
TIME-BASED COMPETITION & INDUSTRIAL LOCATION IN THE FAST CENTURY

by John D. Kasarda

What opportunities and challenges await 21st century industry? The picture is becoming clearer by the day. Commercial borders will effectively supplant national borders. Global sourcing will predominate as advanced telecommunications and transportation technologies allow a wide geographic dispersion of component manufacturing sites and places of final assembly, predicated on raw material availability, labor costs and skills, and markets.

Networks of strategically aligned firms will replace individual companies as the effective enterprise, with supply chains competing against supply chains. In this world of "virtual enterprises," a manufacturer's profitability will be determined as much by its supplier's performance (cost, quality, delivery) and the performance of its downstream distribution and support firms as by the manufacturer's internal operations.

Products will increasingly be designed and customized to be sold throughout the world. International markets will continue to rapidly evolve as new products are introduced and existing products improved at an accelerating pace. Routinized mass production will be replaced by flexible customization; inventories by response; stocks by flows.

Facilitated by computer-aided design (CAD) and computer-assisted manufacturing (CAM), economies of scope (the ability to produce multiple products more cheaply in combination than separately) will supplant economies of scale. Innovation, flexibility, and rapid response will rule competitive strategies.

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Technological breakthroughs and new product development will no longer be contained within the national geography of their discovery, but freely flow throughout the world, just as capital and information do today. Intellectual property rights and product security will become evasive. Pirating, duplicating, and copying, despite protections incumbent in World Trade Organization (WTO) and various international trade acts, will be even more commonplace. Successful firms will thus not only be dedicated to continuous improvement, but they must also be constant innovators and rapid distributors of their products to stay ahead of an imitating pack of global competitors.

Cost and quality will be necessary, but not sufficient determinants of commercial success. In the coming fast century, speed and agility will become increasingly pivotal, with industry increasingly emphasizing: 1). accelerated development cycles; 2). flexible production; and 3). quick response. In all cases, time-based competition will intensify.

Firms that are most successful in time-based competition will use advanced information technology and high speed transportation to source parts and components globally, minimize their inventories, and provide fast and flexible responses to unique customer needs worldwide. They will seek international partners and rely on just-in-time suppliers and sophisticated downstream logistics providers. By combining information connectivity between supplier and customer with production flexibility, manufacturers will customize or otherwise differentiate products to create customer value. Manufacturers must also be able to offer the same speed and flexibility in the delivery process - from the time their assembled products leave the factory until the time they arrive on the customer's doorstep.

Growing pressure to cut sourcing, production, and delivery cycle times has led to the introduction of new global supply chain management practices that increasingly rely on air cargo, in general, and integrated air express, in particular. Manufacturing firms are selecting strategic locations to optimize their domestic and international supply-chain flows and customer delivery response times. From a commercial real estate standpoint, the three L's (location, location, and location) are being replaced by the three A's (accessibility, accessibility, and accessibility). Of course, the two are related.

Strategic accessibility, shaped by evolving transportation technology and infrastructure, will have

a significant impact on where modern industries locate and where commercial growth occurs. This has certainly been the case in the past, and will likely be even more so in the future, as can be illustrated by highlighting five waves of industrial location and commercial real estate development.

TRANSPORTATION ACCESSIBILITY AND COMMERCIAL GROWTH

Distribution networks and transportation accessibility have always been paramount to industrial location. The world's first great commercial centers grew up around seaports. The next wave of major commercial development occurred at river- and canal-based cities that formed the backbone of America's Industrial Revolution.

Railroads sparked the third wave of commercial development, opening up land-locked interiors to manufacturing and trade. Major goods-processing and distribution industries emerged at rail hubs and terminal points. For example, Atlanta, the largest commercial real estate market in the South initially developed as a railway hub and was originally known as "Terminus."

The fourth wave of commercial real estate development was fostered by the shift to cars and trucks to move people and goods. Freeways, expressways, and interstate highways generated a massive deconcentration of housing and firms. Large suburban malls and commercial centers, industrial parks, and office complexes sprouted as far as 50 miles from major city centers. Some of these fourth-wave "edge cities" now have more retail and office space than their metropolitan areas' downtowns.¹

We are now entering the fifth and most opportune development era - the Fifth Wave - where aviation, international markets, and time-based competition will predominate. This new era is being ushered in by large, high-speed jet airplanes, advanced telecommunications technologies, and three irreversible forces of immense significance: 1). the globalization of business transactions; 2). the shift to just-in-time manufacturing and distribution methods; and, as a result of the first two, 3). the growing requirement of industries of all types to ship products quickly by air to distant customers. The combined thrust of these interacting forces is creating new commercial growth nodes around the world, with international airports supplanting seaports, rail, and highway systems as primary wealth and job generators.

It is the author's opinion that optimizing long-term returns on commercial real estate investments will require an understanding of the Fifth Wave and the forces underlying it. Solid returns will also require vision and action regarding the pivotal role air commerce will play in the 21st century. This will be further explained by elaborating upon the forces making up the Fifth Wave of economic development.

GLOBALIZATION

Since the early 1980s there has been a marked growth and integration of world markets resulting in huge volumes of raw materials, components, finished products, information, and capital flowing across international borders every day. U.S. exports and imports more than doubled during the past decade exceeding \$2 trillion in 1997, while total world exports surged to \$5.3 trillion in 1997. Investment abroad by multinational corporations likewise mushroomed to over \$3 trillion in 1997, while sales generated by multinationals outside their country of origin exceeded \$6 trillion (million million).²

Perhaps nowhere is the new global economy more concretely manifested than in the dramatic rise of component sourcing. Just a decade ago, Ford introduced the world car, assembled in Detroit from parts produced in each of the major continents. Today, global sourcing is so commonplace that it is difficult to find assembled goods anywhere in America made up entirely of domestic parts and components. For example, a personal computer produced in North Carolina's Research Triangle Park is likely to be assembled from electrical components imported from Taiwan, disk drives from Singapore, integrated circuits from Japan, microprocessors from Korea, a keyboard from Thailand, and a glass screen from Mexico.

The growing interdependence of world markets is reflected not only in terms of international trade, but also in international information flows and financial transactions. Between 1977 and 1997, international telephone calls to and from the U.S. (the vast majority for business purposes) increased 8,000 percent, from 375 million minutes in 1977 to nearly 30 billion minutes just 20 years later.³ From a global capital flow standpoint, by 1997, the volume of foreign exchange trading exceeded \$1 trillion each day.⁴ While the current global economic woes will certainly reduce the growth of world trade this year and perhaps next year as well, few doubt that this is more than a short-term cyclical downturn and that the powerful trend toward global commerce will dominate the 21st century.

Air commerce is likewise creating entirely new industries such as shipping customized clothing and freshly-cut flowers to distant markets within hours, adding considerable value to products. People not only pay for freshness in perishable goods, they also pay extra for the satisfaction of speedy, reliable delivery of more durable goods.

JUST-IN-TIME PRODUCTION AND DELIVERY

The shift to a global economy, while generating a phenomenal expansion of market opportunities, has also brought in a multitude of new international competitors, placing growing pressure on firms to reduce costs and increase production efficiency. In the manufacturing arena, global sourcing has been one mechanism frequently employed to reduce costs. Another is a major advance in production, distribution, and inventory control methods commonly known as "just-in-time" (JIT). Under the JIT system, all elements in the supply chain, from raw material acquisition to delivered finished products, are synchronized to cut sourcing, production, and delivery cycle times and substantially reduce, or even eliminate, inventories.

One factor underlying just-in-time operations is that inventory costs are becoming a greater percentage of the total cost of production and distribution of many products. Research shows that the proportion of total distribution costs going to maintaining inventory has doubled during the past decade, with timing of delivery a crucial factor. Early delivery raises warehousing and inventory expenses, while late delivery results in costly interruptions in production schedules and missed sales opportunities. The new economy will place a premium on manufacturers acquiring materials and producing and delivering finished products in a highly synchronized fashion, precisely as needed.

The necessary transition to just-in-time systems is further being validated by marketing research which documents that consumer tastes and product demands are changing much more swiftly today than was the case in prior decades. Indications are that such shifts will accelerate even faster in the decades ahead, resulting in situations where products that are "hot" one month may become obsolete six months later. This has already happened in the computer software and peripherals industry.

Thus, the passing era in which manufacturers can mass produce large batches of standardized goods for relatively stable markets is quickly giving way to an accelerated era of customized production on short notice for rapid response to quickly changing demands. Just-in-time systems are especially well-suited to this new agile environment where flexibility and speed will become imperative to competitive success.

THE COMING AIR COMMERCE ERA

With international transactions, production flexibility, and speed characterizing the new economy, it is absolutely certain that air cargo and air express (overnight) delivery service will play increasingly important roles in business strategy. No other means of transit is better equipped to meet the economic realities of the emerging era where global sourcing and selling and just-in-time logistics require that producers receive and ship smaller quantities more frequently and quickly over long distances.

Already air freight accounts for more than one-third of the value of U.S. products exported, a percentage that is continuously rising. Within the United States, air express actually accounts for 60 percent of all air cargo shipments, increasing at a remarkable rate of 25 percent per year.

International air cargo shipments are projected to grow at least 6.5 percent annually during the coming decade, with Pacific Rim routes also generating annual average growth rates over this period of over six percent, despite the negative impact of the Asian economic crisis expected to last for at least another year.⁵

Much of this freight will continue to be shipped in the bellies of passenger planes, with some Boeing 747s (combi aircraft) carrying as much as 35 tons of cargo along with their passenger loads. Yet, because air cargo is expected to grow so much faster than passenger transit, hundreds of passenger planes are being converted to all-cargo carriers, including numerous 747s, DC-10s, and MD-11s. According to Boeing, the number of wide-body air freighters are expected to increase from 219 to 859 between 1995 and 2015 with the majority of air cargo being shipped by freighter aircraft.^{6, 7}

In prior economic eras, when speed of delivery and production flexibility were less crucial to competitive success, air freight was considered a luxury. It was confined primarily to small, lightweight, compact products with high value-to-weight ratios or to

items needed on an emergency basis at distant sites. Today, essentially anything that can be loaded onto a large aircraft is routinely shipped internationally by air: automobiles, heavy machinery, high-tech equipment, textiles, furniture, pharmaceuticals, live cattle, bulk seafood, poultry, and agricultural products. In fact, heavy and oversize cargo, along with perishables, are among the fastest growing sectors of the air freight industry.

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Many of America's catalogue retailers and brand manufacturers have thus begun using overnight and two-day express as a competitive, value-adding tool. An excellent example here is P.C. Connections, Inc., of Marlow, NH, which set up its distribution warehouse as part of the Airborne Express complex in Wilmington, OH. The company guarantees next day delivery of its computer software and peripherals for phone orders received up to midnight. Using advanced telecommunications (electronic commerce) and air express service to differentiate its products through rapid customer response, P.C. Connections' sales and profits have skyrocketed.

Other catalogue and Internet retailers such as Lands End and Amazon.com have found that large and growing numbers of their customers will pay considerably extra to have their orders air expressed. They have learned that in today's "must have it now" environment, delivery and not price often wins the sale.

Air commerce is also revolutionizing global supply chain management and shaping industrial location decisions. Companies have found that they can reduce numbers of factories and warehouses through air cargo logistics while improving overall performance. For example, National Semiconductor of Santa Clara, CA, has contracted with FedEx to fully manage air transportation of 7,000 tons of finished products and 7,000 tons of components through a single warehouse consolidation facility near Singapore's Changi International Airport, thus replacing 13 factory warehouses that were previously scattered throughout Asia. The 48-hour Singapore to U.S. delivery schedule by air compares

to the prior more than 30-day Asia to California delivery using traditional ocean transportation. The air logistics system has proven highly competitive for National Semiconductor based on its much lower inventory expenses, reduced labor costs, and considerably shorter order cycle-times.

AIRPORTS AS NEW INDUSTRIAL MAGNETS

As more and more modern businesses and industries are gaining competitive advantage through air logistics, locations near airports have become increasingly valued. This has resulted in substantial agglomeration of industrial and commercial development in proximity to these new economic growth nodes. For example:

- In the 26-mile commercial corridor linking Washington, D.C.'s Reagan (National) and Dulles Airports, employment grew from 50,000 in 1970 to over 600,000 in 1996, representing a 1,100 percent increase compared to an overall U.S. employment growth of 59 percent during this period.
- The number of companies within the dynamic Las Colinas area just to the east of Dallas-Fort Worth International Airport has grown to more than 2,000 including Abbott Laboratories, AT&T, Exxon, GTE, Hewlett-Packard, Kimberly-Clark, and Microsoft.
- FedEx has transformed the once-sleepy Memphis into a center of international business, attracting billions of dollars in investment in manufacturing and distribution facilities in the vicinity of its airport. More than 130 foreign-owned firms from 22 countries employing 17,250 workers have been drawn to Memphis since the 1980s. American companies such as Nike, Apple Computer, Square D, Disney Stores, and Starter Corporation, among many others, have similarly established new manufacturing and distribution centers near Memphis International Airport. Nearly all these companies pointed to the FedEx hub as a key attraction.
- In the 10 years following the introduction in 1975 of international air service in Atlanta 813 foreign firms located there generating \$33 billion in investment and 54,000 jobs. Charles Elliot, director of location consulting at Moran, Stahl and Boyer, concluded that airports are the most important factor in determining the location of an international business, especially those with direct international air service.⁸
- A study by the al Chalabi Group documented that more than 200,000 manufacturing, warehousing, and office jobs located in the vicinity of Chicago's O'Hare Airport between 1975 and

1990 largely because of the accessibility it provides to national and international markets.⁹

- Rickenbacker International Airport (Columbus, OH), originally built in 1941 as an army airbase, has successfully converted into a dedicated air cargo airport, foreign trade zone, and industrial park. Since the early 1990s, Rickenbacker has attracted dozens of development projects with more than six million square feet of commercial space constructed and occupied by 1997.
- Alliance Industrial Airport (Fort Worth, TX), being developed by the Perot Group, has landed more than 50 companies during the 1990s including Intel, Nokia, Nestle Distribution, BFGoodrich Aerospace, and Zenith Electronics generating \$3.6 billion in new investment. Alliance is currently developing 1,277 acres as an Advanced Technology Center (anchored by Intel's \$1.3 billion computer chip manufacturing facility) with space for nearly six million square feet of planned buildings at the Center.
- In the Philippines, Subic Bay Freeport is rapidly expanding around a former U.S. naval airbase converted to commercial use in 1993. Since FedEx announced in 1994 that it was locating its Asia/Pacific hub at Subic Bay, over 150 firms employing 40,000 workers have located there, generating almost \$2.5 billion in investment. In late 1998, Acer completed and opened its largest PC assembly facility in the world, heavily utilizing air express for its supply-chain management.
- By late 1997, nearly 50,000 people were employed on the airport grounds at Amsterdam's Schiphol Airport, a 7.2 percent increase over the previous year. Schiphol, alone, accounts for 10 percent of the European air cargo market and 1.9 percent of Netherlands' GNP. Nearly half of the 547 companies linked to Schiphol grew in 1998, compared to 31 percent in 1995. The airport forecasts that it will generate 2.8 percent of Netherlands' GNP by 2015 (approximately \$14 billion).

In addition to their growing attractiveness as sites for modern manufacturing and distribution industries, airports are becoming magnets for corporate headquarters and regional offices as well as for professional services, such as consulting, that require considerable employee long-distance travel.¹⁰ Airport accessibility is likewise a powerful draw to service-sector industries such as advertising, legal, data processing, accounting and auditing, and public relations which frequently send out professional staff to customer sites or bring in their customers by air.¹¹ The same applies to high-tech

industries whose supply-chain management relies extensively on air shipments and where employees have a 60 percent higher air travel propensity than workers in general.

Apropos the latter, a comprehensive empirical study was conducted in 1998 by Kenneth Button and Roger Stough of the impact of hub airports on an area's high tech job growth.¹² Their multiple regression analysis (controlling for appropriate alternative factors impacting high tech job growth) across all 321 U.S. metropolitan statistical areas (MSAs), supplemented by specific case studies contrasting the economic performance of areas that have hub airports with those that do not, generated convincing results. Button and Stough show that the existence of a hub airport in an MSA increases the area's high-technology employment by over 12,000, with their multiple regression model explaining over 64 percent of the variation in high-technology employment across metropolitan areas.¹³ Additional analysis revealed that the causal link between job growth and degree of airport services flows from air transportation input to creation of employment and not the other way around.

The above findings are consistent to an Ernst and Young study which identified the U.S. metropolitan areas likely to exhibit the most growth in facilities and jobs between 1992 and 2000.¹⁴ Five of the six top cities (Atlanta, #1; Dallas, #2; Raleigh-Durham, #3; Charlotte, #4; and Houston, #6) had hub airports, with only Salt Lake City at number 5, operating without a hub.

The message is clear. Even "second tier" cities that have "first tier" national and global air links offer distinct advantages in the minds of plant siting specialists and executives seeking to locate their businesses.¹⁵ Growing time-based competition should make access to well-served airports an even more important locational advantage in the years ahead, significantly impacting the demand for and value of nearby commercial real estate.

CONCLUSION

Advances in transportation and telecommunications technology are spawning a new speed-driven economic era which is considerably altering the location decisions of business and industry. Just as seaports, rivers and canals, railroads, and highway systems provided competitive advantages and shaped the locus of commercial development in the past, major gateway airports will increasingly do so in the future. In the coming fast century, where

globalization and time-based competition will increase aviation utilization, these airports will become increasingly powerful drivers of commercial development. Counselors of real estate and other real estate professionals who recognize this megatrend can select strategic sites near gateway airports and position investments to be leveraged by air commerce in the coming fast century. REI

NOTES

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13. The model was estimated using ordinary least-squares and the preferred specification was:

$$\begin{aligned} \text{Ln high-technology employment} = & 5.407^* \\ & +0.503 \text{ hub airport}^* \\ & +0.033 \text{ Fortune 500 companies}^* \\ & +0.115 \text{ Ln housing values} \\ & +1.354 \text{ Ln highway density}^* \\ & +0.141 \text{ Ln defense expenditure}^* \\ & +2.845 \text{ Ln service employment}^* \\ & +1.405 \text{ Ln population size}^* \end{aligned}$$

* denotes statistical significance at 99% confidence level; n= 303; R² = 0.643.
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