to ten years. Governments planning horizons are often ten to forty years. Private investors want returns on their investments, cash flow, and an exit by the end of their term. Governments want investment that will generate tax revenues and create jobs that will elevate the income levels of its citizens and secure the community's long-term economic future. Be that as it may, the universal stages of development can be reasonably anticipated and the work focused on a step-by-step approach for all aerotropolises and all types of investors.

Regarding the above, the master plan should present phased strategies likely to generate both desired aerotropolis development and desired financial returns for private-sector investors and government over the short-, medium-, and long-terms. Since sufficient investment returns often will not be realized in the short term when infrastructure and reinforcing commercial facilities may be limited, the planning team should recommend development pathways that can catalyze initial investments and positive results. In particular, because the private sector, unlike government, is generally unwilling to take a longer-term

¹² Franks, J. (1998). *Building Procurement Systems: A Client's Guide* (3rd edition). Harlow, UK: Longman.

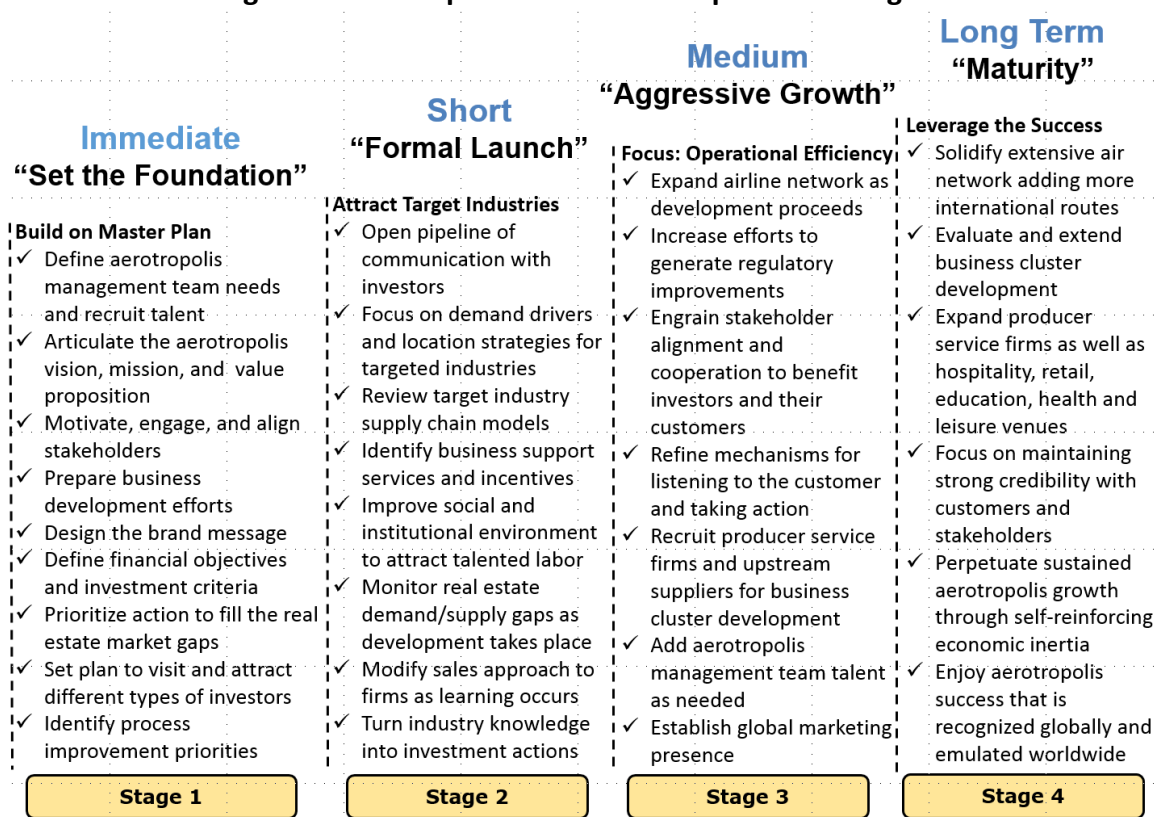
¹³ Shen, L. Y., Li, H., & Li, Q. M. (2002). Alternative concession model for build/operate/transfer contract projects. *Journal of Construction Engineering and Management*, 128(4), 326-330. doi:10.1061/(ASCE)0733-9364(2002)128:4(326)

benefits approach, pioneer investors in the aerotropolis may require significant incentives to mitigate their real and perceived risks in the aerotropolis’s earliest development phases. Through pertinent information in the master plan, the consulting team can help aerotropolis management understand and potentially lower such risks to early-stage investors.

Even prior to this, there are initial actions that need to be taken. Noted as “Immediate” in the four-stage strategic approach illustrated in Figure 6, this stage sets the foundation, building on the master plan to prepare for a successful launch.

From the outset, it is important that the aerotropolis management team have the right personnel to begin execution of the plan. Talent gaps must be expeditiously filled through recruiting appropriate staff during the first stage.

Figure 6. Aerotropolis Phased Development Strategies



Planners should also be aware that when the decision to establish an aerotropolis is made, airports, the owners of surrounding land, investors, developers, and other stakeholders are heavily involved in their current business lives. They are not typically focused on developing an aerotropolis. Because of their state of mind, the plan must guide the management team in generating stakeholder enthusiasm, engagement, and alignment. All stakeholders and potential customers must be energized through a clearly articulated vision of the aerotropolis and the benefits it will bring to them and to the broader community.

The master plan will have recommended an operational budget for the aerotropolis management team to function effectively. It will, as well, have provided the strategies, general

criteria for investment, and illustrative pro forma financial models investors will use to evaluate a project and suggestions for initial branding and marketing to them. The master plan will have delineated the real estate demand and supply gaps and the management team will have been provided a list of recommended commercial property assets to pursue (logistics facilities, hotels, office buildings, etc.) to meet market demands. Finally, process-improvement priorities will be set with specific action items identified.

The second stage (“Formal Launch”) defines how the management team will turn their knowledge of aerotropolis assets and target industries into investment action. The master plan will have elaborated the aerotropolis’ competitive advantages and the demand drivers of the targeted sectors, including their location strategies, supply chains, and their needs for incentives and business support services. Aerotropolis management can also use the information gathered in the first (Immediate) stage to help attract targeted business sectors.

Companies in some targeted sectors may experience day-to-day challenges presented by the infrastructure, regulatory authorities, and local service providers that can negatively impact their operations and financial results. If they are newly arrived foreign companies, their understanding of the local rules of engagement may require assistance. The aerotropolis management team must be prepared to be their advocate and help resolve issues that may impede profitable performance. Without a mechanism to listen to the wants and needs (voice) of the customer, this responsibility will be difficult to fulfill.

In addition, the aerotropolis management team must continue to monitor the pulse of the market to identify supply gaps and communicate this information to potential investors. Since the consulting team will usually depart from the project right after submitting its final report, this report must serve as an enduring educational reference for the aerotropolis management team on a range of operational, financial, and marketing tasks.

The aerotropolis management team during this stage will be on a steep learning curve. This may result in modifications to what was the original go-to-market strategy and follow-on training of the aerotropolis sales and marketing staff may be required. If all proceeds as planned, investment actions will commence.

The third stage, called “Aggressive Growth”, focuses on growing aviation networks and industry presence through improved operational efficiencies and global marketing. This is where airlines can expand their routes based upon increased demand from the new investments. The regulatory improvements suggested in the master plan will be ongoing. As they are achieved, the aerotropolis will become even more attractive to investors, including foreign direct investment. The management team should be aggressively managing the operational relationships with the stakeholders and resolving any investor and customer issues.

As the aerotropolis proceeds through the aggressive growth stage, the stakeholders will understand the benefits of cooperation to facilitate the needs of investors and their business tenants. The mechanisms for listening to customers and taking action to improve processes will be a daily responsibility of the management team. As the benefits of operating in the aerotropolis become more widely known, suppliers of products and services to the manufacturing companies present will start following their customers to the site and business

clusters will emerge. Such cluster development can be enhanced through a global marketing presence to attract foreign suppliers and certain downstream customers.

In the fourth stage (“Maturity”), the aerotropolis will leverage the successes of the prior two stages. It should have sufficient economic inertia to generate sustained development. Domestic and international air transportation networks will have expanded and the supply chains, the producer service firms, other service sector firms, and economic clusters will be present and growing. The world will be fully aware of the aerotropolis’s success and treat it as a model to be emulated.

The master plan should provide the strategy and recommended actions to facilitate progression along these stages. In other words, the plan should define how the aerotropolis should manage its customer cycle as commercial investment increases, infrastructure expands, suppliers and producer service firms arrive, and business clusters grow. It should identify the competitive strengths of the industries as they emerge and how the aerotropolis can further build on those strengths. The master plan should guide the management team in prioritizing actions that will continuously leverage the aerotropolis’s evolving assets and address any weaknesses in order for investment growth to be sustained.

It is important to recognize that the beginnings and ends of the four stages do not have specific dates or timelines. Rather, the stages constitute an overlapping continuum that will evolve with the assistance of a comprehensive, strategic aerotropolis master plan. The development of an aerotropolis is not unlike the development of any enterprise, from business planning and resource acquisition to start-up, to accelerated growth, and to maturity. The master plan should provide the strategic roadmap for a multi-decade aerotropolis evolution encompassing a multitude of customers and stakeholders that achieves sustained development through creating an investment environment where the private sector and government both achieve their economic objectives.

Summary and Conclusions

An effective aerotropolis master plan will include land use, transportation, and environmental planning, along with urban design and related elements found in traditional city and regional plans. It will include, as well, pertinent elements of airport planning, aviation forecasting, and air route development. But, to effectively achieve the aerotropolis commercial and industrial development envisioned, it must be more comprehensive, strategic, and investment-based. Commercial spatial form evolves from the siting of viable economic functions, and viable economic functions are based on financially sustainable business investments. An effective aerotropolis master plan, therefore, must also be a realistic, bankable economic plan, reflecting market conditions, needs of aviation-oriented businesses and industries, and factors underlying firm site selection and commercial real estate investment decision-making.

To help achieve a bankable plan, aerotropolis planners should demonstrate that (1) market demand and appropriate labor availability exists for proposed aerotropolis businesses and industries; (2) the aerotropolis’s air and surface connectivity provides advantages over other sites; (3) the voices of customers have been heard and stakeholders aligned; (4) real

estate development will generate the highest and best use of land parcels guided by qualified professionals; and most importantly, (5) investors, developers, and commercial facility end-users will be attracted to aerotropolis sites.

Accomplishing the above will require that the master plan incorporate principles of business location, public and private sector finance, and commercial real estate investment along with aerotropolis development strategies. The plan should provide a rough estimate of the capital expenditures necessary to develop the public infrastructure and private-sector real estate including illustrative pro forma income statements that can frame cash flow projections and eventually lead to investment-grade analyses. The master plan should identify the actions necessary to attract investors, operators, and tenants to aerotropolis commercial real estate that constitutes the foundation of its development. It should also recommend functional clusters and particular real estate products based on the availability of adequate land and labor, competitive market analyses, and first-order facility demand and revenue forecasts for various aerotropolis projects. Strategies for motivating, engaging, and aligning stakeholders, managing or at least guiding real estate investment over an expansive territory, human resources development with specific actions for talent acquisition including creating community amenities appealing to highly-educated or skilled labor, and marketing to investors and the public are other essential components of an effective aerotropolis master plan.

Managers of businesses are charged with achieving results. So too will be the managers of entities overseeing the aerotropolis effort, whether they be a public entity, private entity, or public-private partnership. These managers must know what resources they have available and aerotropolis assets they can leverage. They also need to know what needs to be put in place to maximize the chances of aerotropolis success.

Based on our assessment of aerotropolis success factors, we see at least twenty-one conditions or criteria:

1. A large and growing number of aviation-oriented businesses support a large and growing number of air routes.
2. The airport has frequent wide-body aircraft service to major global hubs and gateways.
3. Ground connectivity to the airport is fast and predictable for passengers and cargo.
4. The competitive advantages of the aerotropolis over alternative sites for business location are made clear.
5. An aerotropolis value proposition is defined which shows the benefits being brought to its customers (investors, developers, and business end-users), to the airport, and to the broader community.
6. Key stakeholders are aligned and solidly behind aerotropolis development, including the private sector and government agencies at multiple jurisdictional levels.
7. Airport-area communities support the aerotropolis initiative.
8. A pipeline of information exists on the quality of performance in the provision of service to aerotropolis customers.
9. Illustrative pro forma financial statements are prepared for proposed commercial and industrial projects.
10. Long-term capital infrastructure financing structures are in place.

11. The airport's non-aeronautical revenues can grow significantly, enabling lower landing fees and aircraft parking charges as incentives to attract new airlines or route expansion of existing airlines.
12. The legal and regulatory environments are transparent and predictable.
13. Customs clearance and immigration operations are fast and efficient.
14. There is adequate land for new development that is zoned for highest and best functional use.
15. Investors view the aerotropolis as a profitable site that meets their investment criteria with drivers of future demand operating.
16. Upstream suppliers and downstream customers see the aerotropolis as an opportunity to follow manufacturers locating there, resulting in industry-specific clusters.
17. Producer service firms are present to support local manufacturers as well as serve distant clients that they can conveniently reach with flights from the airport.
18. Quality hospitality, food and beverage, retail, education and healthcare facilities, leisure venues, and various levels of housing for airport-area residents are available.
19. An aerotropolis development organization with full-time talented staff and an adequate budget has been formed to coordinate efforts and guide development.
20. A comprehensive aerotropolis communication strategy is in place that regularly tells its story to potential investors, the community, the nation, and the world.
21. The aerotropolis initiative is led by a highly respected champion who has the vision and understanding of what it will take to generate success and the personal and institutional networks necessary to attract required resources.

An ideal aerotropolis would meet all these conditions and criteria. To our knowledge, only a dozen or so existing and proposed aerotropolises meet a majority of them. An effective master plan would benchmark the potential aerotropolis under study against these twenty-one criteria. If it comes up seriously short, especially on the most critical factors such as market demand for air commerce and air route connectivity, and prospects are bleak for attaining them, the consultants have a professional responsibility to inform their client of this, uncomfortable as it may be. However, if the consultants determine that the potential aerotropolis has prospects of meeting a majority of the criteria, even if presently it lacks most, the aerotropolis master plan must lay out the explicit steps to achieve them. Otherwise, airport regions with true aerotropolis potential may never realize that potential.

Authors' Note

John D. Kasarda is Director of the Center for Air Commerce at the University of North Carolina's Kenan-Flagler Business School and President of the Aerotropolis Institute in Zhengzhou, China. Michael H. Canon is President of Catalytic Logistics (USA) and a Senior Research Associate of the Aerotropolis Institute in Zhengzhou.