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CARLSON SCHOOL OF MANAGEMENT
CENTER FOR TRANSPORTATION STUDIES

The Competitiveness of the
Twin Cities Metropolitan Area and
the Minneapolis-St. Paul
International Airport:
Building and Using a Knowledge Base

Submitted to the Twin Cities Airports Task Force

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The Competitiveness of the Twin Cities Metropolitan Area and the Minneapolis-St. Paul International Airport: Building and Using a Knowledge Base

Final Report

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PREFACE

This study is the culmination of research started by the Academic Committee nearly one year ago. Given the complexity of the subject and the multidisciplinary background of the researchers, the Academic Committee and two very capable Graduate Research Assistants faced a difficult task in preparing the report. It is our hope that this study will help stimulate a dialogue in Minnesota on the competitive position of the Twin Cities in the global market, and on the value of the Twin Cities International Airport to the community it serves.

In the process of carrying out this research a number of people assisted us with our work. At the University of Minnesota we would like to thank Mary Maus Kosir, Linda Ganyaw (Carlson School of Management International Programs), Jeanne Anderson (Carlson School of Management Financial Services Office) and Peter Nelson (Center for Transportation Studies).

Many individuals associated with the Twin Cities Airports Task Force (TCATF) were also very helpful. We would especially like to mention Irv Stern, Bob Stassen, Hugh Schilling, John Smith and Steve Anderson for developing and supporting the idea that such a study be undertaken by the University of Minnesota and TCATF's Oversight Committee consisting of Erin Dunn (Chair), John Smith, Mike Louis and Ray Rought for their very thoughtful comments and insights in our meetings with them.

We would also like to thank the large number of Minnesota citizens who participated in our mail survey, as well as those individuals who agreed to be interviewed for data collection purposes. The project would not have been possible without their cooperation.

Needless to say, the opinions, findings and conclusions expressed in this report are those of the authors, and do not necessarily represent the views of the Twin Cities Airports Task Force.

Finally, we would like to thank the Twin Cities Airports Task Force for providing the financial support for this study.

Mahmood A. Zaidi, Chair
Robert Johns, Vice-Chair
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INTRODUCTION

This University of Minnesota study examines the role of air transportation—particularly the Minneapolis-St. Paul International Airport—in the economy of the Twin Cities and the State of Minnesota. In so doing, the study attempts to understand the competitive position of our area in the global economy vis-à-vis the air transportation infrastructure, focusing on exports-producing industries as the driving force behind the region’s economy. Additionally, knowledge gained from the economic analysis is applied to current and future challenges in marketing the Minneapolis-St. Paul International Airport and the Twin Cities metropolitan area.

A primary goal is to develop a knowledge base that can not only help answer current questions, but also serve as a tool to support decision making in the future. Examples of individuals and organizations who might use this report include: the Twin Cities Airports Task Force (TCATF), the business community, the Governor of Minnesota and the Minnesota Legislature, the Minnesota Department of Transportation (Mn/DOT), and the Metropolitan Airports Commission (MAC).

This report comprises four major subject areas: demographics and economic activities, competition between airports, passenger and cargo flows, and the air transportation purchasing process. Data on these subjects were obtained through a variety of methods, including commercially available detailed economic data for the Twin Cities Metropolitan Statistical Area (MSA) and for six competing MSAs; personal interviews with a variety of business “players” using the Twin Cities airport; a survey of business travelers throughout the state of Minnesota; phone conversations with and written responses from airport officials around the country; and interviews with and data supplied by MAC executives.

The format of the report is as follows: an Executive Summary, three chapters of detailed data and analysis, and appendices containing supplementary information.

The Executive Summary presents an overview of the research employed in preparing this report, together with a brief synopsis of key findings. The issues raised in the Executive Summary are explored in detail in the three main chapters of the report.

Chapter 1 employs detailed economic data to explain demographic and economic differences between the various competing MSAs and their airports; it also examines how economic activity has grown and changed over time at these airport locations. A central theme of the area comparisons is the use of exports as a measure of global competitive position. This chapter also looks at the role of air transportation in the various MSA economies and compares them to the Twin Cities. Projections of economic data are made to the year 2010.

Chapter 2 draws on personal interviews, business surveys, and information supplied by MAC executives and airport executives around the country. First, it details the purchasing processes used by businesses when they ship freight by air or book business-related air travel. Second, it introduces a quantitative comparison of competitive airports in terms of infrastructure, and passenger and cargo flows. Third, it quantifies the results of the survey of business travelers who utilize the Minneapolis-St. Paul International Airport.

Chapter 3 synthesizes the information gained in the first two chapters into a *knowledge base*, suitable for use by the individuals and organizations enumerated earlier. Specific recommendations are also provided as to which information should be periodically updated, and the methods that should be used for those updates. Further, Chapter 3 illustrates potential applications of the knowledge base to real-world issues.

This report constitutes a detailed snapshot of the Twin Cities in the global economy, seen from the viewpoint of air transportation. The researchers hope that the knowledge base developed herein will enable analysts and policy makers to react to changes in the dynamic air-transportation business sector, to maintain—and improve—the competitive position of the Minneapolis-St. Paul International Airport, the Twin Cities, and the State of Minnesota.

EXECUTIVE SUMMARY

A primary purpose of this study is building a knowledge base for monitoring the competitive position of the Twin Cities metropolitan area and measuring the value of the Minneapolis-St. Paul International Airport to its community. The creation of value is driven by the exports of goods and services to market destinations outside the Minneapolis-St. Paul metropolitan area.¹ The knowledge base is intended to allow users of this report to: measure the value of the Minneapolis-St. Paul International Airport in terms of demand for air transportation, monitor the competitive position of the Minneapolis-St. Paul area; and market the Minneapolis-St. Paul International Airport.

Key Findings

- The Minneapolis-St. Paul metropolitan area, with 20 percent population growth from 1985 to 1997, exceeded all other large air hub metropolitan areas in the North, seven of the ten metropolitan areas in the South, and six of the eight metropolitan areas in the West. Per capita income in 1997 was the highest, along with Denver, among the seven competing areas selected for this study. It was the second lowest, however, in differential change (as a percent above or below the U.S. income change) from 1985 to 1997.
- Earnings per worker of businesses exporting to international markets from the Minneapolis-St. Paul metropolitan area were 40 percent higher than the overall average earnings per worker. Value added per worker, that is, the contribution to Gross Area Product, was 46 percent higher.
- Exports-producing industries constitute a fundamental element of the regional economy. These industries are heavy users of air transportation—not just for moving goods, but to maintain business connections with far-flung consumers of exported goods destined for intermediate processing or public consumption.
- Among the seven competing areas, the Chicago manufacturing sectors are the most closely competitive with the Minneapolis-St. Paul manufacturing sectors. While the manufacturing export shares are higher for the Minneapolis-St. Paul area, the apparent competition is greater for services. However, many of the services are exports to nearby areas and, hence, are not directly competitive with services in the Minneapolis-St. Paul area. The nearby service areas outside their respective metropolitan area are in total simply larger for Chicago than Minneapolis-St. Paul.

¹ Industry exports are the business passengers and cargo originating from industry activities in the Minneapolis-St. Paul metropolitan area. Business passengers provide various services to non-resident clients and customers. Cargo refers to the products of local industry, including U.S. Mail and transportation services agencies like Federal Express. These exports bring “new money” into an area for the purchase of production inputs from all sources for the next cycle of industry production and exports.

- Among exports-producing industries, the high-tech sector is particularly reliant on the air transportation infrastructure. A trend away from manufacturing toward high-tech services will likely reinforce the sector's reliance on air transportation, and use of air transportation for both business travel and air cargo is likely to increase.
- The high projected export growth from 1997 to 2010 for the Minneapolis-St. Paul metropolitan area relates to the area's increasing dependence on exports. Minneapolis-St. Paul's 76 percent projected increase in exports (in constant 1997 dollars) is the highest in the North but lags behind the South and West. Part of this lagging growth is the result of an above-average level of manufacturing—a lagging industry sector nationally.
- In terms of the ability of Minneapolis-St. Paul's air transportation infrastructure to accommodate future demand, the projections of future use levels provided by the Metropolitan Airport Commission are below forecasts developed by the FAA, and below current growth trends. This may represent a potential economic liability for the area, because industries dependent on air transportation are strongly motivated to seek metropolitan areas with superior air-transportation infrastructure.
- Adequacy of air transportation infrastructure is a significant contributor to a region's ability to compete in a global marketplace; therefore, the MSP airport should be considered as an important part of the region's overall economic infrastructure and its capacity relative to demand should be periodically reviewed.
- In the area of air cargo shipments, a trend is currently evident away from the traditional logistics chain (customer—freight forwarder—shipper) toward the integrated logistics providers like Federal Express and UPS which operate their own fleets and are sensitive to airport cargo capacity. Expansion of MSP cargo facilities will be important to these businesses.
- Chicago's O'Hare airport offers shippers advantages of scale and international access which cannot be duplicated by MSP. Currently, economic and logistic considerations favor overnight trucking of freight to O'Hare for direct international air shipment. It is unlikely that MSP can capture this business. However, because of MSP's status as an important infrastructure facility, the airport will continue to be a critical part of the region's infrastructure.
- Air cargo and air passenger traffic follow different flow patterns. For example, none of Northwest Airlines' hub airports are significant air cargo airports.
- The business passenger market is directly impacted by economic cycles, such as the economic slowdown of the early 1990s. Passenger volume is expected to increase by over 3% per year through 2010 at MSP, mirroring increases at competing airports.
- Business survey data suggests that service level ratings from business travelers are low in relation to norms extrapolated from other surveys. This may indicate a service gap which will only grow more severe as exports, enplanements and traffic all increase. Other results from the business traveler survey suggest that parking and other ground access considerations are viewed negatively at MSP, particularly among respondents from outside the Minneapolis-St. Paul metropolitan area.

- Business travelers surveyed generally agreed that telecommunications will not significantly reduce the need for business air travel, and that business travel will continue to play a significant role in their future business operations.
- Because the air transportation industry is highly dynamic and competitive, continued monitoring of economic, demographic, and business trends is recommended to maintain the knowledge base established in this report.

Macro Trends and Forecasts

Chapter 1 focuses on the Minneapolis-St. Paul metropolitan area and six large metropolitan areas viewed as its principal competitors, giving particular attention to the operations of the cities' international airports in the "hub and spoke" air transportation system. Chapter 1 addresses the task of measuring the value—the jobs and income generated by the local economy—of the Minneapolis-St. Paul International Airport to the community. This is part of the larger task of evaluating the global position of the Minneapolis-St. Paul metropolitan area. The central theme of the area comparisons is the use of exports as a measure of global competitive position.

Elements of Passenger and Cargo Transfer Systems

Passenger and cargo transfer can be understood as a system that involves production, exports, imports, market outlets and supply sources (See Figure 1.1). Exports are the passengers and cargo originating from the industry activities in the Minneapolis-St. Paul metropolitan area. These passengers provide various services to non-resident clients and customers. Cargo refers to the products of local industry, including the U.S. Postal Service and transportation services agencies like Federal Express, shipped to industrial and institutional destinations located outside the metropolitan area. These exports bring "new money" into the area for the purchase of production inputs from all sources for the next cycle of industry production and exports. Total exports from the Twin Cities metropolitan area in 1997 to all destinations outside the area were more than \$71 billion, or 38.2 percent of total sales.

Analysis of Macro Issues

We identify the air hubs and their local areas with the sharpest competition with the Minneapolis-St. Paul metropolitan area and its economy. These are Chicago, Cincinnati, and Detroit in the North Central Region, Atlanta and Dallas in the South, and Denver in the West;

additional comparison areas included within the scope of this report include three “second-tier” cities (Charlotte, Pittsburgh, and St. Louis) and three additional air hubs (Boston, San Francisco, and Seattle) with high-tech industry clusters that are highly dependent on air transportation for later comparisons. These 13 cities were among the 29 large air hubs in the U.S. “hub and spoke” air transportation system in 1997—the base year for this study.

The annual percentage increases in population and per capita income for the two periods—1985 to 1990 and 1991 to 1997—help identify the more rapidly and the more slowly growing areas and the consistency of their growth trends over the 12-year period. Minneapolis-St. Paul, with 20 percent population growth from 1985 to 1997, was the surpassed all other metropolitan areas in the North, seven of ten in the South, and six of eight in the West. Among the designated competing airport areas, Minneapolis-St. Paul and Denver had the highest per capita income—however, the differential increase in income in Minneapolis-St. Paul was second-lowest among competing airport areas (See Table 1.2).

Trends in Commodities Exports

Exports from the Minneapolis-St. Paul metropolitan area to all destinations outside the area accounted for 38.2% of the area’s total sales (\$71 billion); the remaining 61.8% of the area’s total sales (\$115 billion) were final sales to local households, governments, and other institutional sectors, or intermediate sales to local industries.

Total exports of the air transportation industry were \$3.1 billion, or 83.5 percent of sales for this industry, with the Minneapolis-St. Paul International Airport and its services to airlines, passengers, and other clients accounting for the remaining \$600 million, or 16.5 percent of industry sales. Industry purchases of air transportation inputs totaled to only \$495 million—less than seven-tenths of one percent of total industry exports. These purchases are widely diffused within the local economy, with most industries spending less than one percent of their total input spending on air transportation.

Six of the top 10 domestic exports originate from the services-producing sectors (Table 1.4). These include specialized services largely for regional markets in Minnesota and the Upper Midwest.

The key area economic indicators for the Twin Cities area are the exports—domestic and foreign—of more than 500 commodities.² Domestic markets generate a demand for air transportation primarily through business travel of sales personnel and business executives. Foreign markets involve both business travel and commodity shipments. For both markets, the number and frequency of non-stop flights are critical variables affecting the profitability and competitive status of exports-producing businesses.³

Trends in Industry Location

A major finding of Chapter 1 is the critical role of exports-producing industries in the Minneapolis-St. Paul area. The more than \$71 billion in total exports generated by these industries each year is a major component of the area's total sales. In terms of industry location, the exports-producing sectors were the largest purchasers of air transportation, with both domestic and foreign exporters showing increases over the 1991–1997 period (in current dollars). These top exports-producing industries are more concentrated in the Minneapolis-St. Paul area—and constitute a larger percentage of total area exports—than in any of the competing metropolitan areas.

High-tech Manufacturing and Services

The high-tech industries in particular are highly dependent on air transportation access, and are increasing their already high concentration in the Minneapolis-St. Paul metropolitan area (See also Footnote 3). High-tech industries have the highest exports, of which foreign exports account for the majority of total exports. The local high-tech sector also shows a steady historical shift from manufacturing to service industries—this reflects a national trend of faster growth in high-

² Details of the total commodities analysis can be found in the Appendices. Tables 1.4 and 1.5 show the top 10 domestic and foreign exports and related economic indicators.

³ Likely limitations of air access to domestic and foreign markets are among decision parameters taken into account by air transportation-sensitive industries, as noted in Ross DeVol, "Blueprint for a High-Tech Cluster—The Case of the Microsystems Industry in the Southwest" and "America's High Tech Economy." The high proportion of foreign exports among certain industries, e.g., high-tech, is another measure of dependence on air transportation. See, also, Maki and Lichty, *Urban Regional Economics*, pages 195-246, for a critical discussion of the role of forecasts and related information in business decisions and pages 457-9 for references on "economic sector sensitivity to air access." Additionally, refer to Appendix Table 2.41.

tech services than high-tech manufacturing. Service industries tend to generate higher levels of air transportation use than do manufacturing industries.

Air Transportation and Exports

The air transportation industry of the Twin Cities is one of the area's largest resident industries. It includes the resident airlines, airports, and direct service providers with total output or sales of more than \$3.8 billion. It employed 27,900 workers in 1997—an increase of 31 percent over its 1991 employment level. It added \$2.3 billion to gross area product in 1997. The air transportation industry and other providers of air transportation serve all local industries purchasing air transportation and the institutional sectors—households, state, federal, and local governments, and private capital formation—as well domestic and foreign export markets.

The most important sectors for the purchase of air transportation were exports—domestic and foreign—with both sectors showing increases over the 1991–1997 period (in current dollars). Foreign exports show the largest percentage increase from the 1991 recession year, not only in the United States, but for foreign export destinations as well.

Comparing Twin Cities Economy to Competing Areas

The annual increase in total enplanements for the Minneapolis-St. Paul area from 1991–1997 and the projected increases 1997–2010 is well above three percent per year. A slight slowdown is projected for the area from 1997–2002, followed by an increase from 2002–2010; this pattern is followed by each of the selected competing airports.

Analysis of this data confirms the sensitivity of the air travel market to economic cycles: the number of enplaned passengers in the U.S. declined by 3.6 percent from the peak year 1990 to the recession year 1991, but increased at a 4.7 percent annual rate from 1991 to 1997.

Minneapolis-St. Paul was the only large air hub in the North to increase passenger enplanements during the recession period; among the areas identified as economic competitors, only Denver, San Francisco, and Seattle in the West did the same.

The growth in total demand for air transportation also correlates closely with growth in gross area product and population. Passenger enplanements, for example, grow at a rate three times the rate of growth in population and six times the rate of growth in gross area product.

Projection of Future Trends

Comparison of key economic indicators (including total industry and commodity output, total exports, employment, and population) suggest a rapidly growing demand for air transportation. Demand in the Minneapolis-St. Paul MSA is predicted to lead the North, but be outpaced by competing areas in the South and West. In terms of the ability of Minneapolis-St. Paul's air transportation infrastructure to accommodate future demand, the projections of future use levels provided by the Metropolitan Airport Commission are below forecasts developed by the FAA. Indeed the airport operations forecast in the low series for 2020 seems to be close to the actual airport operations in 2000 and the "high" 2020 forecast may be exceeded by 2005 if present trends continue. (Final figures for 2000 airport operations were not available at time of report preparation.) This may represent a potential economic liability for the area, because industries dependent on air transportation are strongly motivated to seek metropolitan areas with superior air-transportation infrastructure (see Footnote 2). To understand the implications of these figures for the future, Chapters 2 and 3 present comparisons of capital enhancement decision practices among competing airports in the knowledge base.

Freight and Passenger Purchasing Processes

In addition to the "big picture" economic trends relating Minneapolis-St. Paul to competing areas, it is necessary to understand the specifics of interactions between air transportation facilities and the consumers who use them. This is the subject of Chapter 2. These consumers are divided into two categories: air cargo and passenger service.

Air Cargo Distribution Channels

Air cargo services are distributed through two distinct channels: the traditional logistics chain (TLC) and the integrated logistics chain (ILC). A traditional logistics chain is made up of several different businesses, each specialized in a different aspect of the air cargo service process, for

example, shippers, freight forwarders, customhouse brokers, drayage firms, and air carriers. The ILC, in contrast, is exemplified by firms such as UPS and FedEx that maintain their own integrated air and ground carrier fleets, as well as warehouses, sorting facilities, and tracking systems. The differences between the TLC and ILC can be summarized as follows:

- The TLC is made up of individual players operating “at arm’s length” while the ILC has integrated assets under single management for greater control and service.
- The TLC provides emphasis on low cost with adequate service. The ILC provides higher levels of service at a substantially higher price.

Research indicates a trend in freight shipping towards smaller shipments and more emphasis on service, e.g., fast and timely delivery. Thus, the future trend tends to favor the ILC.

Significance: MSP vs. O’Hare

An airport’s location is critical to its competitive position for the air cargo segment. Although MSP enjoys good access to the rest of the country and to global markets, other cities—particularly Chicago—are better situated. Chicago has long filled the role of the nation’s transportation center, and is the headquarters location for many transportation firms and a natural point for consolidating freight. As the market leader, Chicago has the existing infrastructure to handle large volumes of freight and thereby offer economies of scale to its carriers. Reflecting this, the Northwest Airlines 747 freighters which carry transpacific cargo do not cycle through MSP except for maintenance purposes; they are deployed from O’Hare, New York (Kennedy), San Francisco, and Los Angeles. It is noteworthy that none of Northwest’s hubs are major freight shipment points—this illustrates the difference between passenger and cargo flows.

In terms of infrastructure, Chicago’s O’Hare airport enjoys a surprising advantage over MSP: it is easier (more economical) for freight carriers to ship cargo by truck from Minneapolis-St. Paul to O’Hare overnight for loading onto an airplane than it is to fly the same cargo to O’Hare and transfer it to another airplane there. This is due to the fact that many more airlines offer direct cargo service from Chicago as well as the efficiencies of overnight container service from within 500 miles. In contrast, MSP is served by a much smaller array of carriers than O’Hare—and no carrier offers international freight-only air service at MSP. Therefore, even with

a planned increase in freight handling space at MSP, Chicago will continue to dominate the air cargo market for the Midwest.

Integrated carriers represent the growth segment of the market. Because of this, integrated carriers are making significant investments in their facilities and gaining increased market share from traditional freight forwarders. This is certainly true at MSP, where the integrated carriers are driving the expansion of cargo space. For example, integrated carriers such as FedEx, UPS, DHL and so on, account for 82% of the expansion of cargo space. The fact that they are willing to make these investments is a strong indication that MSP will continue to play a major role in the future.

Traditional Travel Agency vs. Managed Contract

In the world of business travel there are two distinct primary distribution channels, both of which involve travel agents. The first comprises traditional travel agent services to business organizations; the second involves direct negotiated contracts with airlines, where travel agents manage the contract between airline and corporate customer.

Travel agents routinely align themselves with a specific Computer Reservation System (CRS)—usually the system owned by the dominant airline in the regions served by the agency. Use of a CRS affords many operational benefits to the travel agency, and also involves bonuses paid to the agency according to the level of ticket bookings.

Understanding business travel patterns and the satisfaction of these users of air services requires a very different methodology compared to the interviews used to develop the data about participants in the air cargo business and the intermediaries in the air travel business. A key informant questionnaire survey was used to gather relevant data. Unlike a consumer survey, a key informant survey does not ask for the respondent's personal opinions and behavior, but instead focuses on the informant's knowledge of their organization's business operations air travel use.

Approximately 74% of the surveys reported that people traveled to and/or from their location via MSP in the last year. This large penetration of air travel is consistent with the macro-level data

on the pervasive usage of the service across industries. In general, respondents agreed that business travel will continue to play an important role in their operations in the future, and that telecommunications will not significantly reduce the need for travel.

A comparison of responses from metro-based and out-state users revealed that respondents from outside the Twin Cities area are significantly less satisfied with the accessibility of MSP, as well as the availability of non-stop flights to their preferred destinations. While the general perception is that fares are high, there are benefits from being a hub, i.e., convenient schedules and access to non-stop flights. However, out-state users do not appear to be capturing those benefits. In addition, the airport appears less accessible for out-state travelers. Strategies to address this apparent discrepancy may represent a marketing opportunity for the airport.

An additional comparison was made between MSP and competing airports in the area of parking (Table 2.10). Results suggest that MSP may be at a disadvantage until it completes its parking expansion (which will effectively double its parking capacity).

Creating the Knowledge Base

A primary goal of this research project is to synthesize the information generated in Chapters 1 and 2 into a knowledge base that will serve as a framework for decision making in the future.

The knowledge base will enable policy makers to: measure the value of MSP in terms of demand for air transportation; monitor the competitive position of the Minneapolis-St. Paul area; and market the MSP International Airport.

To maintain such a knowledge base, it is necessary to track changes in:

- the demand for air transportation (including local population, income, and employment; measures of commodity exports; and trends in industry location)
- the competitive position of the Minneapolis-St. Paul economy (including employment, industrial output, and exports as well as passenger enplanements and airport operations)
- airport users' patterns of interaction with the airport (including service to the air transportation sector as well as to shippers and business travelers).

Uses of the Knowledge Base

One key question is whether or not the Twin Cities' air transportation infrastructure is adequate to keep up with increases in the demand for air transportation services. Recall that one of Chicago's advantages over Minneapolis-St. Paul is its capacity to handle high traffic volumes (both freight and passengers). Changes in industry location patterns and in air service consumers' usage patterns may make an area more or less competitive.

Research indicates that the Minneapolis-St. Paul International Airport constitutes an important infrastructure facility for the region it serves. Three elements that define an important infrastructure facility are:

- It must be of *significant value* to an area's economy
- Its users should be widely *diffused* across the different sectors of an area's economy
- Its services are a *small fraction* of total expenditures, but critical to individual export-producing businesses that are part of the area's economic base

MSP satisfies all three of these criteria, and so it should be considered as a part of the region's essential business infrastructure.

In light of this infrastructure status, the knowledge base is an ideal tool for assessing service gaps and marketing opportunities for the airport. Some illustrations of these potential uses are as follows:

- The data analysis in Chapter 2 suggests that service level ratings from business travelers are low in relation to norms extrapolated from other surveys. This may indicate a service gap which can be addressed through operational or marketing programs.
- Other results from the business traveler survey suggest that parking and other ground access considerations are viewed negatively at MSP. A communications program could therefore be designed to address these perceptual issues.
- Analysis of the knowledge base argues against marketing MSP to shippers as an alternative to Chicago's O'Hare Airport. Because of the weight of O'Hare's existing advantages to shippers, and MSP's status as a regional infrastructure facility, it is unlikely that MSP could compete effectively against O'Hare. Instead of marketing the airport to shippers as an alternative to O'Hare, resources would be better spent to address issues specific to MSP.
- A serious issue raised by the knowledge base is the possibility that the Twin Cities area's air transportation capacity will not keep up with increasing demands placed on its services by the export-producing industries that are such an important component of the region's

economic base. Adequacy of air transportation infrastructure is a significant contributor to a region's ability to compete in a global marketplace; therefore, the MSP airport should be considered as an important part of the region's overall economic infrastructure and its capacity relative to demand should be periodically reviewed.

Knowledge for the Future

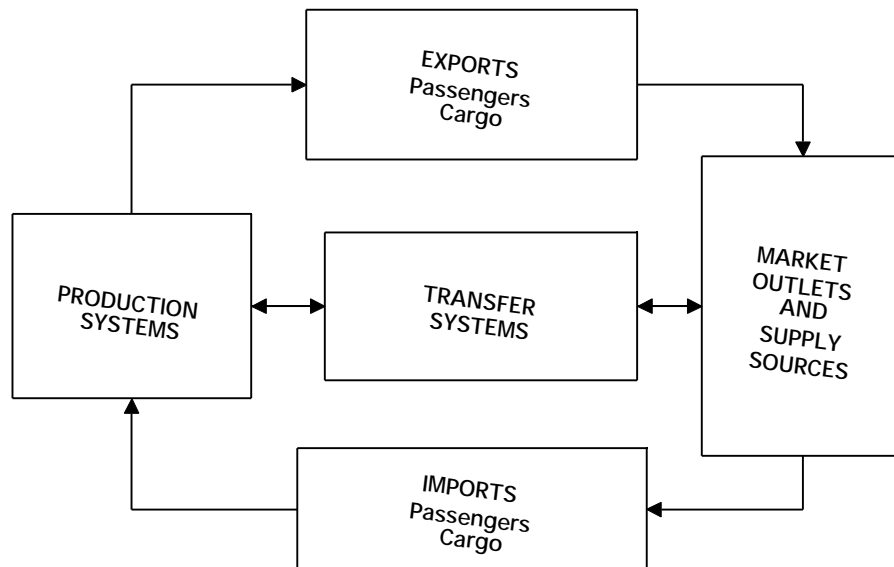
The real power of a knowledge base will only be realized through the continual updating of the information it contains. This will allow users to understand important ongoing issues in the world of air transportation, and how these issues impact the competitive landscape of the national hub-and-spokes airport system. Equally important will be the chance to monitor new developments in other regions, and gather new knowledge by analyzing how other airports respond to changing market conditions and demand levels. The researchers urge that the knowledge base be continually updated, like a tool that is kept sharp for use at any time. This will enable users of this report to identify service gaps and take appropriate action to improve the competitiveness of the airport and the Twin Cities metropolitan area.

1. Macro Trends and Forecasts: The Big Picture

Chapter 1 focuses on the Minneapolis-St. Paul metropolitan area and six large metropolitan areas viewed as its principal competitors. It addresses the task of measuring the value of the Minneapolis-St. Paul International Airport to its community. By value we mean the jobs and income generated by the local economy.⁴ This is part of the larger task of evaluating the global position of the Minneapolis-St. Paul metropolitan area. The central theme of the area comparisons is the use of exports as a measure of global competitive position.

Central to exports is a transfer system of air transportation and related communication services that move business travelers and cargo and, also, information from the local airport to distant market destinations and from distant market destinations and supply sources to the local airport and its clients and customers.⁵ The two elements—air transportation and communications services—are largely complementary. They keep the production systems in touch with market outlets and supply sources, and vice versa (Figure 1.1).

Figure 1.1 Elements of Passenger and Cargo Transfer Systems



⁴ The Glossary in Appendix A provides definitions of commonly used terms.

⁵ An extended discussion of exports and transfer systems is presented in *Urban Regional Economics*, Chapter 5 (Infrastructure and transfer systems). This reference provides a framework for the findings presented in Chapter 1.

Exports are the passengers and cargo originating from the industry activities in the Minneapolis-St. Paul metropolitan area. These passengers provide various services to non-resident clients and customers. Cargo refers to the products of local industry, including the U.S. Postal Service and transportation services agencies like Federal Express, shipped to industrial and institutional destinations located outside the metropolitan area. These exports bring “new money” into the area for the purchase of production inputs from all sources for the next cycle of industry production and exports. Total exports from the Minneapolis-St. Paul metropolitan area in 1997 to all destinations outside the area were more than \$71 billion, or 38.2 percent of total sales.⁶ The remaining 61.8 percent of the total, or \$115 billion, were final sales to local households, governments, and other institutional sectors, and intermediate sales to other local industries. Total exports of the air transportation industry were \$3.1 billion, or 83.5 percent of total sales, with the Minneapolis-St. Paul International Airport and its services to airlines, passengers, and other clients accounting for much of the remaining 16.5 percent of total sales (\$600 million). Purchases of air transportation inputs of all industries in the Twin Cities metropolitan area totaled only \$495 million—less than six-tenths of one percent of total industry exports. This study, however, does not focus on the input side of local air transportation purchases, but, rather, on the total area economy dependent on air transportation to reach its more distant markets and supply sources.⁷ We start, therefore, with questions about the air transportation-dependent industries: What are they, how do we measure their value and importance to the community, and how do we use this measure in monitoring and evaluating the competitive position of the community and its industries in global markets?

We tackle the three questions in the following ways. We first identify the air-transportation-dependent industries among those local industries producing in excess of local requirements. A good many of these industries, depending on value of product and distance to market, will opt for air transportation to reach their market destinations and supply sources. We lack, however, the direct statistical connection between commodity export and transportation mode for each

⁶ Metropolitan Statistical Area (MSA) or Consolidated Metropolitan Statistical Area (CMSA). The Minneapolis-St. Paul MSA consists of 10 counties in Minnesota (Anoka, Carver, Chisago, Hennepin, Isanti, Ramsey, Scott, Sherburne, Washington, and Wright) and two in Wisconsin (Pierce and St. Croix).

⁷ Table 1.2 refers to the total production of air transportation services in the Minneapolis-St. Paul MSA and the demand for this production. The total product is made up of intermediate inputs and value added, i.e., primary inputs. These include imports as well as inputs from local sources.

commodity and area, whether a single county or a collection of one or more counties—a limitation of our federal databases. We identify, therefore, the air hubs and their local areas with the sharpest competition with the Minneapolis-St. Paul metropolitan area and its economy. These are Chicago, Cincinnati, and Detroit in the North Central Region, Atlanta and Dallas in the South, and Denver in the West. We include several additional large air hubs of “second tier” cities—Charlotte, Pittsburgh, and St. Louis, as well as three air hubs with highly air-transportation-dependent “high-tech” industry clusters for later comparisons.⁸ The 13 air hubs were among the 29 large air hubs in the U.S. “hub and spoke” air transportation system in 1997—the base year for this study.⁹

We measure trends in commodity exports, industry location, association of air transportation with commodity exports among the competing airport areas using the 1991 and 1997 IMPLAN databases and the 1999 Pro-IMPLAN modeling system. We use also the Federal Aviation Administration estimates and projections of passenger enplanements and airport operations.¹⁰ In addition, we use the 1969–1997 Regional Economic Information System (REIS) from the U. S. Bureau of Economic Analysis estimates of population, income, and employment. We conclude using the findings in positioning a metropolitan area for global competition.

1.1 Selecting Competing Areas and Related Statistics

We start with the first task of a listing of the population, income, and employment of the Minneapolis-St. Paul area and the six competing Metropolitan Statistical Areas (MSAs in the

⁸ The individual competing cities (selected by study sponsors) were viewed as MSP’s strongest competitors. Three of the additional six “comparison” airports were selected for special attributes for the Chapter 2 surveys and comparisons (e.g., pricing effects of airline dominance) while the remaining three were selected for their location in leading high-tech areas. The 13 metropolitan areas include mostly “first tier” cities, that is, the larger cities with each accounting for more than one percent of total U. S passenger enplanements. The “second tier” cities are the three smaller cities selected for the Chapter 2 comparisons.

⁹ Additional tabular series and related discussions of the demographics and economy of the Twin Cities MSA and competing MSAs are included in the Appendices.

¹⁰ The Federal Aviation Administration (FAA) prepares forecasts of passenger enplanements and airport operations based on its independent, objective, econometric modeling systems. These results are summarized in Tables 1.23 and 1.24. In addition, the FAA assembles the forecasts prepared by individual airports in support of their capital enhancement plans and programs. These are two different forecast series. The forecast series provided by the Twin Cities MAC published by the FAA are below the FAA forecasts. Indeed the airport operations forecast in the low series for 2020 seems to be close to the actual airport operations in 2000 and the “high” 2020 forecast will be exceeded by 2005 if present trends continue. (Final figures for 2000 airport operations were not available at time of report preparation.) Chapters 2 and 3 were intended to present and compare the capital enhancement decision practices among the competing airports in the knowledge base.

“hub and spoke” air transportation system: Chicago, Cincinnati, Detroit, Atlanta, Dallas, and Denver. The Twin Cities metropolitan area is an important service center for Minnesota and the Upper Midwest Region that extends from Michigan’s Upper Peninsula, over northern parts of Wisconsin and Iowa, to the western borders of the Dakotas. It is one of seven MSAs in Minnesota and its border areas that include one or more Minnesota counties, as shown in Table 1.1. Along with the St. Cloud and Rochester MSAs, it forms Minnesota’s core metropolitan area. Duluth-Superior, Grand Forks, Fargo-Moorhead, and La Crosse are Minnesota’s border MSAs. The core area accounts for two-thirds of Minnesota’s population and nearly three-fourths of its total personal income. The border areas are gaining slightly over the core area in per capita personal income, although declining in their share of the total population. The border MSAs serve as smaller regional centers with air access to several of the large air nodes.

Table 1.1 Population and Income of Metropolitan Statistical Areas, Minnesota, 1985–97

Metropolitan Area	Population			Chng		Per Capita Income			Chng	
	1985	1990	1991	1997	85-97	1985	1990	1991	1997	85-97
	(thou.)	(thou.)	(thou.)	(thou.)	(pct.)	(thou.\$)	(thou.\$)	(thou.\$)	(thou.\$)	(pct.)
Minnesota	4,184	4,387	4,428	4,687	12	14.8	19.3	19.8	26.2	78
Core MN MSAs:										
Minneapolis-St. Paul, MN-WI	2,334	2,548	2,581	2,795	20	17.1	22.1	22.7	30.1	77
St. Cloud, MN	139	150	152	161	16	11.3	14.9	15.4	19.6	73
Rochester, MN	98	107	109	115	16	16.0	20.7	21.4	27.2	70
Core MSAs	2,572	2,805	2,842	3,071	19	16.7	21.7	22.3	29.5	76
Core MSAs as % of MN	61	64	64	66	7	113	112	112	112	-1
MN shared MSAs:										
La Crosse, WI-MN	113	117	117	121	8	12.8	17.1	17.6	22.8	78
Duluth-Superior, MN-WI	247	240	241	238	-4	11.8	15.9	16.7	21.7	85
Fargo-Moorhead, ND-MN	146	154	155	167	14	12.9	16.4	16.9	22.5	75
Grand Forks, ND-MN	104	103	103	101	-2	11.6	14.9	15.2	19.7	70
MN shared MSAs	609	614	616	627	3	12.2	16.1	16.7	21.8	79
MN shared MSAs as % of MN	15	14	14	13	25	83	83	84	83	100

Source: U.S. Department of Commerce, Regional Economic Information System

Each of the regional centers in Table 1.1 is part of the “hub and spoke” aviation system with direct flights to the Twin Cities. They also have direct flights to one or more of the national air hubs—large, medium, and small.¹¹ The regional centers are the central places of respective labor market areas, providing a wide range of services. Beyond the regional centers are the non-metropolitan labor market areas.

¹¹ Air hubs are differentiated by the total number of U.S. annual enplanements with large having one percent or more of the total, medium one-tenth of one percent to one percent, and small having less than one-tenth of one percent.

The Minneapolis-St. Paul MSA is the primary service area for the Minneapolis-St. Paul International Airport and its tenants and clients, including Northwest Airlines. Because of its role as a large air transportation hub, it achieves national and international recognition of its location, economy, and services.

Table 1.2 lists the 29 large air hub metropolitan areas, including the seven competing areas for this study. These are Atlanta, Dallas, Denver, Chicago, Cincinnati, and Detroit, besides Minneapolis-St. Paul.¹² These are inland air node metropolitan areas. Included also are six comparison areas—Boston, Pittsburgh, St. Louis, Charlotte, San Francisco, and Seattle. Except for Minneapolis-St. Paul, each of the North metropolitan areas lagged behind the U.S. average population growth. Minneapolis-St. Paul, with 20 percent population growth from 1985 to 1997, exceeded all other metropolitan areas in the North, seven of the ten metropolitan areas in the South, and six of the eight metropolitan areas in the West. Per capita income in 1997 was the highest, along with Denver, among the seven competing areas. It was the second lowest, however, in differential change. Differential income change refers to the area income change as a percent above or below the U.S. income change from 1985 to 1997. Per capita income levels are generally higher than the U.S. average for the metropolitan areas. The metropolitan areas in the North have the higher total change relative to the U.S. average. New York, for example, shows a total change 7.1 percent above the U.S. average while Los Angeles is 13.4 percent below the U.S. average.

Table 1.2 Population and income of large air hub areas, 1985, 1990, 1991, and 1997 and change 1985–97

Large Hub Area	Population					Per Capita Income				Diff. Chg. (pct.)
	1985 (thou.)	1990 (thou.)	1991 (thou.)	1997 (thou.)	Total Chg. (pct.)	1985 (thou.\$)	1990 (thou.\$)	1991 (thou.\$)	1997 (thou.\$)	
United States	237,924	249,439	252,127	267,744	13	14.4	19.2	19.6	25.3	0.0
North:										
New York-Newark CMSA	19,277	19,488	19,497	19,915	3	18.4	26.1	26.6	34.6	7.1
Chicago CMSA*	8,130	8,255	8,332	8,751	8	16.3	22.0	22.6	30.0	4.9
Philadelphia CMSA	5,724	5,899	5,921	5,975	4	16.0	22.2	22.8	29.3	4.5
Boston NECMA#	5,524	5,688	5,665	5,827	5	17.1	23.5	24.0	31.8	5.7
Detroit CMSA*	5,108	5,192	5,234	5,443	7	16.1	20.7	20.9	27.4	-3.1
Minneapolis-St. Paul MSA*	2,334	2,548	2,581	2,795	20	17.1	22.1	22.7	30.1	0.6
St. Louis MSA#	2,444	2,496	2,507	2,559	5	15.6	20.4	21.0	27.2	-0.6
Pittsburgh MSA#	2,466	2,395	2,398	2,360	-4	15.6	20.4	21.0	27.2	-0.6
Cincinnati CMSA*	1,755	1,822	1,842	1,934	10	14.1	19.4	20.3	26.2	5.7
South:										
Washington-Baltimore CMSA	6,181	6,748	6,824	7,213	17	17.7	24.2	24.8	31.3	0.9

¹² Baltimore and the District of Columbia are combined into one CSMA, as are Newark and New York.

Large Hub Area	Population					Per Capita Income				Diff. Chg.
	1985 (thou.)	1990 (thou.)	1991 (thou.)	1997 (thou.)	Total Chg. (pct.)	1985 (thou.\$)	1990 (thou.\$)	1991 (thou.\$)	1997 (thou.\$)	
Dallas CMSA*	3,641	4,058	4,143	4,678	28	17.0	20.6	21.3	28.7	-4.0
Houston CMSA	3,608	3,753	3,853	4,314	20	15.9	20.5	21.6	28.2	1.4
Atlanta MSA*	2,577	2,978	3,052	3,634	41	15.7	20.8	21.2	28.3	2.5
Miami CMSA	2,910	3,205	3,266	3,602	24	15.3	19.7	19.9	24.1	-9.9
Tampa MSA	1,877	2,076	2,098	2,225	19	14.1	18.3	18.7	24.9	0.6
Orlando MSA	996	1,239	1,275	1,463	47	13.9	17.9	18.1	23.4	-4.2
Charlotte MSA#	1,058	1,169	1,192	1,352	28	13.8	19.1	19.3	26.5	9.6
West:										
Los Angeles CMSA	12,856	14,593	14,791	15,550	21	16.7	21.5	21.4	25.3	-13.4
San Francisco CMSA#	5,821	6,291	6,355	6,718	15	19.5	25.6	26.1	34.6	1.4
Seattle CMSA#	2,609	2,993	3,054	3,378	29	15.8	21.6	22.5	29.8	7.4
Phoenix MSA	1,932	2,246	2,302	2,842	47	14.6	18.3	18.5	24.1	-5.7
San Diego MSA	2,126	2,513	2,554	2,724	28	15.7	20.2	20.7	25.0	-9.3
Denver CMSA*	1,943	1,986	2,028	2,319	19	16.7	21.3	22.2	30.1	2.4
Portland CMSA	1,642	1,806	1,856	2,115	29	14.1	19.0	19.5	26.4	6.3
Las Vegas MSA	647	868	927	1,262	95	13.9	19.0	19.2	25.3	3.3
Salt Lake City MSA	1,019	1,077	1,101	1,251	23	12.1	15.4	16.1	22.3	4.8
Honolulu MSA	804	838	847	874	9	15.2	22.7	23.5	27.3	1.9

*Designated competing airport area #Comparison areas

Source: U.S. Department of Commerce, BEA, REIS, 1969-1997.

The annual percentage increases in population and per capita income for the two periods—1985 to 1990 and 1991 to 1997—help identify the more rapidly and the more slowly growing areas and the consistency of their growth trends over the 12-year period. The five-year 1985–90 U.S. population MSA growth rates, for example, were exceeded in the 1991–97 period for 11 of the 27 areas—five in the North, three in the South, and three in the West. For per capita income, the rates for the five-year period exceeded the U.S. average in 17 of the 27 areas—six in the North, four in the South, and seven in the West.

In-migration of population into each of the areas is an additional measure of area growth and viability. The U.S. Bureau of the Census estimates population in-migration of 17.9 thousand and 900, respectively, for the Minneapolis-St. Paul MSA and the Cincinnati CMSA and out-migration of 8.9 thousand and 17.8 thousand, respectively, for the Chicago and Detroit CMSAs in 1999. In-migration estimates for Atlanta, Dallas, and Denver are, respectively, 73.3 thousand, 37.8 thousand, and 23.8 thousand.

Table 1.3 lists the projected 2010 levels of population and employment for 13 of the 27 major air hub metropolitan areas (MSAs, CMSAs, and the Boston NECMA).¹³ The Minneapolis-St. Paul MSA is the only metropolitan area in the North that exceeds the U.S. growth rate for the projection period. It has the highest projected growth rate in the North, but is exceeded by each of the competing areas in the South and West.

Table 1.3 Employment and population of selected air hub areas, 1997 and projected 2010

Area	Employment			Emp-Pop Ratio			Population		
	1997 (thou.)	2010 (thou.)	Annual Change (pct.)	1997 (units)	2010 (units)	Annual Change (pct.)	1997 (thou.)	2010 (thou.)	Annual Change (pct.)
United States	156,410	194,256	1.7	584	636	0.7	267,744	305,377	1.0
North:									
North, total	32,618	36,800	0.9	587	623	0.4	55,558	59,088	0.5
Chicago CMSA*	5,279	6,365	1.4	603	653	0.6	8,751	9,751	0.8
Boston NECMA#	3,795	4,416	1.2	651	725	0.8	5,827	6,093	0.3
Detroit CMSA*	3,007	3,541	1.3	553	596	0.6	5,443	5,941	0.7
Minneapolis-St. Paul MSA*	1,996	2,679	2.3	714	807	0.9	2,795	3,318	1.3
St. Louis MSA#	1,574	1,840	1.2	615	686	0.8	2,559	2,680	0.4
Pittsburgh MSA#	1,318	1,475	0.9	558	643	1.1	2,360	2,296	-0.2
Cincinnati CMSA*	1,173	1,527	2.0	607	707	1.2	1,934	2,160	0.9
South:									
South, total	17,874	23,974	2.2	628	668	0.4	28,481	35,875	1.7
Dallas CMSA*	3,105	4,526	2.9	664	743	0.9	4,678	6,092	2.1
Atlanta MSA*	2,419	3,795	3.5	666	721	0.6	3,634	5,262	2.9
Charlotte MSA#	910	1,277	2.6	673	721	0.5	1,352	1,771	2.1
West:									
West, total	23,412	29,841	1.6	600	623	0.1	39,033	47,933	1.5
San Francisco CMSA#	4,388	5,238	1.4	653	690	0.4	6,718	7,588	0.9
Seattle CMSA#	2,179	2,878	2.2	645	680	0.4	3,378	4,231	1.7
Denver CMSA*	1,657	2,568	3.4	715	831	1.2	2,319	3,092	2.2

*Designated competing airport area

*Comparison areas

Source: U.S. Bureau of Economic Analysis, Regional Information System, 1969–1997

The employment-population ratios reflect a combination of population age distributions, labor force participation rates, and commuting patterns. They convert the employment projections into population projections. The annual change in the Minneapolis-St. Paul MSA ratio of 0.9 is exceeded by Cincinnati and Denver among the competing areas. This ratio was already among the highest in 1997, exceeded only the Denver CMSA. Projected population is the result of multiplying the preceding two values.

¹³ The projected values are the outcome of a three-step procedure, starting with the calculation of area 2010 employment levels based on the individual area annual growth rates for the seven-year period from 1990 to 1997—a period that includes the 1990-91 recession and six years beyond the recession. The 1990-97 area growth rates are applied to each area's 1997 employment-to-population ratio to obtain the projected ratios. This ratio is then applied to the projected 2010 employment to obtain the projected 2010 population.

1.2 Measuring Trends in Commodity Exports

The key area economic indicators for the Twin Cities area are the exports—domestic and foreign—of more than 500 commodities. Domestic markets generate a demand for air transportation of the sort included in the next table primarily through business travel of sales personnel and business executives. Foreign markets involve both business travel and commodity shipments. For both markets, the number and frequency of non-stop flights are critical variables affecting the profitability and competitive status of exports-producing businesses.¹⁴

Six of the top 10 domestic exports originate from the services-producing sectors (Table 1.4). These include specialized services largely for regional markets in Minnesota and the Upper Midwest. Two of the manufacturing industries listed in one or both of the earlier tables and a third industry—laminated packaging—are closely related to two of the paper products industries also listed earlier. These top 10 industries account for more than 75 percent of the domestic exports of the top 80 domestic exports-producing industries and for more than 50 percent of the top foreign exports of the top 80 domestic-exports-producing industries. We explore the underlying conditions for the high levels of foreign and domestic exports associated with these industries in the next section.

Table 1.4 Top 10 Domestic Exports and Related Economic Indicators, MSP MSA, 1997 and 1991–97

Commodity	SIC Code	Domestic Exports		Foreign Exports		Change, 1991–97	
		1997 (mil.\$)	1991 (mil.\$)	1997 (mil.\$)	1991 (mil.\$)	Domestic (mil.\$)	Foreign (mil.\$)
Insurance Carriers	6300	3,622	1,946	46	25	1,677	21
Wholesale Trade	5000, 5100	3,553	1,132	1,388	1,137	2,421	251
Miscellaneous Plastics Products	3080	2,115	1,218	162	0	896	162
Computer and Data Processing Services	7370	2,092	444	88	11	1,648	77
Air Transportation	4500	1,954	1,742	1,191	499	212	692
Flour and Other Grain Mill Products	2041	1,743	1,097	116	94	646	22
Paper Coated & Laminated N.E.C.	2672	1,638	2,222	647	306	-585	341
Real Estate	6500	1,400	1,210	288	214	190	74
Advertising	7310	1,158	541	15	42	616	-27
Paper Coated & Laminated Packaging	2671	1,012	236	1	0	776	1
Top 10, Total		20,286	11,789	3,943	2,329	8,497	1,614
Other		6,672	5,967	3,847	2,817	705	1,030
Top 80, Total		26,958	17,757	7,790	5,145	9,202	2,644
Top 10 as % of Top 80		75.3	66.4	50.6	45.3	92.3	61.0

Source: Minnesota IMPLAN Group, 1999 IMPLAN Model and 1997 IMPLAN Database

¹⁴ BLS and Survey of Current Business articles. The available secondary data lacks breakdowns on the market destinations, and whether passengers or cargo, of individual four-digit commodity export categories for individual airports. This was an important reason for the comparison area airport surveys to acquire the added information for Chapter 2 (and also Chapter 3 in building the knowledge base). The term “exports” includes business travelers for whom nonstop flights provide quicker access to clients with the possibility of reaching more clients in a shorter period of time and thus being more productive than in the case of stopover flights.

The top 10 foreign exports include three of the top 10 concentrated industries and a fourth closely linked to the three ordnance-type industries listed earlier. In addition, three services industries—wholesale trade, air transportation, and real estate—are among the top 10. The latter include realty commissions among other services payments, which originate from either foreign or domestic sources, as listed in Table 1.5.¹⁵

Table 1.5 Top 10 Foreign Exports and Related Economic Indicators, MSP MSA, 1997 and 1991–97

Commodity	SIC Code	Foreign Exports		Domestic Exports		Change, 1991–97	
		1997 (mil.\$)	1991 (mil.\$)	1997 (mil.\$)	1991 (mil.\$)	Foreign (mil.\$)	Domestic (mil.\$)
Wholesale Trade	5000, 5100	1,388	1,137	3,553	1,132	251	2,421
Air Transportation	4500	1,191	499	1,954	1,742	692	212
Electronic Computers	3571	814	1,171	156	89	-356	67
Paper Coated & Laminated N.E.C.	2672	647	306	1,638	2,222	341	-585
Other Ordnance and Accessories	3489	510	0	213	566	510	-353
Mechanical Measuring Devices	3823, 3824, 3829	487	588	66	66	-101	0
Magnetic & Optical Recording Media	3695	422	11	207	0	410	207
Electromedical Apparatus	3845	375	381	217	352	-5	-135
Surgical and Medical Instrument	3841	322	106	223	142	216	80
Real Estate	6500	288	214	1,400	1,210	74	190
Top 10, Total		6,445	4,413	9,625	7,521	2,032	2,104
Other industries		5,109	3,093	21,134	12,457	2,016	8,677
Top 80, Total		11,554	7,506	30,759	19,978	4,048	10,781
Top 10 as % of Top 80		55.8	58.8	31.3	37.6	50.2	19.5

Source: Minnesota IMPLAN Group, 1999 IMPLAN Model and 1997 IMPLAN Database

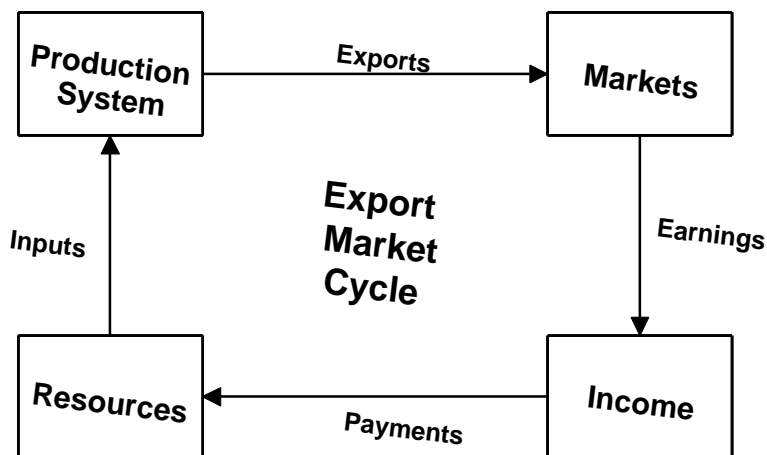
These top ten industries account for nearly 56 percent of the top foreign exports. The domestic exports for the aggregate of these industries total to slightly more than 31 percent of the top 80 and their growth over the six-year period has been less than 40 percent of the growth of foreign exports.

Access to the more distant destinations is essential for sustainable value creation. The more distant market destinations generate the earnings to both labor and capital and higher incomes to acquire the resources and inputs for the next cycle of production and exports. The cycle of local exports reaching distant markets to create local value is represented in a conceptual model in which the additional dollars from exports are used to purchase locally produced and imported resources.¹⁶ Figure 1.2 represents these product and money flows as an Export Market Cycle.

¹⁵ The real estate sector is described in the Glossary along with a listing of its components.

¹⁶ The role of exports in bringing “new dollars” into an area is illustrated with additional data and references in Urban Regional Economics, Chapter 4 (Exports and Economic Base).

Figure 1.2 Flow of Resources and Products in the Export-Market Cycle.



The export market cycle highlights the critical role of exports in the economy of every metropolitan area. For the most part, these areas specialize in services of all sorts—from transportation and communication to financial, personal, and business services, and health care. They bring into the area the “new dollars” to purchase the agricultural and manufactured products originating elsewhere as intermediate products for local industries and as final products for local consumption.

Table 1.6 summarizes the findings on the commodity share ratios based on the U.S. commodity supplies and whether or not the ratios are increasing or decreasing from their 1991 values. We calculate a total of 173 commodities with ratios greater than 1, an indication of an above-average level of the commodity in the Minneapolis-St. Paul MSA. Many commodities with ratios less than 1 are also exported. Manufacturing among the top 80 exports with positive change in the average commodity supply ratio from 1991 to 1997, for example, increased 1.2 percentage points in its average commodity supply ratio—from 2.4 percent in 1991 to 3.6 percent in 1997, thus indicating a total manufacturing supply in this sector 3.6 times its normal level, based on the U.S. distribution. Manufacturing dollar value increased by 14 percent annually over this period. Total exports increased by 13 percent with the larger increase in foreign exports—20 percent compared with 12 percent for domestic exports. Services increased by an even larger percentage, mostly due to increases in domestic exports.

Table 1.6 Share of total commodity supply (U.S.) and exports, Minneapolis-St. Paul MSA, 1997 and change 1991–97

Commodity	Comm Share (pct.)	Comm. Supply (mil.\$)	Exports			Total Chg Comm Share (pct.)	Annual Change, 1991-97			
			Total (mil.\$)	Dom (mil.\$)	For (mil.\$)	Comm. Supply (pct.)	Total (pct.)	Dom (pct.)	For (pct.)	
Top 80 exports, positive share change:										
Manufacturing	3.6	21,891	17,454	13,759	3,695	1.2	14	13	12	20
Services	1.8	44,790	16,881	15,168	1,713	0.4	16	17	19	4
Top 80 exports, negative share change:										
Manufacturing	3.8	13,329	10,328	7,447	2,881	-1.4	2	0	0	0
Services	2.0	9,158	4,927	3,735	1,192	-0.2	4	3	1	16
Other above-average sectors, pos. chg:										
New Farm Structures	5.3	260	0	0	0	0.0	12	0	0	0
Manufacturing	2.3	6,194	2,922	2,132	790	0.5	11	8	8	11
Services	1.5	3,894	455	449	6	0.3	11	20	21	2
Other above-average sectors, neg.chg:										
Manufacturing	2.0	4,083	1,808	1,278	530	-0.9	1	-5	-5	-2
Services	1.4	6,516	594	510	84	-0.4	1	-11	-12	-2
Other sectors, total	0.9	79,955	15,736	12,979	2,757	0.1	8	6	6	5
All sectors, total	1.3	189,810	71,105	57,456	13,648	0.1	9	7	8	7

*Ranking from 1 to 173 for above average area commodity output share

Source: Minnesota IMPLAN Group, IMPLAN Model, 1999

Other sectors with above-average commodity share, but below the top 80 exports, show much growth in service exports from 1991 to 1997, and, also, foreign exports of manufactured products. Negative change in commodity shares is accompanied by small positive changes in exports.

1.3 Measuring Trends in Industry Location

A simple measure of industry location is the Location Quotient—the ratio of the percentage that the total output of a given commodity in the area is of total area output divided by the corresponding commodity percentage for the region or nation. We identify an industry by its Standard Industrial Classification (SIC) Code. A Location Quotient of more than one indicates an above-average level of commodity output in the given area—that is, a concentration. Another measure of industry location is the Commodity Supply Ratio—the proportion of a region’s specific commodity supply originating from a specific area. Thus, the demographic and economic models selected for this task help identify and define the critical relationships and variables involved in forecasting the area’s economic future.¹⁷

¹⁷ The IMPLAN model, for example, is available for a 528-sector breakdown of inter-industry transactions—purchases and sales of industries, households, and governments, by county and year for three of the four years, namely, 1990, 1991, and 1997. It also includes estimates of exports—domestic and foreign—for each industry producing in excess of local sales.

The four-digit industry with the highest Location Quotient in 1997 for the Minneapolis-St. Paul MSA was Paper Coated & Laminated, Not Elsewhere Classified, SIC Code 2672. It had an LQ value of 27, that is, 27 times the percentage value for the nation. The LQ for this sector was even higher in 1991 at 34.2—indicating a drop of 7.2 percentage points over the six-year period (Table 1.7). Despite the drop in the LQ value, this industry maintained its top ranking. Among the 10 top-ranking industries in 1997, the tenth ranking industry in 1991 lost its place in the top 10 by 1997. Each in the top 10 is a manufacturing industry in both years: Two of the four-digit industries are in the two-digit (referring to the first two digits of the SIC code) Food Products sector (SIC 20), one is in Paper Products (SIC 26), three are in Fabricated Metals (SIC 34), one is in Machinery and Computer Equipment (SIC 35), one is in Electrical Equipment (SIC 36), and two are in Measuring, Analyzing, and Controlling Instruments (SIC 38). Individually, these four-digit industries are highly concentrated. The entire group of two-digit industries, however, is less highly concentrated because it includes other four-digit industries that may not exist, or exist in very small numbers, in the given area.

Table 1.7 Top 10 Industry Concentrations and Related Economic Indicators, Minneapolis-St. Paul MSA, 1997 and 1991

Industry	SIC	Location Quotient			Comm. Output (U.S.) Share			Total Employment		
		1997 (units)	1991 (units)	1991-97 (units)	1997 (pct.)	1991 (pct.)	1991-97 (pct.)	1997 (thou.)	1991 (thou.)	1991-97 (pct.)
Paper Coated & Laminated N.E.C.	2672	27.0	34.2	-7.2	22.8	40.3	-17.4	15.9	18.2	-2.3
Other Ordnance and Accessories	3489	26.5	29.0	-2.5	37.8	32.1	5.7	1.2	2.3	-10.3
Flour and Other Grain Mill Products	2041	19.2	17.9	1.2	25.7	24.0	1.7	4.7	4.5	0.6
Electromedical Apparatus	3845	11.1	12.1	-1.0	14.3	14.2	0.1	6.2	4.6	5.0
Small Arms Ammunition	3482	9.9	24.6	-14.7	15.6	28.6	-13.1	1.0	2.4	-14.3
Automatic Temperature Controls	3822	9.5	10.1	-0.6	14.0	13.9	0.1	5.0	5.5	-1.6
Malt	2083	7.9	7.9	-0.1	10.2	8.9	1.3	0.1	0.1	-0.9
Magnetic & Optical Recording Media	3695	7.7	0.2	7.4	12.0	0.5	11.5	1.8	0.1	81.0
Computer Storage Devices	3572	7.4	10.5	-3.0	4.5	10.7	-6.2	4.3	4.7	-1.7
Ammunition, Exc.Small Arms, N.E.C.	3483	7.2	8.9	-1.7	8.1	11.2	-3.1	2.1	4.8	-12.8
Top 10, weighted average or total		17.8	21.9	-4.1	14.0	18.3	-4.4	42.3	47.5	-1.9

Source: Minnesota IMPLAN Group, 1999 IMPLAN Model and 1997 IMPLAN Database

Existing areas of industry concentration may expand in the concentrated industries, thus increasing their overall importance in the nation, or they may lack the resources to maintain its work force and markets. In either case, the high-ranking LQ will drop in value and yet maintain

its top-ranking position in the area. This is an application of the Product Cycle Model to individual industries, as well as competing areas.¹⁸

The Minneapolis-St. Paul MSA offers favorable location advantage for industry clusters¹⁹ with the high-ranking LQs. The top 10 industries represent most of the major industry clusters in the Minneapolis-St. Paul MSA, including food products, paper and allied products, printing and publishing, industrial machinery, computer equipment, mechanical measuring devices, and medical instruments in the manufacturing sector.

Table 1.8 presents a summary tabulation of the association between the higher ranking industry clusters and the level of employment and exports for each of the competing areas, based on the Minneapolis-St. Paul ranking of the top 80 location quotients (compiled by four-digit classification). For the Minneapolis-St. Paul MSA, industries with the top ranking LQs account for 17 percent of the total employment and 63 percent of the total exports. For Atlanta, the same industries account for only nine percent of the total employment and 23 percent of the total exports.²⁰ We show also the Commodity Supply Ratio with total exports of an area as a percentage of the total exports for the aggregate competing areas. Total exports for the Minneapolis-St. Paul MSA were 10 percent of the total exports for the aggregate competing areas in 1997. Total exports were 12 percent of the corresponding commodity exports for the aggregate competing areas, thus showing a slightly higher concentration of export-producing industries among the top 80 than among all industries in the area. The higher concentration of an industry in an area correlates with a higher level of local production and, hence, a larger excess supply of industry output for export.

¹⁸ The product cycle model depicts new products growing most rapidly in early stages of successful market introduction and penetration. As competition from other products enters these markets, the initial product loses market share to the competing products because of the special advantages they offer their customers.

¹⁹ Michael E. Porter. Clusters and the New Economics of Competition. Harvard Business Review, November-December 1998, pp. 77-90.

²⁰ The top 10 Location Quotients vary among competing areas with almost no overlap. The largest overlap is the Twin Cities area. Flour and Other Grain Mill Products (SIC 2041) and Automatic Temperature Controls (SIC 3822) compete with the Chicago area and Computer Storage Devices (SIC 3572) competes with the Denver area.

Table 1.8 Industry Location Quotients and Related Economic Indicators, MSP and Competing Areas, 1997

Economic Indicator	MSP	Atlanta	Chicago	Cincinnati	Dallas	Denver	Detroit
Total Employment	1,991,170	2,424,604	5,251,475	1,173,167	3,147,881	1,659,400	2,975,237
Total Exports	71,105	97,789	212,102	43,071	135,054	57,466	147,130
Top 80 LQs, MSP ranking							
Total Employment	332,849	213,462	520,252	90,777	293,456	155,180	228,130
Total Exports	44,715	22,018	67,628	10,958	32,753	14,680	19,271
Domestic	26,958	14,469	40,932	6,676	19,223	9,376	11,947
Foreign	17,757	7,549	26,696	4,282	13,530	5,305	7,324
Top 80 LQs as % of All Sectors:							
Total Employment	17	9	10	8	9	9	8
Total Exports	63	23	32	25	24	26	13
Total Exports as % of Aggregate Area:							
Top 80 share	12	14	31	6	19	10	24
All sector share	10	12	29	6	17	8	18

Source: Minnesota IMPLAN Group, 1999 IMPLAN Model and 1997 IMPLAN Database

A more comprehensive measure of area export trends than the Location Quotient is the change in the economic base from one period to the next. The economic base, or basic employment, is calculated from the ratio of total exports to commodity supply. Exporting an increasing proportion of total commodity supply adds to basic employment. Calculation of the basic employment estimates for a metropolitan area is illustrated for the high-tech industry in the Minneapolis-St. Paul metropolitan area (Table 1.9). Thus, for Computer & Data Processing Services, the ratio of total exports (2,180) to commodity supply (4,742) is multiplied by total employment (44,125) to yield basic employment (20,284). A combination of high exports and high total employment yields high basic employment. Three of the high-tech industries (SIC 3572, 3822, and 3845) are also top-ranking, in their LQ values (7.4, 9.5, and 11.1, respectively).

Table 1.9 Employment and Exports of Top 10 High-tech Industries, MSP MSA, 1997*

Industry	Basic Employ (no.)	Exports Total (mil.\$)	Comm. Supply (mil \$)	Employment Total (no.)
Computer & Data Processing Services	7370	20,284	2,180	44,125
Engineering, Architectural Services	8710	7,379	548	19,808
Printed Circuit Boards	3672	5,067	132	6,294
Automatic Temperature Controls	3822	4,541	487	5,016
Communications, Except Radio/TV	4810,20,40,90	4,099	908	11,859
Mechanical Measuring Devices	3823-4, 9	3,590	553	6,915
Electronic Computers	3571	3,572	970	5,819
Surgical and Medical Instrument	3841	3,136	544	6,507
Surgical Appliances and Supplies	3842	2,935	552	4,771
Electromedical Apparatus	3845	2,710	592	6,214
Search & Navigation Equipment	3812	1,587	302	3,365
Computer Storage Devices	3572	1,257	267	4,285
Computer Peripheral Equipment,	3577	1,111	483	2,591
Total, top 10 high tech industries		61,268	8,518	127,569

*Industry listing from America's High-Tech Economy, by Ross C. DeVol, Milken Institute, 1999.

Source: Minnesota IMPLAN Group, 1999 IMPLAN Model and 1997 IMPLAN Database

The Minneapolis-St. Paul MSA ranks third, following Dallas and Chicago, in total high-tech employment and third in high-tech manufacturing (Table 1.10).²¹ Total high-tech services employment in the Minneapolis-St. Paul MSA, while ranking fourth, leads both Chicago and Dallas in its growth over the 1991–97 period. The Minneapolis-St. Paul MSA ranked third in high-tech employment as a percent of total employment (at 12.3 percent), following Dallas (at 17.7 percent) and Denver (at 12.8 percent). This percentage dropped for Minneapolis-St. Paul and Dallas, but not Denver. Measuring Instruments & Medical Devices was the largest high-tech cluster in the Minneapolis-St. Paul MSA, as well as in the Atlanta and Denver metropolitan areas. Changes in high-tech manufacturing were generally negative while almost entirely positive in high-tech services. Employment in high-tech services was three to four or more times the employment in high-tech manufacturing, and high-tech manufacturing declined 0.9 percent. Thus, the changes in high-tech industries were confined increasingly to services over the 1991–97 period. The shift from manufacturing to services is characteristic also of other sectors—with corresponding increases in passenger enplanements and airport operations.

Table 1.10 Total high-tech employment in competing areas, 1997 and change 1991-97*

Industry	SIC Code	Mpls-		Cin-		Atlanta	Dallas	Denver
		St. Paul	Chicago	cincinnati	Detroit			
		(thou.)	(thou.)	(thou.)	(thou.)	(thou.)	(thou.)	(thou.)
Mechanical Measuring Devices	3823, 3824, 3829	6.9	3.5	0.8	3.4	0.8	2.0	1.8
Surgical and Medical Instrument	3841	6.5	4.9	0.8	0.4	1.2	1.9	3.5
Printed Circuit Boards	3672	6.3	10.2	0.1	2.1	2.4	4.5	2.3
Electromedical Apparatus	3845	6.2	0.4	0.3	0.0	0.6	1.1	1.3
Electronic Computers	3571	5.8	0.3	0.0	1.9	1.3	1.7	1.0
Automatic Temperature Controls	3822	5.0	6.5	0.1	0.4	0.3	0.1	0.1
Surgical Appliances and Supplies	3842	4.8	2.2	1.7	1.2	0.6	1.8	0.9
Computer Storage Devices	3572	4.3	0.0	0.0	0.1	0.0	0.0	6.3
Search & Navigation Equipment	3812	3.4	2.5	0.0	0.0	0.4	9.7	2.9
Computer Peripheral Equipment	3577	2.6	5.8	0.1	0.4	0.6	0.9	1.3
Semiconductors and Related Devices	3674	2.6	0.3	0.7	0.1	0.1	30.2	0.8
Telephone and Telegraph Apparatus	3661	2.4	7.7	0.0	0.0	1.8	14.6	3.5
Drugs	2830	1.4	18.4	1.8	3.1	0.9	3.0	2.8
Electronic Components, N.E.C.	3675, 3676, 3677, 3678, 3679	1.1	11.7	0.6	2.3	1.3	6.6	1.2
Communications Equipment N.E.C.	3669	0.9	1.8	0.0	0.5	0.6	1.0	0.5
Instruments To Measure Electricity	3825	0.9	1.5	0.2	0.4	0.0	0.7	0.3
Analytical Instruments	3826	0.4	0.7	0.0	0.2	0.0	0.7	0.3

²¹ High tech employment is employment in high-tech industry as defined by Ross C. DeVol, Table 2.1, “America’s High Tech Economy”—currently the most widely used definition of the high-tech industry. High tech industry clusters occur in a limited number of metropolitan areas with certain attributes that favor their development and sustainability. An increasing proportion of high-tech employment is in services. High tech manufacturing is declining in a majority of high-tech industry areas in the United States. See, also, Annalee Saxenian, “Regional Advantage—Culture and Competition in Silicon Valley and Route 128,” Rosegrant and Lampe, “Route 128—Lessons from Boston’s High-Tech Community,” Ross C. DeVol, “Blueprint for a High-Tech Cluster—The Case of the Microsystems Industry in the Southwest,” Michael Porter, “Clusters and the New Economics of Competition,” and Maki and Lichty, on medical devices industries—a case study in “Urban Regional Economics.”

Industry	SIC Code	Mpls-		Cin-		Atlanta	Dallas	Denver
		St. Paul	Chicago	cincinnati	Detroit			
		(thou.)	(thou.)	(thou.)	(thou.)	(thou.)	(thou.)	(thou.)
Optical Instruments & Lenses	3827	0.4	0.2	1.1	0.3	0.0	1.5	0.6
Radio and TV Communication Equipment	3663	0.4	22.0	0.8	0.2	4.7	9.1	0.3
Laboratory Apparatus & Furniture	3821	0.3	0.5	0.1	0.7	0.0	0.0	0.2
Typewriters and Office Machines N.E.C.	3579	0.3	1.1	0.2	0.0	0.0	0.9	0.2
Dental Equipment and Supplies	3843	0.2	1.2	0.0	0.3	0.0	0.1	0.3
Aircraft and Missile Engines and Parts	3724, 3764	0.2	0.2	9.6	1.2	0.2	3.1	0.0
Computer Terminals	3575	0.1	0.2	0.0	0.1	0.1	0.0	0.2
Aircraft and Missile Equipment	3728, 3769	0.1	1.0	0.9	0.4	0.1	12.0	0.5
Calculating and Accounting Machines	3578	0.0	0.3	0.0	0.0	0.1	0.1	0.0
Aircraft	3721	0.0	0.0	0.0	0.0	9.7	22.8	0.0
Total, mfg.		63.6	105.0	19.9	19.7	27.9	130.0	33.0
% change, 1991-97		-0.9	2.0	-6.0	2.3	3.2	-1.2	2.5
Computer and Data Processing Services	7370	44.1	63.2	9.9	53.9	58.4	74.0	49.9
Engineering, Architectural Services	8710	19.8	37.5	11.7	55.1	30.8	33.9	29.2
Communications, Except Radio and TV	4810, 4820, 4840, 4890	11.9	41.7	7.4	15.9	46.2	44.6	30.1
Research, Development & Testing Services	8730	9.9	45.6	6.9	13.9	7.4	10.3	14.0
Motion Pictures	7800	8.8	20.8	3.1	13.0	10.5	15.1	7.0
Total, services		181.7	391.2	74.9	183.6	203.3	426.5	180.0
% change, 1991-97		2.6	2.4	-1.6	4.2	8.2	0.9	7.3
Total, high tech		245.3	496.2	94.8	203.3	231.2	556.4	213.0
Total, all sectors		1,991	5,251	1,173	2,975	2,425	3,148	1,659
HiTech as % of Total		12.3	9.4	8.1	6.8	9.5	17.7	12.8
% change, 1991-97		-1.3	0.3	-5.1	2.0	2.8	-3.8	2.0

*Industry listing from America's High-tech Economy, by Ross C. DeVol, Milkan Institute, 1999

Source: IMPLAN Modeling System

Population and higher education relate to issues of long-term regional viability and economic growth, particularly as they involve the support and performance of a region's higher education system. Minnesota's support of its higher education system ranks second to Illinois among the six states. Performance, however, as measured by Science and Engineering doctorates and graduates per 10,000 population, does not always rank second. Rather Colorado and Texas, which rank sixth and seventh in funding of higher education, vie with each other in ranking first in each of the Science and Engineering measures cited in Table 1.11. Minnesota, however, ranks second on patents issued, following Texas. The important issue is, of course, the proportion of the total patents that are commercialized.

Table 1.11 Total Spending for Higher Education and Related Education Indicators, 1995

State	Per-Capita Education Expenditures* (dol.)	Science and Engineering Per 10,000 Population					
		Doctorates Awarded (no.)	Post Doctoral (no.)	Graduate Students (no.)	Doctoral Scientists (no.)	Doctoral Engineers (no.)	Patents Issued (no.)
U.S.**	673	1.0	1.4	16.4	17.3	3.3	2.3
Minnesota	743	1.2	1.7	13.8	19.0	2.9	4.2
Illinois	790	1.3	1.0	18.6	16.5	2.8	2.6
Michigan	640	1.2	1.3	18.2	13.7	3.6	3.1
Ohio	609	1.0	1.0	19.0	14.5	3.6	2.5
Georgia	605	0.8	0.8	12.3	12.9	1.6	1.3
Colorado	566	1.0	1.3	15.9	14.4	3.6	0.7
Texas	503	1.5	2.2	23.8	24.7	5.2	11.0

** Total for 50 states, District of Columbia, and Puerto Rico.

* Total current fund expenditures for higher education from all sources.

Source: Division of Science Resources Studies, National Science Foundation

Outstanding local research institutes and centers often provide the initial opportunities for professional employment of the new doctorates and graduates of a state university. Many local high-tech companies also provide these opportunities. How many of the graduates of higher education institutions remain in the state relates to the opportunities for economic and professional advancement as well as the attainment of a preferred quality of life. These are additional measures of an area's capacity for competing successfully in the global economy

1.4 Measuring the Association of Air Transportation with Exports

The air transportation industry of the Twin Cities is one its largest resident industries. It includes the resident airlines, airports, and direct service providers with total output or sales of more than \$3.8 billion. It employed 27,900 workers in 1997—an increase of 31 percent over its 1991 employment level. It added \$2.3 billion to gross area product in 1997. The air transportation industry and other providers of air transportation serve all local industries purchasing air transportation and the institutional sectors—households, state, federal, and local governments, and private capital formation—as well domestic and foreign export markets.

The air transportation industry is, also, the largest sector producing air transportation services. The Transportation Service sector and Other State & Local Enterprise account for \$66 million of the total air transportation produced in the MSP MSA in 1997 (Table 1.12). Labor earnings accounted for slightly more than \$1.6 billion, or more than 70 percent, of the total value added in 1997. The largest part of the nearly \$1.5 billion of intermediate purchases is imports, largely fuel. These purchases amounted to over \$1 billion—nearly 72 percent of the total.

Table 1.12 Air Transportation Output and Gross Demand, MSP MSA, 1997

Output Sector	Commodity Output (mil.\$)	Demand Sector	Gross Demand (mil.\$)
Intermediate:		Intermediate:	
Local	424	Industry	316
Imports	1,065	Imports	409
Total	1,489	Total	725
Primary:		Local Institutional:	
Labor earnings	1,613	H'hld, gov't, other	370
Other property income	457	Imports	390
Business taxes	206	Total	760
Total	2,276	Exports	
Industry Output	3,765	Domestic	1,954
Transportation Services	37	Foreign	1,191
State- Local Govt. Enterprise	29	Total	3,145
Imports	799		
Total, Comm. Supply	4,630	Total, Comm. Demand	4,630

Source: Minnesota IMPLAN Group, 1997 IMPLAN Database

Imports of air transportation, that is, purchases of air transportation from providers outside the Minneapolis-St. Paul MSA, were important also for all sectors of the local economy purchasing air transportation services. However, total purchases of air transportation services from local sources were only \$424 million—slightly less than seven-tenths of one percent of the total value of industry exports originating from the Minneapolis-St. Paul area. The focus of this chapter is on the role of air transportation in facilitating access to export markets and thus creating value to the local area, rather than on the local impact of air transportation purchases.

Air transportation demand originates from intermediate and institutional purchasers of goods and services. Intermediate purchases of air transportation, that is, purchases by industry, totaled \$725 million, of which imports accounted for 56 percent of the total. Local institutional purchases, that is, households, state, local, and federal governments, and related activities, totaled \$760 million, of which imports accounted for 51 percent of the total. While the intermediate purchases of air transportation increased by 78 percent from 1991 to 1997, the local institutional purchases decreased by 10 percent. Non-local institutional purchases of air transportation increased in importance during this period.

The largest sectors for the purchases of air transportation were exports—domestic and foreign—with both sectors showing increases over the 1991–1997 period (in current dollars). Foreign exports show the largest percentage increase from the 1991 recession year, not only in the United States, but for foreign export destinations as well.

The Twin Cities air transportation providers thus show increases in employment, output, and gross demand several times greater than the increase in population and income. The increased purchases of air transportation from local providers and those outside the area were exceeded only by foreign exports of air transportation, that is, purchases of locally-produced air transportation by non-resident households and businesses.

Air Transportation, which has the largest demand among all transportation sectors for its services, was more than \$4.6 billion in the Minneapolis-St. Paul MSA in 1997 (Table 1.13). The next largest, Motor Freight & Warehousing, was \$2.7 billion. The largest source of demand (of more than \$3.1 billion) originates from air transportation's export sector (the purchase of air transportation services by non-resident businesses, households, and other institutions). The communications sector exceeds air transportation in local demand. Foreign exports account for much of the above-average growth in overall demand for air transportation over the 1991–97 period. Local purchases of air transportation include the intermediate purchases of industry and the final purchases of households and government agencies.

Table 1.13 Total demand for transportation and communication services, Minneapolis-St. Paul MSA, 1997 and change 1991–97

Sector	Air Transportation (SIC45)	Railroad (SIC40)	Interurban Passenger (SIC41)	Motor Freight (SIC42)	Water Trans. (SIC44)	Pipe- lines (SIC46)	Transport Services (SIC47)	Communi- cations (SIC48)	All Sectors
Demand (mil.\$):									
Local:									
Intermediate	725	375	53	2,019	184	75	453	2,092	5,976
Institutional	759	105	276	556	122	13	48	1,585	3,464
Export:									
Foreign	1,191	82	1	153	49	3	50	41	1,570
Domestic	1,954	61	89	0	0	0	209	866	3,179
Total demand	4,629	623	419	2,728	355	91	760	4,584	14,189
Annual increase or decrease in demand, 1991 to 1997 (%):									
Local:									
Intermediate	10.1	2.2	-9.3	17.1	6.9	-5.9	11.6	17.4	11.9
Institutional	3.4	5.8	9.7	-1.6	-8.9	-1.1	8.8	15.4	6.4
Exports:									
Foreign	21.5	0.2	0.0	-0.2	32.7	5.1	42.2	13.1	16.1
Domestic	7.1	-6.8	-9.2	na	0.0	0.0	40.7	-8.1	6.5
Total demand	9.4	1.2	0.3	9.7	0.5	-5.0	17.0	5.9	8.1

Source: IMPLAN Model, 1999

The exports and, also, imports of businesses in the Minneapolis-St. Paul metropolitan area are associated with air transportation. In the base year 1991, the Twin Cities economy produced \$115 billion in goods and services. Exports—the principal measure of the area's economic base—totaled \$46 billion. Domestic exports were four times as large as foreign exports—nearly

\$37 billion compared with \$9 billion. Total industry employment was nearly 1.7 million, total labor income exceeded \$41 billion, and total value added—industry’s contribution to Gross State Product—exceeded \$67 billion. Six years later, in 1997, the Twin Cities economy produced \$190 billion worth of goods and services (Table 1.14).

Table 1.14 Air Transportation Inputs, Imports, and Exports, MSP and Competing Areas, 1997 and 1991–97

Commodity	MSP	Atlanta	Chicago	Cincinnati	Dallas	Denver	Detroit
Commodity Supply, Total (mil.\$):	189,810	236,917	559,756	107,857	332,928	153,962	358,345
Exports, Total	71,105	97,789	212,102	43,071	135,054	57,466	147,130
Air Transportation	3,145	5,688	5,887	1,507	6,362	1,623	2,382
Imports, Total	65,506	83,928	174,220	42,032	108,254	53,286	187,394
Tran. Inputs	725	930	1,956	414	1,283	530	1,406
Change, 1991-97: (percent):							
Commodity Supply, Total	8.7	11.0	7.7	7.0	10.0	9.5	7.5
Exports, Total	7.5	10.8	6.7	5.7	8.2	8.4	5.5
Air Transportation	5.8	7.8	6.4	11.7	3.3	-0.5	9.3
Imports, Total	7.6	10.2	6.9	5.9	10.1	10.1	10.7
Air Tran. Inputs	10.1	14.0	10.5	12.7	10.9	11.3	10.2

Source: Minnesota IMPLAN Group, 1999 IMPLAN Model and 1997 IMPLAN Database

Table 1.15 summarizes the listing of the top 80 domestic exports for the Minneapolis-St. Paul MSA, including air transportation. The top 80 accounts for 78 percent of the area’s total domestic exports. It accounts for a smaller share of the total for all the competing areas, ranging from 50 percent for Cincinnati to 74 percent for Detroit. Labor earnings per worker range from \$28 thousand for Cincinnati to \$35.9 thousand for Detroit. Value added per worker ranges from \$47.5 thousand for Cincinnati to \$61.8 thousand for Atlanta. The growth rate from 1991 to 1997 for total domestic exports ranges from 35 percent for Cincinnati to 88 percent for Atlanta. Because most domestic exports have destinations of less than 500 miles, air transportation declines as a percentage of total exports for areas with increasingly larger shares of total exports going to nearby destinations by truck or more distant destinations by pipeline and water, as well as truck and rail.

Table 1.15 Domestic Exports and Related Economic Indicators, MSP and Competing Areas, 1997

Economic Indicator	MSP	Atlanta	Chicago	Cincinnati	Dallas	Denver	Detroit
Domestic Exports, Total	57,456	84,687	177,450	34,606	114,442	50,059	111,839
Air Transportation	1,954	3,635	3,540	988	4,009	961	1,484
% of Domestic Exports, Total	3.4	4.3	2.0	2.9	3.5	1.9	1.3
Top 80 domestic exports, MSP ranking:							
Total Exports	52,576	67,216	124,030	20,074	75,415	35,464	102,096
Domestic	44,654	60,038	109,950	17,416	66,843	32,060	83,318
Foreign	7,922	7,178	14,080	2,658	8,572	3,404	18,778
Other Domestic Exports	12,802	24,649	67,501	17,189	47,599	18,000	28,521
Labor Earn. Per Worker	33.8	34.6	34.7	28.0	32.5	29.7	35.9
Value Added per Worker	53.7	61.8	60.9	47.5	61.1	53.8	58.6
Change, 1991-97: (percent)							
Domestic Exports, Total	55	88	46	35	67	64	30
Air Trans.	12	27	15	61	-3	-26	40
Top 80 domestic exports:							
Total Exports	74	104	53	60	74	87	35
Domestic	71	109	55	59	77	92	30
Foreign	91	66	39	67	55	50	56
Other Domestic	18	50	33	16	55	31	27
Labor Earnings Per Worker	37	36	33	33	33	34	38
Value Added per Worker	30	35	31	28	35	29	26

Source: Minnesota IMPLAN Group, 1999 IMPLAN Model and 1997 IMPLAN Database

Table 1.16 summarizes the listing of the top 80 foreign exports for the Minneapolis-St. Paul MSA, including air transportation. The top 80 account for 90 percent of the area's total foreign exports. This group accounts for a smaller share of the total for all the competing areas, ranging from 50 percent for Cincinnati to 74 percent for Detroit. Labor earnings per worker range from \$49 thousand for Cincinnati to \$55.5 thousand for Detroit. Value added per worker range \$76.3 thousand for Cincinnati to \$96.6 thousand for Dallas. Both labor earnings and value added are higher for the top foreign exports ranking. Air transportation is a larger share of foreign than of domestic exports because of the lesser competition from trucks over the longer distances. Growth in foreign exports of air transportation exceeded overall growth of foreign exports, except for Denver. The percentage shares of air transportation are lower for the inland port cities of Minneapolis-St. Paul, Chicago and Cincinnati as a result of competition from rail and water for shipments to Canada and Mexico.

Table 1.16 Foreign Exports and Related Economic Indicators, MSP and Competing Areas, 1997

Economic Indicator	MSP	Atlanta	Chicago	Cincinnati	Dallas	Denver	Detroit
Foreign Exports, Total	13,648	13,102	34,652	8,465	20,612	7,406	35,292
Air Transportation	1,191	2,054	2,348	518	2,354	662	897
% of Foreign Exports, Total	8.7	15.7	6.8	6.1	11.4	8.9	2.5
Top 80 foreign exp., MSP ranking:							
Total Exports	42,866	55,558	100,382	16,260	68,882	29,656	109,030
Domestic	30,562	46,521	76,679	11,717	55,396	23,961	78,077
Foreign	12,304	9,037	23,702	4,543	13,486	5,695	30,952
Other Foreign Exports	1,345	4,065	10,950	3,922	7,126	1,711	4,339
Labor Earn. Per Worker	48.7	48.6	49.0	41.2	46.1	44.9	55.5
Value Added per Worker	81.3	95.2	94.9	76.3	96.6	87.8	90.5
Change, 1991-97: (percent):							
Foreign Exports, Total	50	69	60	63	33	47	75
Air Trans.	139	172	142	223	118	79	166
Top 80 domestic exports:							
Total Exports	53	105	57	65	78	104	34
Domestic	53	113	56	65	87	121	22
Foreign	54	73	59	66	48	53	83
Other Foreign	23	60	60	60	11	28	30
Labor Earn. Per Worker	13	41	44	19	54	37	84
Value Added per Worker	32	42	42	36	47	42	27

Source: Minnesota IMPLAN Group, 1999 IMPLAN Model and 1997 IMPLAN Database

Communication services constitute another critical resource for global competition. Production of communication services in the U.S. amounted to \$1,126 per person in 1997, including foreign exports. Local spending for communication services was less in the North, but higher in the South and West, with Denver leading the competing areas (Table 1.17). Exports of communication services, that is, purchase of communication services by non-residents, was the second lowest for the Minneapolis-St. Paul MSA, next to Cincinnati. Dallas had the highest exports and next to highest growth rate.

Table 1.17 Communication Services, Minneapolis-St. Paul MSA and Competing Metropolitan Areas, 1997 and 1997

Metropolitan Area	Total		Exports		Total		Per Capita		Annual Change	
	1991	1997	1991	1997	1991	1997	1991	1997	Exports	Local
	(mil \$)	(mil \$)	(mil \$)	(mil \$)	(mil \$)	(mil \$)	(dol.)	(dol.)	(pct.)	(pct.)
Minneapolis-St. Paul MSA	1,319	2,654	631	908	688	1,746	266	625	6.2	16.8
Chicago CMSA	5,476	12,632	3,258	6,728	2,218	5,904	266	683	12.8	17.7
Cincinnati CMSA	1,068	1,939	580	714	488	1,225	265	634	3.5	16.6
Detroit CMSA	2,237	3,497	914	584	1,322	2,914	253	536	-7.2	14.1
Atlanta MSA	5,102	15,125	4,131	11,244	971	3,882	318	1,070	18.2	26
Dallas CMSA	3,701	12,850	2,444	8,401	1,257	4,448	304	950	22.8	23.4
Denver CMSA	3,303	10,768	2,645	8,140	657	2,628	323	1,133	20.6	26

Source: U.S. Bureau of the Census

Communication services, while generally complementary with air transportation, represent the cutting edge of the new economy and its new technologies. They allow individuals real-time exchange of ideas that can lead to a multiplication of new discoveries and innovative approaches

to existing problems and challenges. This is one of the lagging sectors of the Twin Cities economy, at least in terms of total sales, both local and export and, hence, an extremely important sector to monitor and continuously update current measures of sector performance.

Internet use introduces new and different measures of communications services. Estimates for the current year show Minneapolis-St. Paul leading the North metropolitan areas in “internet presence.” It places third in “total points” among the seven competing areas, following Atlanta and Dallas (Table 1.18). Atlanta leads in density of networked companies. Dallas leads in internet use at work and density of net businesses.

Table 1.18 Points of Internet Presence, Minneapolis-St. Paul MSA and Competing Areas, 2000

Metropolitan Area	Total Points (no.)	Internet Use		Net Busi- nesses (no.)	Density of:	City-Specific Links (no.)	Quality of
		Home (no.)	Work (no.)		Networked Companies (no.)		City-related Content (no.)
Minneapolis-St. Paul	32.3	9.2	6.6	3.3	4.2	1.9	7
Chicago	29.9	6.1	5.9	3.3	3.5	1.1	10
Cincinnati	26.3	7.8	6.2	2.3	3.2	0.8	6
Detroit	24.4	6.5	4.8	2.0	3.5	0.6	7
Atlanta	32.4	6.9	6.0	3.7	7.0	1.8	7
Dallas	33.2	7.4	7.8	4.0	4.1	1.9	8
Denver	31.5	8.0	7.1	3.3	3.9	2.2	7

Source: Yahoo Internet Life

Internet presence is still another measure of area participation in the new economy. Both communications services and internet presence require continual updating to keep pace with the changes occurring in both markets.

1.5 Comparing the Twin Cities Economy with Competing Areas

Comparisons of the export-import measures and other key economic indicators of the competing airport areas with the corresponding measures for the Twin Cities area serve several purposes, the first being the evaluation of the changing export-import balances and their implications for the Twin Cities area economy and people. A second purpose is to provide factual information for the discussion of the implications of the competing area findings for the Twin Cities area and its economy and people as discussed earlier. Again, the key indicators for the competing airport areas include the association of each area’s commodity exports with the value of its air transportation inputs.

1.5.1 Employment, Output, and Exports

International exports, while much smaller than total domestic markets, generate the higher earnings per worker among the competing large hub areas in Table 1.19. Earnings per worker of businesses exporting to international markets are 40 percent higher than the average earnings per worker in the Minneapolis-St. Paul MSA, partly because of a high proportion of high-valued manufactured products in the international sales product mix. Value added per worker, that is, the contribution to Gross Area Product, is 46 percent higher. Thus, for the Minneapolis-St. Paul MSA in 1997, each \$1 billion in total exports was associated with 7.8 thousand in basic employment, \$258 million in labor earnings and \$422 million in value added. Total exports exceeded \$71 billion. The basic employment multiplier for the total economy increases these values 3.6 times in equivalent total employment.²²

Table 1.19 Employment and Earnings of Top 80 Exports, Selected Competing Areas, 1997 and 1991-97

Commodity	Base	Exports		Per Worker		Base	Exports		Per Worker	
	Employ	Total	Foreign	LabEarn	ValAdd	Employ	Total	Foreign	LabEarn	ValAdd
	(thou.)	(bil.\$)	(bil.\$)	(thou.\$)	(thou.\$)	(pct.)	(pct.)	(pct.)	(pct.)	(pct.)
Minneapolis-St. Paul MSA:										
Total Manufacturing	136	28.0	6.3	58	81	0.7	7.2	7.5	6.1	2.8
Total Services	271	26.2	3.5	32	54	7.0	12.2	6.9	5.8	6.0
Total, top 80 total exports	407	54.2	9.8	36	58	4.2	9.5	7.2	5.4	4.7
Total, all sectors	556	71.1	13.6	33	54	2.2	7.5	7.0	5.5	5.1
Top 80 as % of all sectors	73	76	72	108	107	202	132	104	99	92
Chicago CMSA:										
Total Manufacturing	387	78.4	13.9	49	79	1.3	7.1	11.5	5.4	3.8
Total Services	691	79.7	9.1	41	75	1.6	8.9	3.4	4.9	5.1
Total, top 80 total exports	1,159	158.2	23.0	43	76	1.6	8.0	7.7	5.0	4.7
Total, all sectors	1,990	212.1	34.7	36	62	1.1	6.8	8.1	5.0	5.3
Top 80 as % of all sectors	58	75	66	119	123	145	122	94	98	90
Dallas MSA:										
Total Manufacturing	197	48.3	9.5	54	122	0.7	6.4	2.2	5.8	3.5
Total Services	582	65.2	7.2	33	61	4.2	11.3	7.1	5.3	6.0
Total, top 80 total exports	779	113.5	16.7	36	69	3.2	9.0	4.2	5.1	4.7
Total, all sectors	945	135.1	20.6	32	62	2.5	8.3	4.9	4.7	4.7
Top 80 as % of all sectors	82	84	81	110	111	129	112	85	107	100
Denver CMSA:										
Total Manufacturing	83	17.2	2.5	87	83	2.9	4.6	7.0	16.3	-2.1
Total Services	292	31.5	2.8	33	59	6.0	13.6	5.8	6.1	6.0
Total, top 80 total exports	371	48.2	5.3	35	62	5.1	9.7	6.4	5.6	3.9
Total, all sectors	438	57.5	7.4	31	55	3.7	8.4	6.6	5.0	4.2
Top 80 as % of all sectors	85	84	72	112	114	145	119	96	114	92

Source: Minnesota IMPLAN Group, 1999 IMPLAN Model and 1997 IMPLAN Database

²² Basic employment multiplier is calculated by using total employment (1,996 thousand from Table 1.3) divided by basic employment (556,000 from Table 1.19).

The top 80 commodity exports are associated with above-average increases in employment. The Twin Cities area, for example, experienced an increase in basic employment 95 percent above the overall increase for all sectors. This was associated with an increase in total exports 31 percent above the overall increase. The overall increase, however, was the second lowest among the four competing areas, with the Chicago area being the lowest. These large increases in basic employment eventually generate correspondingly large increases in total employment.

The declining manufacturing sector has the higher total exports value, but lower annual change. The highest export levels are in food products, paper and allied productions, printing and publishing, fabricated metals, industrial machinery and computer equipment, and instruments with a majority of sectors showing the higher rates of annual change.

Table 1.20 summarizes these trends and the corresponding economic projections to the year 2010 for the selected areas (with industry output represented in constant 1997 dollars). The two projection series are based on the U.S. Bureau of Labor Statistics detailed employment and output projections to 2008, which are then extended to 2010 for this study. The U.S. rates of change apply to individual three-digit industries. The high export growth relative to output for the MSP MSA relates to the area's increasing dependence on exports. The 76 percent increase in exports (in constant 1997 dollars) is the highest in the North but lags behind the South and West.

Table 1.20 Industry employment, output, and exports, competing areas, 1991, 1997, and 2010

Area	Employment				Industry Output				Total Exports			
	1991	1997	Projection 2010		1991	1997	Projection 2010		1991	1997	Projection 2010	
	(thou.)	(thou.)	US Rate	AdjRate	(bil \$)	(bil \$)	US Rate	AdjRate	(bil \$)	(bil \$)	US Rate	AdjRate
Minneapolis-St. Paul:												
Agr., mining, constr.	116	129	140	139	10	11	14	13	1	1	1	1
Manufacturing	271	290	299	352	36	54	96	104	26	38	60	67
Services	1,287	1,573	2,039	2,257	66	117	176	191	19	32	52	57
Total	1,674	1,992	2,479	2,749	112	182	285	309	46	71	113	125
Chicago:												
Agr., mining, constr.	324	330	373	331	29	30	36	31	4	2	2	2
Manufacturing	723	744	747	748	113	161	249	268	75	109	162	170
Services	3,608	4,173	5,286	5,470	200	329	489	499	61	89	142	143
Total	4,655	5,248	6,406	6,549	342	520	774	798	139	200	306	315
Cincinnati:												
Agr., mining, constr.	86	96	105	104	7	7	8	8	0	0	1	1
Manufacturing	167	167	169	181	28	36	49	51	21	27	35	38
Services	753	910	1,148	1,303	34	58	85	96	8	14	22	25
Total	1,006	1,173	1,422	1,587	69	101	142	155	29	41	58	64
Detroit:												
Agr., mining, constr.	155	191	213	233	14	16	19	21	2	2	2	2
Manufacturing	519	552	540	540	114	168	215	199	86	106	135	122
Services	1,971	2,227	2,859	3,011	95	153	225	228	16	33	51	54
Total	2,645	2,970	3,613	3,784	223	337	460	447	104	140	189	178

Area	Employment				Industry Output				Total Exports			
	1997		Projection 2010		1997		Projection 2010		1997		Projection 2010	
	(thou.)	(thou.)	US Rate (thou.)	AdjRate (thou.)	(bil \$)	(bil \$)	US Rate (bil \$)	AdjRate (bil \$)	(bil \$)	(bil \$)	US Rate (bil \$)	AdjRate (bil \$)
Atlanta:												
Agr., mining, constr.	146	189	213	245	12	16	19	21	1	1	1	1
Manufacturing	190	225	228	314	27	44	63	84	18	29	39	53
Services	1,511	2,009	2,583	3,391	82	161	258	324	32	64	106	131
Total	1,847	2,423	3,024	3,951	121	221	340	430	51	93	145	185
Dallas:												
Agr., mining, constr.	198	332	340	555	31	40	47	67	11	16	18	21
Manufacturing	352	372	400	464	50	76	143	156	33	45	78	88
Services	1,887	2,442	3,159	3,617	101	196	301	353	38	69	112	130
Total	2,437	3,146	3,899	4,637	181	313	491	576	82	130	208	240
Denver:												
Agr., mining, constr.	116	157	166	215	13	18	22	25	3	6	7	7
Manufacturing	132	141	145	218	21	28	52	69	15	16	29	38
Services	1,038	1,360	1,777	2,174	51	99	154	181	16	33	56	68
Total	1,286	1,657	2,088	2,607	85	145	228	276	34	55	92	113

Source: BLS Industry Projections to 2008; Minnesota IMPLAN Group, IMPLAN Model Database, 1999

The adjusted rates take into account differences in the area-to-U.S. rates of growth for individual three-digit industries. For most industries in each of the competing areas these rates are higher than the corresponding U.S. growth rates. Part of the lagging growth for the Minneapolis-St. Paul MSA compared to the South and West is the result of an above-average level of manufacturing—a lagging industry sector nationally.²³

Table 1.21 introduces the specific competing areas and their competitive positions in the individual commodity sectors. The export share ratio is calculated from the percentage that the specific commodity export is of the same commodity export for the aggregate competing area divided by the corresponding percentage for all exports from the given area. Thus, each of the area commodity export ratios is adjusted to the total area exports. Again, the commodity sectors cited earlier account for the highest ratios. The bold numbers identify the competing commodities, by area. The Chicago CMSA, for example, has the highest ratio (1.8) among the competing areas for Automatic Temperature Controls, SIC 3822. None of the ratios, however, are as great as the corresponding values for the Minneapolis-St. Paul MSA. The Appendix Chapter 1 tables for competing areas show the entire distribution of export ratios for the 173 sectors with commodity supply ratios greater than one. They show the Chicago manufacturing sectors as the most closely competitive with the Minneapolis-St. Paul manufacturing sectors.

²³ U.S. Department of Commerce, Bureau of the Census, 1997 Economic Census.

Table 1.21 Export Share Indices of Top 10 Exports, Minneapolis-St. Paul MSA and Competing Areas, 1997

Sector		North				South		West	Total AGG
		MSP	CHI	CIN	DET	ATL	DAL	DEN	
Manufacturing, top 10 exports, positive share change:									
Average, manufacturing, top 80, pos. chg.		2.6	1.2	1.2	0.6	0.5	0.7	0.6	1.0
Other Ordnance and Accessories	3489	10.6	0.0	0.1	0.0	0.0	0.1	0.0	1.0
Flour and Other Grain Mill Products	2041	8.4	0.3	0.1	0.2	0.0	0.4	0.3	1.0
Magnetic & Optical Recording Media	3695	7.5	0.0	1.4	0.0	0.9	0.0	1.4	1.0
Paper Coated & Laminated Packaging	2671	7.3	0.5	0.3	0.1	0.6	0.2	0.2	1.0
Surgical Appliances and Supplies	3842	6.0	0.3	3.4	0.2	0.2	0.3	0.4	1.0
Automatic Temperature Controls	3822	5.1	1.8	0.0	0.1	0.1	0.0	0.0	1.0
Surgical and Medical Instrument	3841	4.5	0.9	0.5	0.1	0.3	0.4	2.4	1.0
Blowers and Fans	3564	3.8	1.1	1.5	0.4	0.1	0.9	0.2	1.0
Stationery Products	2678	3.5	0.4	1.5	0.1	1.9	1.2	0.3	1.0
Blended and Prepared Flour	2045	3.5	1.0	1.6	0.1	0.9	0.5	1.3	1.0
Services, top 10 exports, positive share change									
Average, services, top 80, pos. chg.		1.3	1.0	1.0	0.6	1.4	1.0	1.1	1.0
Photofinishing, Commercial Photography	7334-6, 7384	2.7	1.4	0.8	0.0	1.2	0.4	1.1	1.0
Insurance Carriers	6300	2.0	1.2	1.3	0.4	0.9	0.7	1.0	1.0
Automobile Rental and Leasing	7510	1.8	1.0	0.6	0.0	1.5	1.2	1.7	1.0
Watch, Clock, Jewelry and Furniture Repair	7630, 7640	1.7	0.7	0.2	0.0	3.1	0.9	1.3	1.0
Arrangement Of Passenger Transportation	4720	1.5	1.2	0.0	0.5	1.2	0.9	1.7	1.0
Bowling Alleys and Pool Halls	7930	1.3	0.6	2.6	2.1	0.0	0.6	1.0	1.0
Credit Agencies	6102, 6733, 6790	1.3	1.0	0.4	0.4	1.1	1.3	1.6	1.0
Advertising	7310	1.3	1.4	0.8	0.5	1.2	0.7	1.0	1.0
Legal Services	8110	1.1	2.3	0.0	0.0	0.9	0.5	0.7	1.0
Wholesale Trade	5000, 5100	1.0	0.7	1.3	0.7	1.9	1.1	0.8	1.0

Source: Minnesota IMPLAN Group, IMPLAN Model and Database, 1999

While the manufacturing export shares are higher for the Minneapolis-St. Paul MSA, the apparent competition is greater for services. However, many of the services are exports to nearby areas and, hence, are not directly competitive with services in the Minneapolis-St. Paul MSA.

Calculation of export share indices based on projected levels of commodity exports would show changes in each area's competitive position for the four-digit commodity listing, as suggested by the earlier comparisons. The BLS projected output series used in preparing the projected industry output and employment series cited earlier is based on a three-digit industry classification.

1.5.2 Passenger Enplanements and Airport Operations

Air transportation has the largest demand among all transportation sectors for its services. Its rapid growth in foreign exports is a major source of its growing demand. The air transportation sector also accounts for a growing share of the growth in total commodity exports. It is directly involved in facilitating business travel to new and existing markets and moving high-valued

products to these markets. The growth in total demand for air transportation, that is, the purchases of air transportation from local sources and imports, correlates closely with growth in gross area product and population.²⁴ Passenger enplanements, for example, grow at a rate three times the rate of growth in population and six times the rate of growth in gross area product.

Total passenger enplanements are closely related to communications services and various combinations of total area population, employment, labor earnings, and exports. At this stage, an association between total population and total air passenger enplanements is interrupted by special factors accounting for sharp differences in enplaned passengers. While the listing of major air hubs is by population, the number of enplaned passengers per 1,000 varies by number of departures and the number of passengers per departure.²⁵ Revenue tons of freight and mail also differ from the rank order based on population. St. Louis, for example, has many more aircraft departures than Philadelphia although it is a much smaller metropolitan area. Similarly, Orlando and Las Vegas have more enplaned passengers and departures, respectively, than Tampa and San Diego. We show later the association between passenger enplanements and value added, for example, as well as the more rapid growth of passenger enplanements than population growth.

Table 1.22 compares the growth in domestic enplaned passengers originating and returning to the same airport in the 1990s. First, it reveals the sensitivity of the air travel market to economic cycles: the number of enplaned passengers in the U.S. declined by 3.6 percent from the peak year 1990 to the recession year 1991, but increased at a 4.7 percent annual rate from 1991 to 1997. Minneapolis-St. Paul was the only large air hub in the North or the South to increase in passenger enplanements from 1990 to 1991, along with Denver as well as San Francisco and Seattle. Secondly, it shows the phenomenal growth of air transportation in the 1990s. Minneapolis-St. Paul, for example, continued its above-average increase at a 5.0 percent rate from 1991 to 1997, a rate exceeded, however, by Atlanta as well as Charlotte, San Francisco, and Seattle.

²⁴ U.S. DOT reports (see, References).

²⁵ Further discussion of this and related points is included in the two appendices to this report—Minneapolis-St. Paul Metropolitan Area and Competing Metropolitan Areas.

Table 1.22 Total domestic passenger enplanements, selected areas, 1990, 1991, and 1997

Origin and Destination	Reported			Annual Change		
	1990 (mil.)	1991 (mil.)	1997 (mil.)	1990-91 (pct.)	1991-97 (pct.)	1990-97 (pct.)
United States	619	597	789	-3.6	4.7	3.5
North:						
North, total	138	129	160	-6.5	3.7	2.2
Chicago CMSA*	27.8	27.1	35.0	-2.4	4.4	3.4
Boston NECMA#	16.5	15.3	19.0	-7.1	3.7	2.1
Detroit CMSA*	11.0	10.2	13.3	-7.3	4.5	2.8
Minneapolis-St. Paul MSA*	8.6	8.6	11.6	0.4	5.0	4.3
St. Louis MSA#	8.8	7.9	10.2	-9.8	4.3	2.2
Pittsburgh MSA#	6.2	5.8	6.1	-7.4	0.8	0.1
Cincinnati CMSA*	4.1	4.1	5.4	-0.3	4.9	4.1
South:						
South, total	121	113	157	-6.2	5.5	3.8
Dallas CMSA*	20	19.4	23.9	-3.3	3.6	2.6
Atlanta MSA*	14.2	13.1	23.0	-7.3	9.8	7.2
Charlotte MSA#	3.7	3.5	5.5	-5.3	7.7	5.7
West:						
West, total	145	147	204	1.2	5.6	5.0
San Francisco CMSA#	28.4	29.5	39.7	3.8	5.1	4.9
Seattle CMSA#	10.5	10.6	17.6	0.2	8.9	7.6
Denver CMSA*	11.9	12.0	16.0	0.3	5.0	4.3

*Designated competing airport area # Comparison area

Source: FAA, U.S. Department of Transportation, 1999.

The Federal Aviation Administration has produced projected enplanement levels for 2002 and 2010 in its Terminal Areas Forecast report (Table 1.23). The projected annual increases extend the relatively high growth rates (relative to population) of the 1990s to 2010 for a majority of the selected airports, including Minneapolis-St. Paul.

Table 1.23 Total passenger enplanements, selected airports, 1997, 2002, and 2010

Originating Airport	Reported	Projected		Annual Change		
	1997 (mil.)	2002 (mil.)	2010 (mil.)	1997-02 (pct.)	2002-10 (pct.)	1997-10 (pct.)
North:						
Chicago O'Hare	32.6	37.9	46.3	3.0	2.5	2.7
Boston Logan	12.7	14.6	16.9	2.8	1.8	2.2
Detroit Wayne County	15.9	20.3	27.4	5.1	3.8	4.3
Minneapolis-St. Paul/Wold Chamberlain	14.1	17.5	22.9	4.4	3.4	3.8
St. Louis	14.1	17.3	22.4	4.1	3.3	3.6
Pittsburgh	10.3	12.4	15.6	3.6	2.9	3.2
Cincinnati/Northern Kentucky	9.5	13.2	19.2	6.8	4.7	5.5
South:						
Dallas/Ft. Worth	28.9	36.3	48.2	4.7	3.6	4.0
Atlanta	31.6	36.5	44.3	2.9	2.4	2.6
Charlotte/Douglas	11.2	13.4	16.9	3.7	3.0	3.3
West:						
San Francisco	19.4	24.4	30.3	4.7	2.8	3.5
Seattle-Tacoma	12.3	14.9	19.0	3.9	3.1	3.4
Denver	15.7	18.1	22.0	2.9	2.4	2.6

Source: Terminal Area Forecast Fiscal Years 1997-2010, FAA, U.S. Dept. of Trans., 1999

The annual change in total enplanements for the Minneapolis-St. Paul area for both the reported period from 1991 to 1997 and the projected period from 1997 to 2010 is well above three percent per year. A slight slowdown is projected for the Minneapolis-St. Paul airport from 1997 to 2002—4.4 percent to 3.4 percent, followed, however, by an increase from 2002 to 2010. This is a pattern followed, varying degree, by each of the selected airports.

The FAA airport operations projections show annual change rates below those for enplanements because of an increasingly larger number of enplanements per operation anticipated in future years (Table 1.24). These rates vary from 1.5 percent for Chicago O’Hare and Atlanta to 3.8 percent for Cincinnati/Northern Kentucky. The Minneapolis-St. Paul airport, with an annual change rate of 2.2 percent, ranks fourth among the seven competing airports and fifth among the 13 selected airports.

Table 1.24 Total airport operations, selected airports, 1997, 2002, and 2010

Originating Airport	Reported			Projected			Annual Change		
	1997 (thou.)	2002 (thou.)	2010 (thou.)	1997–02 (pct.)	2002–10 (pct.)	1997–2010 (pct.)			
North:									
Chicago O’Hare	892	967	1081	1.6	1.4	1.5			
Boston Logan	473	492	520	0.8	0.7	0.7			
Detroit Wayne County	547	628	758	2.8	2.4	2.5			
Minneapolis-St. Paul	496	558	658	2.4	2.1	2.2			
St. Louis	528	585	676	2.1	1.8	1.9			
Pittsburgh	454	499	571	1.9	1.7	1.8			
Cincinnati/Northern Kentucky	413	513	674	4.4	3.5	3.8			
South:									
Dallas/Ft. Worth	903	1068	1334	3.4	2.8	3.0			
Atlanta	785	852	958	1.7	1.5	1.5			
Charlotte/Douglas	473	520	594	1.9	1.7	1.8			
West:									
San Francisco	454	516	615	2.6	2.2	2.4			
Seattle-Tacoma	407	455	532	2.3	2.0	2.1			
Denver	463	508	580	1.9	1.7	1.7			

Source: Terminal Area Forecast Fiscal Years 1997–2010, FAA, U.S. Dept. of Transportation, 1999

The FAA projected airport operations for the Minneapolis-St. Paul International Airport from a later report covering only the Minneapolis-St. Paul International Airport for the period from 1998 to 2013 show an annual rate of change of 2.8 percent—an increase of 243 thousand

operations from 481 thousand in 1998 to 724 thousand in 2013.²⁶ This forecast would be equivalent to 876 thousand operations if extended to 2020.

Forecasts of total airport operations are critical values for planning airport capacity expansion. In a December 1993 report to the Federal Aviation Administration (FAA), the Metropolitan Airports Commission of the Twin Cities produced two projected values for 2020—530 thousand operations in a Future 1 scenario and 600 thousand operations in a Future 2 scenario for the Minneapolis-St. Paul International Airport.²⁷ These are annual increases of 0.8 percent and 1.3 percent, respectively, from the 420 thousand airport operations in 1992. The 1993 plans were updated in a 1996 report, but not the forecasts.²⁸

The summary tables thus compare key economic indicators, starting with total industry and commodity output, total exports, and employment and population. These comparisons suggest a rapidly growing demand for air transportation with the Minneapolis-St. Paul MSA leading the competing areas in the North but lagging the competing areas in the South and West.

In considering the relationship between air transportation and the regional economy, it is important to consider two central facts about air transportation's role in today's economy:

- Lack of adequate air access is a clear signal for the industries dependent on air transportation to seek other metropolitan areas.²⁹ The loss of such industries occurs quietly, without much advance notice of their location preferences.
- The information these industries now have reveals years in advance likely limitations of the essential facilities and services—the critically important infrastructure—for reaching their distant markets.

²⁶ Federal Aviation Administration Office of System Capacity, U.S. Department of Transportation, 1999 Aviation Capacity Enhancement Plan, December 1999.

²⁷ Federal Aviation Administration, U.S. Department of Transportation, Minneapolis-St. Paul International Airport Capacity Enhancement, December 1993.

²⁸ Federal Aviation Administration, U.S. Department of Transportation, Minneapolis-St. Paul International Airport Capacity Enhancement Terminal Airspace Study, Minneapolis-St. Paul International Airport, Summary Report, August 1996.

²⁹ Likely limitations of air access to domestic and foreign markets are among decision parameters taken into account by air transportation-sensitive industries, as noted in Ross DeVol, "Blueprint for a High-Tech Cluster—The Case of the Microsystems Industry in the Southwest" and "America's High Tech Economy." The high proportion of foreign exports among certain industries, e.g., high-tech, is another measure of dependence on air transportation. See, also, Maki and Lichty, *Urban Regional Economics*, pages 195-246, for a critical discussion of the role of forecasts and related information in business decisions and pages 457-9 for references on "economic sector sensitivity to air access."

Stephen Huber, co-author with Kenneth R. Foster of “Judging Science” notes: “Industries are built on a vast, fast-growing infrastructure of systemized knowledge. Systematic inquiry is superceding the traditional tools of legal process, too.”

1.6 Conclusions

This chapter has presented an analysis of the Minneapolis-St. Paul area’s economy in terms of air transportation facilities; for comparison, several competing metropolitan areas have been analyzed in a similar manner. The result is a macro-economic snapshot of the air transportation market and its significance to the Minneapolis-St. Paul area.

Analysis of this data confirms the sensitivity of the air travel market to economic cycles: the number of enplaned passengers in the U.S. declined by 3.6 percent from the peak year 1990 to the recession year 1991, but increased at a 4.7 percent annual rate from 1991 to 1997.

Minneapolis-St. Paul was the only large air hub in the North to increase passenger enplanements during the recession period; among the areas identified as economic competitors, only Denver, San Francisco and Seattle in the West did the same.

The growth in total demand for air transportation also correlates closely with growth in gross area product and population. Passenger enplanements, for example, grow at a rate three times the rate of growth in population and six times the rate of growth in gross area product.

Comparison of key economic indicators (including total industry and commodity output, total exports, employment, and population) suggest a rapidly growing demand for air transportation. Demand in the Minneapolis-St. Paul MSA is predicted to lead the North, but be outpaced by competing areas in the South and West. In terms of the ability of Minneapolis-St. Paul’s air transportation infrastructure to accommodate this future demand, MSP projections for 2020 fall short of the actual growth trends in airport operations projected by the FAA. This may represent

a potential economic liability for the area, because industries dependent on air transportation are strongly motivated to seek metropolitan areas with superior air-transportation infrastructure.³⁰

³⁰ Chapter 1 deals with the association among variables at the regional level, focusing on domestic and foreign commodity exports and, specifically, air transportation exports. Clearly, industries dependent on air transportation would avoid areas with only limited air access to distant clients and export markets. See, Michael Porter, “Clusters and the New Economics of Competition” and Ross DeVol, “America’s High Tech Economy.” Findings from both Chapter 1 and Chapter 2 and the integration of these findings in Chapter 3 was the original plan of study to help quantify the importance of air access for air transportation sensitive industries. This remains an important task in the building of the knowledge base as discussed in Chapter 3.

2. Purchasing Processes for Air Transportation Services

2.1 Introduction

This chapter reviews purchasing practices and distribution systems for air cargo and business air travel. The information is gathered from secondary sources as well as primary data generated from interviews with corporations, freight forwarders, integrated cargo carriers, travel agents, and airport managers.

Secondary sources included documents supplied by the Metropolitan Airport Commission (MAC). Primary data came from interviews conducted with various people including:

- Personal interviews with four travel managers and two telephone interviews with travel managers at different companies, all located in the Twin Cities Metro area. Travel managers represented firms of significant size in various industries.
- Extensive interviews over time with two representatives of MAC.
- Personal interviews with three freight forwarders, and representatives from UPS and FedEx, all located in the Twin Cities Metro area. A personal interview with a senior executive of the Twin Cities Air Cargo Association. Attendance at a TCATF meeting where the featured speaker was a senior executive of Northwest Airlines' Cargo Division.
- Personal interviews with travel agency executives at three different agencies. The travel agencies included the largest in the Twin Cities Metro area, a mid-sized and a small agency.
- Telephone requests for information (followed by the faxing of a three-page survey request)³¹ were conducted with various airport managers around the country. The airports contacted included Detroit, Cincinnati, Chicago (O'Hare), Chicago (Midway), Dallas/Ft. Worth International Airport, Dallas (Love Field), Atlanta, Denver, St. Louis, Charlotte, and Pittsburgh. All airport contacts were very cooperative but the amount of usable information given to us varied by location.

There are two concentric rings of airport users. The inner ring consisting of air transportation industry participants, including carriers, freight forwarders, corporate travel managers, etc.; these "insiders" are heavily involved and knowledgeable about the inner workings of the air transportation industry. In contrast, the outer ring consists of the much larger universe of business travelers and cargo shippers. These groups are much less involved with the air

³¹ Survey and other documents used in interviews are reproduced in the Appendix.

transportation industry, and lack the insiders' detailed knowledge. Very different methods are needed to track the delivery of services to these two groups.

2.2 Distribution Channels for Air Cargo Services

There are at least two channel alignments through which airfreight services are distributed; the traditional logistics chain (TLC) and the integrated logistics chain (ILC). Each is discussed in turn.

The TLC is made up of a number of firms specializing in a particular aspect of the total distribution process. For example, such chains typically involve the shipper (customer), freight forwarder, and carriers. Generally all of these "players" are independent firms, i.e., integration is not common in the TLC. In addition to the three primary players, there may be supporting roles depending on the nature of the shipment and the capacity of the current chain members. For example, on international shipments, customhouse brokers are used to manage the movement of the shipment through customs. Also, separate drayage firms may be used when the forwarder does not have this capacity. The key player in the TLC is the forwarder as they represent a linkage between the shipper and air carrier who actually performs the service.

The way freight forwarders contribute value to the distribution process is to take a number of small shipments tendered by a variety of shippers and consolidate them into larger shipments. Because of the larger shipments, e.g., full containers, the forwarder is able to negotiate a lower rate with the air carrier and pass some of those savings back to the shipper by charging less than the shipper would pay if it tendered the small shipment directly to the air carrier. The forwarder may also provide other services such as warehousing, packaging and managing foreign trade zones. In general, there is a migration of forwarders toward providing more integrative services for their clients so the list of services provided by these middlemen will continue to expand.

The role of the airline in the TLC also needs explanation. Regarding MSP, all freight handled by Northwest Airlines moves in the belly of the aircraft. That is, there are no dedicated cargo-only flights from MSP. Under these circumstances, the aircraft serves three markets simultaneously; passengers with baggage, the U.S. Postal Service, and freight tendered by freight forwarders. Of the three segments, freight has the lowest priority and consequently moves "at the convenience

of the carrier.” Thus, if baggage or mail displaces cargo, then the cargo will wait for another flight. As a result, airfreight shipments, through the TLC, generally experience longer and greater variance of transit times. Further, according to interviews, the carriers may not always notify the forwarder of the delayed shipment in a timely manner, causing uncertainty to the shipper. Note that the carrier may not even know who the original shipper is since the forwarder is listed as consignor.

In general, there are no long-term commitments between the players in the TLC. Forwarders will contract with air carriers for a particular amount of belly capacity but these can be of short duration and may not require the carrier to provide guaranteed service. The net result is that there is very little coordination between two of the primary players in this channel—the forwarder and the air carrier.

The integrated logistics channel (ILC) provides a stark contrast to the traditional channel. UPS and FedEx are the best examples of the integration of freight services. These firms have integrated the air and ground carrier services to provide centralized control over the movement of the shipment. They also have a variety of other services including warehousing, parcel tracking and special services. These carriers focus only on freight and employ a hub and spoke strategy, e.g., FedEx routes shipments to Memphis and other hubs where they are sorted and consolidated by destination and then reshipped to the appropriate airport. Various levels of service exist including guaranteed overnight, second morning delivery, etc. In addition to UPS and FedEx, there are other firms offering similar services, e.g., DHL, as well as integrated services provided by so called third party logistics providers (3PLs). These are firms who have contracted with air and ground transportation firms similar to freight forwarders. In addition, however, they have developed information systems to provide additional services such as order management, inventory control as well as shipment tracing. When firms outsource their logistics function, they normally select 3PLs who manage the entire transaction. Contracting between integrated carriers and their clients is common and often the relationship focuses on client-specific specialized services.

The differences between the TLC and ILC can be summarized as follows:

- The TLC is made up of individual players operating “at arm’s length” while the ILC has integrated assets under single management for greater control and service.
- The TLC provides emphasis on low price with adequate service. The ILC provides higher levels of service at a substantially higher price.

The trends in freight shipping are for smaller shipments and more emphasis on service, e.g., fast and timely delivery. Thus, the future trend tends to favor the ILC, a fact which also contributes to the growth in 3PLs.

2.3 Significance for the Minneapolis St. Paul International Airport

When assessing the competitive position of an airport, geographic location becomes a critical dimension. While MSP enjoys significant access to the rest of the country and to global markets, other cities, namely Chicago, are better situated. There are a number of reasons for this. Chicago has long filled the role of the country’s transportation center, first with railroads then with highways and finally with air traffic. Note that in the case of movement of freight, shipping companies, i.e., freight forwarders, have evolved from using rail to truck to air transportation. However, over time Chicago has remained the major headquarters location for many transportation firms and a natural geographic point for them to consolidate freight. Thus, one of Chicago’s advantages is that, as the market leader, it has the existing infrastructure to effectively handle large volumes of freight. Another is that O’Hare represents a major point for virtually all domestic and international air carriers. Thus, there is ample competition to keep rates low while providing wider access to global markets than would be available from MSP. The conclusion is that Chicago, by virtue of its history and its current infrastructure, acts as a natural draw for air cargo shipments. Chicago is able to attract sufficient volume to offer economies of scale to its carriers.

One other factor acts as a barrier to entry of other cities in challenging Chicago’s dominance in airfreight. Ironically, it relates to infrastructure and the ability to access O’Hare by truck as opposed to air; specifically, the issue concerns the interchange of air cargo between carriers at O’Hare. Interviews with freight forwarders revealed the conventional wisdom that it is easier to access O’Hare by delivering a container by truck as opposed to air. That is, it is more efficient to

have an air cargo container arrive at O'Hare by truck than it is by another airline. As an example, 10 domestic pure-cargo carriers and 16 pure-cargo international carriers serve O'Hare. MSP is served by a much smaller array of international carriers, none of whom offer pure cargo service. Global shippers face the option of air-freighting a shipment to Chicago and have it connect with another carrier at O'Hare or truck it directly to the connecting carrier at the airport. The economics, as well as transit time objectives, favor overnight truck shipments to O'Hare.

As evidence of Chicago's dominance over MSP, note the following data generated through interviews with freight forwarders:

- Every night more than 40 trucks leave the Twin Cities with freight destined for Chicago (O'Hare), most of the cargo comes from forwarders but some is shipped by airlines or integrated cargo carriers. This is the equivalent of four full 747 aircraft. Even UPS trucks shipments to Chicago when they are destined internationally.
- Northwest 747 freighters are used for transpacific freight shipments only and do not cycle through MSP except for maintenance purposes. Northwest deploys its 747s from New York (Kennedy), Chicago (O'Hare), Los Angeles and San Francisco. Note that none of the carrier's hubs are involved in major freight shipments providing evidence of the differences in the flows of freight and passenger traffic.
- Freight forwarders perceive that customs services are less flexible at MSP than at Chicago causing some difficulties with international shipments.

O'Hare generated approximately 1.243 million metric tons of freight and express in 1997. Pure cargo carriers (including UPS and FedEx) accounted for 45% of the total, while combination carriers, (belly freight and passengers) accounted for the remainder. The total is split almost perfectly between international (49.2%) and domestic (50.8%). The amount of square footage that supports cargo operations is not available, but an idea of capacity can be gained by considering the network of carriers serving the airport. Of the combined passenger and cargo airlines serving O'Hare, there are 10 domestic and 27 international carriers. A total of 10 domestic airlines and 16 international carriers offer pure cargo service. In contrast, MSP is served by six pure cargo carriers (including the two express giants), and seven domestic airlines offering both passenger and cargo service. It is not served by any international carrier offering pure cargo service.

MSP generated 251,555 metric tons of freight in 1997—barely 20% of O'Hare's tonnage (Table 2.1). Total freight volume has remained remarkably stable over the period 1995–1999. Note

that “Freight & Express” appears to enjoy a complementary relationship with Mail, yielding a very stable total. The difference in total freight including mail between 1995 and 1999 is 0.35%. Note that the volume of Freight & Express expands as Mail contracts; this is discussed below.

Table 2.1: Metric Tons of Cargo and Mail In and Out of MSP, 1995–1999

Year	Freight & Express	Mail	Total
1995	241,968	123,235	365,203
1996	239,746	121,916	361,662
1997	251,555	127,562	379,117
1998	240,817	125,530	366,347
1999	248,925	117,541	366,466
% Change 95–99	2.88%	-4.62%	0.35%

The movement of cargo through MSP is very balanced when both freight and mail are considered. Looking at 1999 data provided by MAC, the ratio of inbound/outbound cargo (deplanements/enplanements) is .976 for major airlines, .546 for regional carriers and .989 for all-freight carriers. Without mail, major carriers bring in about 26% more freight than they take out of the area. In other words, outbound mail is used to offset the greater amount of cargo coming into the airport. Regional carriers are not able to take advantage of significant mail traffic and their imbalance is in the reverse direction, i.e. from MSP to smaller communities. The significance of this observation is that the economics of air cargo are highly sensitive to balanced traffic patterns. For example, in order for major carriers to increase the amount of traffic coming into MSP, they would have to increase the outbound traffic as well in order to maintain balance. In effect, this is a type of capacity constraint for future growth.

It is also worth noting that MSP is currently short of cargo space and has plans to increase it substantially. While the data will not allow a direct comparison with Chicago, Table 2.2 is insightful relative to other airports.

Table 2.2: Air Cargo Facilities, Selected Airports, 1997

	Freight (mt, 1997)	Cargo Space (sq. ft.)	sq. ft./metric ton
Atlanta	628,230	2,000,000	3.18
Charlotte	221,906	450,000	2.03
Chicago	1,243,750	n/a	
Cincinnati	399,869	n/a	
Denver	482,032	900,000	1.87
MSP (current)	251,555	324,215	1.29
St. Louis	135,959	233,500	1.72

MSP has the smallest amount of space to support a metric ton of air cargo of any of the airports where data is available. This may imply that MSP is less cargo-friendly than other hubs (such as

Atlanta), or that it may be capacity-constrained. Such a constraint leads to higher operating costs for the freight carrier. However, plans call for MSP to double the size of its air cargo facilities over the next couple of years. Given the planned expansion, and holding the metric tons shipped constant, the square feet/metric ton for MSP would be 2.59, second only to Atlanta in the above comparison. Shippers will always follow the course of least resistance, measured in costs, in moving their freight. While MSP expansion will help it compete with similarly sized hubs, the above revelations support the perceptions of the market that Chicago will continue to dominate other airports in the Midwest—at least for traditional airfreight.

It is also true that integrated carriers represent the growth segment of the market. Because of this, integrated carriers are making significant investments in their facilities and gaining increased market share from traditional freight forwarders. This is certainly true at MSP, where the integrated carriers are driving the expansion of cargo space. For example, integrated carriers such as FedEx, UPS, DHL and so on, account for 82% of the expansion of cargo space. The fact that they are willing to make these investments is a strong indication that MSP will continue to play a major role in the future.

2.4 Distribution Channels for Business Airline Passenger Services

The distribution of business passenger airline services also follows two primary distribution channels, through travel agents performing traditional services or dealing directly with airlines where travel agents manage the negotiated contract between the carrier and the client.

The four largest agencies are: American Express Travel Related Services Company, Carlson Wagonlit Travel, WorldTravel Partners, and Rosenbluth International. All four companies derive the vast majority of their revenue from business travel and provide traditional services as well as managing negotiated contracts between their clients and the airlines.

Travel agencies will often align with a specific Computer Reservation System (CRS)—usually the system owned by the dominant airline in the regions served by the agency. Aligning with the CRS of a locally dominant airline has many benefits including the chance for override commissions, the issuance of free tickets for agency use, and system benefits such as preferred wait-list clearance or extended ticketing deadlines. To a certain extent the nature of the deals

between dominant airlines and travel agents function as a barrier to entry for new carriers. The situation is analogous to trying to enter a new market when all of the primary distributors are occupied by competitors.

The agency's alignment with a CRS involves bonuses to the agency affected by the level of bookings. (Airlines generally pay the CRS a per-ticket fee.) Most agency CRS agreements are for five years. If the agency does not extensively use the CRS for the full period of the contract, large penalties may be incurred. Thus, these agreements represent something of an exit barrier for the agency in that, if business declines, the agency may not be able to justify termination of the agreement. Industry observers anticipate that a shakeout will occur among small travel agents as CRS agreements are renewed over the next few years.

Traditional services involve the payment of *commissions* to the travel agent for booking tickets using *published* fares (Airlines Reporting Corp. fares or ARC). Both large and small agencies will offer traditional services. In terms of business travelers, smaller firms are most likely to use these services. Firms with larger travel budgets will be candidates for negotiated agreements with the airlines.

Approximately five years ago airlines began reducing the commissions paid to travel agents—unilaterally. Commissions are now at a level of 5%, not to exceed \$50, for domestic tickets and \$100 for international tickets. Agencies, both small and large, have begun charging clients supplemental fees to compensate for the reduction in commission revenue. These fees may be \$10/ticket or \$20 per itinerary and are most common in the leisure travel segments.

Managing negotiated fares changes the role of the travel agent. In a deregulated environment, client firms are able to negotiate special rates directly with airlines (sometimes with the help of a designated travel agency). These result in *unpublished rates* and agreements that can either involve front-end discounts or rebates once a certain level of activity has been achieved. Aside from volume, a common characteristic of these negotiations is that a certain percentage of all company travel is on the designated airline. Firms relying on negotiated rates will often designate a single travel agent to manage the arrangement.

Our survey of business travelers shows that approximately 21% of responding business establishments have some sort of contract with an air carrier. Approximately 86% of establishments having contracts are relatively large establishments, having more than 50 employees.³² Manufacturers are most likely to have such contracts but they exist in all forms of business.

An additional benefit of these agreements is the accelerated accumulation of frequent flier miles for the traveling employee. Most employers adopt the view that frequent flier miles will accrue to the employee as additional compensation for traveling. Since negotiated contracts consolidate travel on a few preferred carriers, miles accrue more quickly than if spread over many carriers. In the final analysis, such negotiated agreements, which require firms to consolidate business with a single carrier, along with frequent flier programs, represent a significant barrier to the entry of new airlines into the market. That is, such loyalty programs create a significant switching cost for the traveler. Further, in order to enter the market, a new carrier has to do so on a significant scale, because frequency of flights is an important criterion in the business travel segment.

Travel agencies that are part of these corporate arrangements often rebate their commissions to the corporation and are paid a flat processing fee per ticket issued. The tremendous volumes involved in these deals, coupled with a modest processing fee, make these deals profitable for the agencies. They are not affected by the lowering of commissions, as are agencies that process most of their tickets using published fares, and do not worry if commissions will be lowered further. In effect, their role has changed from being an intermediary to one of transaction processor.

2.5 The Business Passenger Travel Market in MSP

Table 2.3 shows that MSP is in the middle of the pack with respect to common traffic measures like domestic origination-destination passengers (O-D). It is substantially smaller than Chicago, Detroit, Atlanta, Denver, and slightly larger than St. Louis. It is also smaller than Dallas-Ft.

³² 50 employees was our size cutoff separating large and small establishments. Establishments with fewer than 50 employees constituted 54% of the sample.

Worth but approximately twice as large as Cincinnati, Pittsburgh and Charlotte. Although these data do not break out business travel and leisure travel, we would expect that these relative size rankings are likely to be robust. However, Table 2.3 also indicates that yields per passenger mile at MSP are greater than Chicago, Detroit, Atlanta, Denver and St. Louis. MSP is comparable with Dallas-Ft.Worth and below Cincinnati, Pittsburgh and Charlotte. However, to get a clearer picture of the nature of business travel at MSP, we need to go beyond these aggregate data. To this end, we collected primary data about business travel at MSP.

Table 2.3: Hub Airport Volume, Average Fares and Yields for Domestic Origination-Destination Passengers, 1997

City, Airport	O-D Passengers	Average Fare (\$)	Yield/pas-mi	% change 91-97
Chicago, ORD	26,976,350	170.63	\$0.181	1.05
Atlanta, ATL	23,045,250	151.05	\$0.183	-2.65
Dallas-Ft. Worth, DFW	18,547,320	185.73	\$0.190	0.54
Denver, DEN	16,009,370	152.03	\$0.145	-0.67
Detroit, DTW	13,280,340	151.31	\$0.163	0.63
Mpls.-St. Paul, MSP	11,559,320	190.51	\$0.191	1.57
St. Louis, STL	10,183,280	140.47	\$0.175	-0.09
Pittsburgh, PIT	6,075,930	183.87	\$0.225	2.24
Charlotte, CLT	5,488,600	187.98	\$0.256	1.15
Cincinnati, CVG	5,395,150	179.11	\$0.221	-0.22

Source: USDOT OD1A

2.5.1 Survey Methodology

Understanding business travel patterns and the satisfaction of these users of air services requires a very different methodology compared to the interviews used to develop the data about participants in the air cargo business and the intermediaries in the air travel business. Given the large population of business establishments involved here, a *key informant questionnaire survey* is more appropriate. Unlike consumer surveys, where we gather information from respondents about their own opinions and behavior, we need to gather information from individuals who are able to provide us with credible information about their business locations. As these individuals are reporting on behalf of their establishments, they are called key informants. These key informants must be knowledgeable about overall air travel patterns at their establishments.

2.5.2 Sample

We conducted a mail questionnaire with key informants at approximately 1,600 businesses. Our sample of informants was obtained from a commercial list firm that maintains lists of business

addresses organized by job title and location. In larger organizations, we asked for travel managers to serve as our informants, while general managers and/or owners were used as informants in the smaller establishments.

We mailed the questionnaire to these individuals with a cover letter and a stamped self-addressed envelope. As an incentive to participate, we offered to provide them with a summary of the survey results. Approximately 622 surveys were returned within a three-week cutoff period for a response rate of 39%. This is a high response rate and is an indication of the interest by the traveling public in airport services. Manufacturing establishments constituted 68% of the returned surveys; 13.5% were from service organizations and the balance of responses split between administrative agencies, retail and other.

2.5.3 Penetration and Intensity of Business Travel

Approximately 74% of the surveys reported that people traveled to and/or from their location via MSP in the last year. This large penetration of air travel is consistent with the macro-level data on the pervasive usage of the service across industries.

Of those establishments reporting any air travel in the last year, the *average* number of round trips taken involving MSP was 193. However, the *median* number of trips was 50 trips/year. This skewed pattern of intensity of usage is not unexpected given the small number of very large establishments that exist in any business sample. Overall, our informants possess a significant base of travel experience with which to form credible perceptions about their patterns of travel, the role of air service, and their quality rating and satisfaction with air service.

2.5.4 Response Format and Benchmarks

All of the ratings are recorded on a five-point Likert scale format where 1 is “Strongly Disagree” and 5 is “Strongly Agree.” The value of 3 is intended to be the neutral point of the scale, i.e., any value less than 3 indicates disagreement with the statement while a response greater than 3 indicates agreement. The average scores are summarized in the following tables. In order to understand the implications of these ratings scales, we rely on *internal and external benchmarks*.

Internal benchmarks are summary measures such as averages and medians of the responses. Another internal benchmark used is the percentage of responses in the “top box” or “top two boxes” compared across repeated surveys over time. Our survey provides a benchmark for compiling such time trend data. Internal benchmarks can also be compared across relevant groups to make inferences. For example, non-metro residents can be compared to metro-area residents to reach conclusions about differences between them. We undertake such comparisons later in this section.

We also apply external benchmarks available from other surveys. Customer satisfaction surveys are conducted routinely in industry, and they utilize formats identical to our five-point Likert format. Numerous studies of these types of customer satisfaction questions reveal two important conclusions. First, the distribution across the five boxes is typically very skewed. A large majority of products and services firms’ customers typically respond in the top two boxes. Thus, it is common to find 75% of responses in the top two boxes. For instance, in a particularly well-documented case, Xerox, the 1989 Malcolm Baldrige National Award winner set a satisfaction target of “two top boxes” of 90% in 1990 climbing to 97% in 1992 and 100% in 1993!

The American Customer Satisfaction Index (ACSI) program at the University of Michigan Business School provides additional benchmarks for satisfaction scores across industries and companies over time. These data are particularly useful in adapting overall benchmark scores to account for a low-scoring sector. For example, the ACSI comparisons in Table 2.4 indicate that airlines are a low-scoring industry compared to the national average and other sectors like durable goods manufacturers. The variation across companies within a sector or industry is also significant as seen by comparing Federal Express with USPS, or comparing Northwest Airlines to Southwest Airlines. Based on these data, we can set feasible targets for MSP satisfaction scores.

Table 2.4 Selected American Customer Satisfaction Indices: Benchmarks (0-100 point scale)

Sector	ASCI Baseline (1994)	Q1 2000	Q2 2000
<i>U.S. SCORE</i>	74.2	72.5	72.8
<i>PARCEL DELIVERY</i>	81	81	--
Federal Express	85	83	--
USPS (Express)	69	75	--
<i>AIRLINES (SCHEDULED)</i>	72	63	--
Southwest Airlines	78	70	--
Delta	77	66	--
United Airlines	71	62	--
Northwest Airlines	69	62	--
<i>MFG-DURABLES</i>	79	77	--
<i>ELEC UTILITIES</i>	75	75	--
<i>LOCAL TELECOM</i>	79	--	--
US West	77	64	--

Source: American Customer Satisfaction Index, University of Michigan

One conclusion to be drawn from Table 2.4 is that satisfaction surveys are generally skewed toward the high end of the scale, e.g., the U.S. average is approximately 75%, with some firms and industries scoring substantially higher. This is very important in terms of interpreting the survey data that follows. Another conclusion is that the airline industry collectively, and some airlines in particular, do not rate well regarding customer satisfaction. This is important since an argument can be made that attitudes toward the airline(s) will also be applied to the airport.

2.5.5 Content Areas of Questionnaire

Our informants were asked to respond to questions in two content domains. The questions in Table 2.5 asked about the role and importance of air travel at their business location, and these constitute the first content area. The set of questions in Table 2.6 measuring the respondents' evaluation of and satisfaction with MSP constitute the second content area. We derived these specific questions from exploratory interviews with travel agents and corporate travel managers.

Table 2.5: Role of Business-related Travel

Item	Mean Score
Travel is a vital aspect of our business	3.91
We expect these trips to increase in the future	3.55
Telecommunications is reducing the need to travel in our business.	2.93
It is easy to travel to and from our location through the Twin Cities airport	3.29
Most of our trips use non-stop flights	3.43

Our interpretation of these data in Table 2.5 is that it validates our assumption in the macro-level analysis that there is no good substitute for business air travel, e.g., not even telecommunications. For example, over 50% of all respondents chose the “top box” of strongly agree when responding to traveling as vital. The response is even stronger when considering

larger establishments and those with contractual arrangements for air travel. Further, we can conclude that these users expect their travel demand will continue to increase in the future.

Table 2.6: Evaluation of MSP

Item	Mean Score
Usually we have access to reasonable fares	2.51
Usually we have access to convenient schedules	3.43
Usually we have access to convenient ground transportation to and from the airport	3.31
Overall we are satisfied with the Twin Cities airport	3.34
All things considered, the Twin Cities airport meets our travel needs	3.43

Table 2.6 reflects the perception by respondents that fares are not reasonable at MSP. The other service dimensions of convenient schedules and ground transportation appear to be modestly positive but some level of ambivalence exist on the part of respondents. We can rely on an internal benchmark to validate our interpretation. Recall that over 50% of the respondents indicated the “top box” in response to the question about the vital nature of business travel (See Table 2.5). One would expect similar numbers of responses in the “top box” for the evaluative criteria. However, very few respondents picked “strongly agree” relative to ground access (14%), needs fulfillment (7%) and overall satisfaction (10%).

Applying the external benchmarks from the Xerox case or the ACSI scores reinforces this interpretation. First, the data patterns underlying the summary scores in Table 2.6 are not close to the fraction of top box responses found in industry satisfaction studies as represented by the Xerox data described above. Even if we adjust the Xerox benchmarks downwards based on the generally lower scores for airlines and utilities as compared to manufacturers like Xerox (see the ACSI data in Table 2.4), our data still indicate relatively low levels of satisfaction. In sum, business travelers reflect some level of dissatisfaction with the delivery of services by MSP. This will be discussed further in the next chapter.

The survey data were further analyzed by noting any differences in group responses. The total sample was divided according to four sets of opposing groups:

- Flyers vs. non-flyers (had not used the airport in the past 12 months)
- Employees of businesses holding contracts vs. businesses without contracts
- Small vs. large business establishments
- Metro vs. non-metro business locations

The possibility exists, for example, that non-flyers could evaluate the airport differently than those who use it more frequently. Table 2.7 presents the comparison.

Table 2.7: Differences in Responses for Flyers and Non-flyers

Item	Flyers	Non-Flyers
Usually we have access to reasonable fares	2.52	2.54
Usually we have access to convenient schedules	3.48	2.88
Usually we have access to convenient ground transportation to and from the airport	3.37	3.00
Overall we are satisfied with the Twin Cities airport	3.28	3.30
All things considered, the Twin Cities airport meets our travel needs	3.43	3.45

As seen here, there is very little difference between the two groups with the exception of access to convenient schedules and ground transportation. Non-flyers consistently rate these two dimensions lower than flyers. The implication for the airport is that these might be latent perceptions based on past experiences. There is an opportunity for the airport to dispel these perceptions through a promotional campaign focusing on improvements in ground transportation as well as the availability of convenient schedules.

Similarly, a comparison was made between those respondents having special contracts with airlines and those dealing “at arm’s length.” Table 2.8 contains the comparison relative to the importance of air travel and Table 2.9 contains the evaluative results.

Table 2.8: Differences in Responses between Contract and Non-contract Clients, Importance of Travel

Item	Contract	Non-contract
Travel is a vital aspect of our business	4.59	3.67
We expect these trips to increase in the future	4.0	3.4
Telecommunications is reducing the need to travel in our business.	2.91	2.91
It is easy to travel to and from our location through the Twin Cities airport	3.19	3.25
Most of our trips use non-stop flights	3.6	3.34

There is no significant difference in the perceptions of the two groups relative to the impact of telecommunications, ease of access to the airport and access to non-stop flights. Contract holders feel much more strongly about the importance of travel and their expectations of the future growth of travel. These are all very consistent, considering this group has created an environment, through contracting, that removes some of the difficulties of travel.

Table 2.9: Differences in Responses between Contract and Non-contract Clients, Evaluation of MSP

Item	Contract	Non-contract
Usually we have access to reasonable fares	2.4	2.56
Usually we have access to convenient schedules	3.66	3.31
Usually we have access to convenient ground transportation to and from the airport	3.42	3.29
Overall we are satisfied with the Twin Cities airport	3.18	3.31
All things considered, the Twin Cities airport meets our travel needs	3.30	3.47

In Table 2.9, it is interesting to note that the contract respondents judge the fare level slightly more harshly than those not utilizing such contracts, although the difference is not statistically significant. On the other hand, they appear to have access to more favorable schedules and have a more positive perception of ground transportation. However, there is no significant difference in how the two groups feel about the adequacy of the airport and their level of satisfaction—both of which remain at low levels.

A note on ground transportation. A comparison was made between MSP and other airports to look at the adequacy of parking, and while the data is not conclusive, it suggests MSP may not be adequate. An index of domestic O-D passengers/parking spaces was constructed where the data allowed. The following comparisons suggest that MSP is at a disadvantage until it completes its parking expansion in a few years, effectively doubling its parking spaces (Table 2.10).

Table 2.10: Domestic O-D Passengers/Parking Space, Selected Cities

City	Domestic O-D Passengers/Park Space
Atlanta	788
Charlotte	646
Denver	505
MSP	1,156
St. Louis	1,429

Sources: MAC documents and interviews with airport managers in other cities

Given the same level of traffic and a doubling of spaces, MSP’s ratio would be somewhat higher than Denver’s, e.g. 578 vs. 505. In addition, current plans for a light rail connection at MSP may eventually alleviate the parking concern. For example, many additional comments by respondents focused on accessing MSP during the current construction period and in general.

A group analysis was also performed on the evaluative data for large and small establishments, i.e., more or less than 50 employees (Table 2.11).

Table 2.11: Differences in Evaluation of MSP by Small and Large Establishments (Large = 50+ Employees)

Item	Small	Large
Usually we have access to reasonable fares	2.66	2.35
Usually we have access to convenient schedules	3.25	3.54
Usually we have access to convenient ground transportation to and from the airport	3.22	3.59
Overall we are satisfied with the Twin Cities airport	3.30	3.27
All things considered, the Twin Cities airport meets our travel needs	3.46	3.40

Except for larger establishments having a slightly more favorable view of schedules and ground transportation, there is very little difference between the perception of MSP held by small and large establishments.

Finally, responses were grouped according to ZIP code of respondent where such data was provided. Responses were segregated based on whether or not the respondent resided in the seven-county metropolitan area. The out-state group represented firms with significantly larger number of employees (average of 118 employees for metro and 295 for out-state), a comparable number of annual trips from MSP and a significantly greater number of trips by visitors into MSP. It is useful to examine the responses in the context of both the importance of travel and how they evaluate MSP as serving their needs (Tables 2.12 and 2.13).

Table 2.12: Differences in Responses Between Metro and Out-state Respondents, Importance of Travel

Item	Metro	Out-state
Travel is a vital aspect of our business	3.9	4.1
We expect these trips to increase in the future	3.5	4.1
Telecommunications is reducing the need to travel in our business.	2.91	2.72
It is easy to travel to and from our location through the Twin Cities airport	3.3	2.46
Most of our trips use non-stop flights	3.46	2.83

Table 2.13: Differences in Responses Between Metro and Out-state Respondents, Evaluation of MSP

Item	Metro	Out-state
Usually we have access to reasonable fares	2.54	2.25
Usually we have access to convenient schedules	3.44	2.86
Usually we have access to convenient ground transportation to and from the airport	3.34	3.0
Overall we are satisfied with the Twin Cities airport	3.29	3.11
All things considered, the Twin Cities airport meets our travel needs	3.43	3.49

In general, there appear to be no differences regarding the importance of travel now and into the future. Out-state respondents clearly will be as dependent on business travel in the future as their metro counterparts and telecommunications does not appear to be a factor that will temper this trend. However, out-state respondents clearly disagree with the assertion that MSP is accessible as well as the availability of non-stop flights. Note further from Table 2.13, out-state respondents are as negative regarding fare levels and disagree with the assertion that they have

access to convenient schedules. They are also more negative than their metro counterparts regarding ground transportation.

These responses suggest that MSP is not serving the needs of out-state users. While the general perception is that fares are high, there are benefits from being a hub, i.e., convenient schedules and access to non-stop flights. However, out-state users do not appear to be capturing those benefits, e.g., schedules aren't convenient. In addition, the airport appears less accessible for out-state travelers. This appears to be a marketing opportunity for whatever groups are responsible for airport development as well as the airlines in terms of removing these perceptions and educating the out-state user.

2.6 Conclusions

This chapter has summarized the purchasing practices for both air cargo and passenger services. It has also drawn conclusions relative to the flow of air cargo and passenger perceptions of the airport. In regard to air cargo, Chicago will continue to serve as the center for air cargo movement both domestically and internationally. However, given investments by integrated air cargo carriers, MSP appears well suited to serve the market as a regional airport. It will have substantial capacity to accommodate significant growth.

Regarding business passenger service, respondents indicate that no clear substitute for air travel, e.g., telecommunications, is currently available. Respondents expect this condition to persist into the future. Respondents also evaluate MSP unenthusiastically across a number of major dimensions. Respondents are most negative about the reasonableness of fares but are also cool relative to convenient schedules and ground access. Out-state respondents are particularly negative about the latter two dimensions.

This chapter identifies two opportunities for airport managers to target information programs that may dispel these negative perceptions. One group is the out-state flyer who perceives MSP as relatively inaccessible and whose schedules are not convenient although it is a hub. Another group is the infrequent flyer, which as a group holds negative perceptions based on either incomplete or old information. This group holds perceptions that are more or equally negative than more frequent flyers.

3. Knowledge Base

3.1 Introduction

Chapter 3 focuses on the findings of the individual study tasks and their organization and integration into a credible, accessible, and useful knowledge base for

1. Measuring demand for air transportation
2. Monitoring the competitive position of the Minneapolis-St. Paul area
3. Marketing the Minneapolis-St. Paul International Airport

The baseline information system includes the findings reported in the first two chapters. The tracking and analyses of these findings provide factual information for comparing changes in an industry's market share in each of the large air hub metropolitan areas and the ease and adequacy of air access to their export markets from each area.

This chapter captures the information gathered in Chapters 1 and 2 into a decision-making framework that provides the following benefits:

- It discloses the factual background information necessary to assess the performance of role of MSP and its value to the area's economy. More specifically, it pinpoints the key economic metrics that need to be tracked that will challenge MSP to maintain its role as an important infrastructure facility.
- It discloses the background factual information necessary to understand the processes used by travelers, suppliers and third-party providers in their economic interactions with MSP. More specifically, it pinpoints the key metrics and methods to be used to track changes in business processes that create challenges to the effective delivery of MSP services.
- It discloses the basic rationale for viewing MSP as an important infrastructure facility. This is essential to understanding the metrics needed to track changes in the underlying demand as well as the performance or value delivery of an infrastructure facility.
- It provides a conceptual framework for identifying service gaps and/or new opportunities to market MSP. It also provides a methodology to assess the "fit" of specific programs intended to close such gaps or to address new opportunities. Specifically, it uses the data we gathered to illustrate current service gaps and finally assesses possible ways to close the service gaps. We stress that the program assessment example only serves to illustrate the utility of the framework.

3.2 Measurements Needed for Maintaining the Knowledge Base

Building an up-to-date knowledge base calls for tracking changes in the commodity markets of local businesses and, also, in air transportation services for reaching these market destinations. Important, also, are findings on whether or not planned and projected facilities and services are adequate to accomplish this end-in-view. This means addressing changes and challenges in:

1. Creating value from added exports, measured by added earnings and income, for the Twin Cities area economy, and
2. Strengthening the global position of export-producing businesses and industries in the Twin Cities area.

Collecting information on current and projected status of competing airport facilities and related planning and services adds to the knowledge base's capabilities. It will be useful for monitoring the available capacities for handling projected increases in domestic and international exports of local businesses.

3.2.1 Tracking Changes in Demand for Air Transportation

Chapter 1 focused on measuring current and projected demand for air transportation at the Minneapolis-St. Paul International Airport and within the Minneapolis-St. Paul MSA. Estimating future demand for air transportation called, first, for the tracking of changes in population, income, and employment in the Minneapolis-St. Paul MSA and competing metropolitan areas—the six large air hubs in the “hub and spokes” air transportation system. The next three tasks involved the tracking of changes in industry location, commodity exports, and the association of air transportation with commodity exports. We measure trends in commodity enplanements and airline operations among the competing airport areas using the 1991 and 1997 IMPLAN databases and the 1999 Pro-IMPLAN modeling system for the estimates of commodity exports, the Federal Aviation Administration estimates and projections of passenger enplanements and airport operations, and the 1969–1997 Regional Economic Information System (REIS) from the U.S. Bureau of Economic Analysis for the Location Quotient, Export Share, and Economic Base measures of industry location.

The tracking of demographic and economic indicators for Chapter 1 comes under four topical headings: 1) population, income, and employment; 2) commodity exports (for Minneapolis-St.

Paul MSA); 3) industry location; and, 4) association of air transportation with exports. We have two sets of summary tables: One comparing a number of related indicators for the Minneapolis-St. Paul MSA (Tables 1.4 to 1.7, 1.9, 1.12 and 1.13), the other comparing a more limited set of indicators for each of the seven competing areas (Tables 1.2, 1.3, 1.8, 1.10, 1.11, and 1.14 to 1.24). Table 1.1 compares only the Minneapolis-St. Paul MSA with each of the six other Minnesota-based MSAs.

Each of the tabular series has a 1997 primary base year and a 1991 secondary base year with selected population, employment, output, and export series projected to 2010. The Federal Aviation Administration publishes projected enplanements and airport operations to later years, for example, 2013 for the Minneapolis-St. Paul International Airport. Updating of the historical values of each of these series will require a corresponding updating of the projection series based, in part, on the BLS 2008 Industry Projections.

Tracking the demand for air transportation hinges on four elements of the Minneapolis-St. Paul MSA and its competing metropolitan areas; viz. the six large air hubs selected in Chapter 1. The elements required for this tracking program are outlined in the following sections.

3.2.1.1 Tracking Changes in Population, Income, and Employment

The Twin Cities metropolitan area is the primary service area for the Minneapolis-St. Paul International Airport and its tenants and clients, including Northwest Airlines. This area includes much of the Ninth Federal Reserve District extending from Michigan's Upper Peninsula to the western borders of the Dakotas. Its core area—the Minneapolis-St. Paul Metropolitan Statistical Area (MSA)—has important linkages to outlying regional metropolitan areas (Table 1.1). Tracking changes in total population and per capita income of Minnesota MSAs starts with the 1991 and 1997 population and income estimates.

Tracking changes in population and income for each of the 27 large air-hub metropolitan areas listed in Table 1.2 may bring in new areas that exceed the one-percent lower limit while dropping hub areas that fall below this limit. The population and income changes point to changing market opportunities for local businesses, as well as the exporters of consumer products from other areas.

Tracking estimates of employment per 1,000 population is important as employment shifts from one industry to another and increases in total numbers (Table 1.3). The employment forecasts drive the population forecasts. Future forecasts should be prepared for each of the seven competing areas plus the six comparison areas.

In-migration of population into each of the areas is an additional measure of area growth and viability. The U.S. Bureau of the Census updates of population in-migration for Minneapolis-St. Paul and each of the competing areas are included in this section.

3.2.1.2 Tracking Changes in Commodity Exports

The top ten domestic exports (Table 1.4) and foreign exports (Table 1.5) provide measures of the leading industries contributing to high earnings of the local workforce. The two are not necessarily overlapping, although in 1997 four of the top ten domestic exporters were among the top ten foreign exporters. Much work is needed to differentiate among the export series, currently represented in dollar values, between different commodities and between passengers—businesses and leisure—and cargo. Nonetheless, even without this added differentiation, the current series provide useful estimates of changes in global positions among competing metropolitan areas.

Tracking changes in commodity share ratios highlights the role of exports in accounting for the changing commodity supply in each metropolitan area. Table 1.6 sorts the changing commodity shares of the above-average commodity shares in 1997 into positive and negative changes from 1991 to 1997 among the top 80 and all other exports for the Minneapolis-St. Paul MSA. The tracking of the individual sectors shows important differences between manufacturing and services in market destinations—foreign markets for manufacturing, domestic for services.

3.2.1.3 Tracking Changes in Industry Location

Tracking changes in industry location calls for calculation of the Location Quotient and the Commodity Supply Ratio for each industry in each area (Table 1.7). The Location Quotient, when calculated on the basis of four-digit SIC industry classification, identifies the high-ranking industry clusters that are also high-ranking exports-producing industries. The top-ranking

Location Quotients identify the industries with a high proportion, although not necessarily a high absolute level, of total output in exports (Table 1.8).

Tracking changes in the economic base from one period to the next provides a more comprehensive measure of area economic change than the Location Quotient or the Commodity Supply Ratio (Table 1.9). Listing the high-tech industries serves the purpose of identifying an industry cluster (in this case, a group of industries that make use of a common pool of skilled workers, transportation infrastructure, and technical know-how), that accounts for a high proportion of total output in exports. The economic base or basic employment, calculated from the ratio of total exports to commodity supply, also represents a high proportion of total employment among the high-tech industries. Exporting an increasing proportion of total commodity supply adds to basic employment. Total high-tech employment as a percentage of total employment is declining, however, largely as a result of lagging growth in the high-tech manufacturing industries (Table 1.10). This series of tables should be expanded to cover rapidly growing or otherwise promising second-tier cities (such as Charlotte, Pittsburgh, and St. Louis) and outstanding high-tech areas (such as Boston, San Francisco, and Seattle).

Tracking changes in the funding and performance of an area's higher education system provides measures of an area's long-term competitiveness, especially in the technology-intensive sectors (Table 1.11). Also important are the various direct and indirect measures of output and performance, for example, the number of science and engineering graduate students, doctorates awarded, patents issued (and commercialized), and the level and degree of competition among science and engineering graduate schools and research centers in each of the seven metropolitan areas. The last item is not currently included in the summary statistics. More detailed measures of state funding of higher education and research also are missing; they would be useful for comparing the distribution of state funding among educational institutions and their colleges and research centers with outputs and performance. Each of these omissions should be addressed as the current series is updated.

3.2.1.4 Tracking Changes in the Association of Air Transportation with Exports

Tracking changes in the association of air transportation with exports provides additional measures of the changing importance of air transportation in competing area economies. In the

Minneapolis-St. Paul MSA, air transportation has the largest demand among all transportation sectors for its services, even exceeding communication services (Table 1.12). Air transportation input purchases of all local industries, however, were less than six-tenths of one percent of total industry exports in 1997. The purchase and use of air transportation inputs are part of production process identified earlier in Figure 1.2 while the air transportation exports are part of the commodity exports contributing to an area's economic base. Periodic updating of this table is unlikely to show significant changes in its values, but, rather, the changing supply-demand balance for all air transportation services. This is, nonetheless, an important presentation for addressing the continuing source of confusion in measuring the importance of air transportation to an area's economy.

The rapid growth in total foreign exports is a major source of the growing demand for air transportation services (Table 1.13). However, the air transportation sector accounts for a declining share of growth in total commodity exports because of the more rapid growth of local commodity purchases and expansion of exports to nearby market destinations (Table 1.14).

A changing market for air transportation in domestic exports and foreign exports is confirmed in the next two tables. Domestic markets have the greater competition for air transportation from other carriers—truck, rail, and water—and from local demand (Table 1.15). Foreign markets, with less competition from other carriers and with more new markets, are the more rapidly expanding market destinations for air transportation (Table 1.16).

Communication services, while generally complementary with air transportation, represent the cutting edge of the new economy and its new technologies. They allow individuals real-time exchange of ideas that can lead to a multiplication of new discoveries and innovative approaches to existing problems and challenges. This is one of the lagging sectors of the Twin Cities economy, at least in terms of total sales, both local and export (Table 1.17) and, hence, an extremely important sector to monitor and continuously update. Internet presence is still another measure of area participation in the new economy (Table 1.18). The communications services sector particularly requires continual updating to keep pace with the changes occurring both locally and in export markets.

3.2.2 Tracking Changes in the Competitive Position of the Minneapolis-St. Paul Area

This section calls for tracking comparisons of the export-import measures and other key economic indicators of the competing airport areas. These comparisons serve several purposes, the first being the evaluation of changing export-import balances and their implications for the MSP area. A second purpose is to provide factual information for evaluating changes in the competing area findings discussed earlier.

3.2.2.1 Tracking Employment, Output, and Exports

The next two tables focus on changes in area employment and its association with changes in area population (Table 1.19) and industry output and exports (Table 1.20). The second table provides projected levels of industry employment, output, and exports to 2010. The projected values are based the Bureau of Labor Statistics industry projections to 2008, extended to 2010, and adjusted to the differential growth of each three-digit industry from 1991 to 1997.

Finally, the measure of export share summarizes the competitive position of the Minneapolis-St. Paul MSA in terms of its top ten manufacturing and top ten service exports (Table 1.21). Similar summary tables are available for each of the competing areas. Not shown in this report but available from the study database are export share estimates for 2002 and 2010 for each area and industry. This final table, or series of tables, brings to focus the individual industries and areas most directly competitive with the Twin Cities area. Updating the differential change for each three-digit industry will, of course, change the projected values.

3.2.2.2 Tracking Enplanements and Airport Operations

The next two tables focus on passenger enplanements—historical (Table 1.22) and projected (Table 1.23). The projected values were acquired from the Federal Aviation Administration. Enplanements include all domestic passengers, both business and leisure travelers. These are not separated in any of the tabulations because of the lack of data. Air transportation exports, with reference to business or leisure travel, represents the purchases of local air transportation services associated with commodity purchases by non-local sources. The association of total enplanements with total revenues will vary from area to area because of differences in the mix of

business travelers and leisure travelers or in the level and intensity of price competition among airlines serving that area.

The final table summarizes the latest available estimates and projections on airport operations at each of the competing metropolitan areas (Table 1.24). These estimates and projections are presumed to underlie current expansion plans and programs at each of the competing airports. The projected values were acquired from the Federal Aviation Administration, which receives the projected air operations from each airport for its airport capital enhancement plans.

3.2.3 Tracking Changes in MSP Interactions with Users

Chapter 2 introduced the basic patterns of interactions between users and MSP. We established two types of users organized into concentric rings. The inner ring consists of a relatively small number of participants in the air transportation sector itself. These participants include carriers, travel agents, freight forwarder, and third-party logistics providers (3PLs). The outer ring consists of freight shippers and business travelers. Each of these groups is considered in the following sections.

3.2.3.1 Tracking Changes in MSP Service to Air Transportation Sector Participants

Chapter 2 described the data from the interviews with travel agents, freight forwarders, air carriers, and logistics providers. All of these interviewees work within the air transportation sector. In order to serve this constituency well, both the methodology and metrics need to be specifically targeted.

Recall that the air transportation sector participants organized themselves into two distinct patterns each for freight and passenger travel. In the airfreight system, we discovered two patterns; viz. the traditional logistics chain (TLC) and the integrated logistics chain (ILC). There are two setups in the passenger travel system as well; viz. travel agents performing traditional services and travel agents executing contracts negotiated directly between air carriers and business firms.

Tracking changes in the delivery of services to industry participants in these four systems requires close and systematic contact with key informants. This can be accomplished quite

effectively with interviews and focus groups, as the numbers of establishments are quite small. For this reason, we used interviews to gather our user data.

The most important tracking metric is user satisfaction with current service levels. Getting this feedback is complicated by the fact that different segments desire different bundles of services. For instance, freight forwarders are sensitive to the availability of competing carriers, unlike logistics firms like FedEx and UPS who operate their own integrated fleets.

In Chapter 2, these users offered a mixed report card for current MSP service levels. Freight forwarders and logistics providers are generally satisfied with MSP services, even though MSP has the lowest amount of space to support a metric ton of air cargo of any of the airports where data is available. This may be due to the fact that these participants are quite happy to truck shipments to Chicago to be put on planes there. On the other hand, specialized services like customs facilities were noted as areas of possible improvement.

In addition to tracking user satisfaction with MSP service, we need to track structural changes in the types of interaction patterns. For instance, our interviews uncovered growth in the integrated logistics chains at the expense of the traditional logistics system.

To track user satisfaction as well as structural changes on an ongoing basis, we recommend forming a panel of users drawn from the four user groups previously identified. Panel members should be interviewed on an annual basis to assess their rating of MSP service levels, as well as to track structural shifts in business patterns. Many industrial firms keep in contact with a small number of their significant customers using such interview panels. Note that we recommend against bringing these panel members together as a focus group or user council. Such groups can move away from their goal of providing feedback into becoming forums for nudging or persuading the principal into specific actions. This reduces the quality of the information and feedback gathered because strategic bargaining considerations enter the picture.

3.2.3.2 Tracking Changes in MSP Service to Shippers and Business Travelers

Chapter 2 identified a large number of freight shippers and business travelers as “outer ring” users of MSP. Three characteristics define these users:

1. They are widely diffused throughout the 528 industries in the MSA economy
2. They view MSP services as important to their business operations, but
3. The purchase of air transportation services involves only a small fraction of all purchases

The most important metric here is the satisfaction rating of MSP services. In Chapter 2, we described the American Customer Satisfaction Index and the Xerox system as two examples of well-established methodologies for deriving satisfaction ratings from large populations of users in virtually any sector of the economy. How do we apply these techniques to our shipper and traveler segments?

Impute satisfaction levels of shippers indirectly. We recommend *against* assessing satisfaction levels of freight shippers directly through a survey as in Chapter 2. Recall that these freight shippers were quite insensitive to the internal workings of the logistics systems. This was true regardless of whether they used a traditional logistics system with freight forwarders and brokers, or contracted with a third-party logistics provider. As such, these indirect users of MSP services do not possess sufficient knowledge to provide reliable satisfaction ratings. Instead, we should use the panel recommended above to provide feedback about MSP service levels as they pertain to the air cargo industry. Those panel members who are participants in the logistics business are much more capable of providing these tracking data.

Conduct a regular satisfaction survey of business travelers. Unlike the freight shippers, business travelers are well-informed about MSP service levels because they experience the service directly. Thus, we can directly employ the satisfaction survey methodology we used in Chapter 2. The most important tracking metric is the overall satisfaction measure. We recommend undertaking surveys of business travelers every six months to build MSP-specific benchmarks for satisfaction levels. In order to accomplish this, care must be taken to maintain consistency in the wording of questions and the type of sample used.

3.3 Uses of the Knowledge Base

The knowledge base has been conceived as a flexible tool to support decision making involving a wide variety of air-transportation-related issues. In a broad sense, potential uses of the knowledge base include:

- Monitoring changing export markets, and understanding how competing area economies respond to these changes. Because MSP is a vital component of the region's business infrastructure, it must be evaluated in the context of competition between other regional facilities.
- Maintaining an air transportation infrastructure that adequately addresses the growing needs of the air transportation market. The knowledge base will provide a framework for evaluating the need for expansion of MSP's capabilities in several areas, including both passenger and freight service.
- Understanding the needs of businesses that utilize the air transportation system as a vital part of their business operations, both for freight and passenger transport. Infrastructure facilities which keep up with the changing needs of these businesses will enjoy a competitive advantage.
- Identifying service gaps which reduce the competitive advantages of MSP, and crafting marketing responses which eliminate those gaps. Accurate information ensures that marketing resources are committed to programs yielding real benefits for the facility and the region.

The following sections illustrate several applications of the knowledge base to important issues facing the region and the airport today.

3.3.1 Measuring the adequacy of infrastructure

A continuously updated knowledge base would monitor airport-related forecasts, plans and construction programs and compare these findings with the economic trends and projections for the Minneapolis-St. Paul metropolitan area and its competing areas. The key question is whether or not available facilities and related infrastructure are adequate to keep up with the increases in the demand for air transportation.

3.3.1.1 Uses of Macro Information

The four parts of measuring the demand for air transportation (3.2.1) focus on the updating of each of its component topics that relate to their initial presentation in Chapter 1. Marketing uses of macro information deal with the changing export markets and the response of each of the competing area economies to these changes. An underlying concern is the adequacy of the air

transportation and communication services infrastructure for meeting the increasing demands for their services. Maintaining of an air transportation-related information infrastructure means a continuing updating and tracking of the changing competitive position (3.2.2) of the Twin Cities economy in global markets and its positioning for global competition. It also means an updating and tracking of airport capital enhancement plans and projections. We recall that MSP projections for 2020 fall far short of the actual growth trends in passenger enplanements and airport operations. As noted earlier:

1. Lack of adequate air access is a clear signal for the air transportation dependent industries to seek other metropolitan areas. The loss of such industries occurs quietly, without much advance notice of their location preferences.
2. The information these industries now have reveals years in advance likely limitations of the essential facilities and services—the critically important infrastructure—for reaching their distant markets.

Stephen Huber, co-author with Kenneth R. Foster of “Judging Science” notes: “Industries are built on a vast, fast-growing infrastructure of systemized knowledge. Systematic inquiry is superceding the traditional tools of legal process, too.”

Important also is the adequacy of related infrastructure—housing, commercial and industrial real estate, higher education, and technical research—to serve a growing workforce and business economy and the demands they generate for higher education and for the findings of scientific and engineering research centers both within and outside the metropolitan area.

3.3.1.2 Uses of Micro Information

Analysis of business surveys regarding purchasing practices and distribution of air cargo and business air travel pinpoint particular market outlets and supply sources for local businesses. This information is gathered primary data generated by interviews with corporations, freight forwarders, travel agents, and airport managers; this data is supplemented by secondary sources including documents supplied by the Metropolitan Airports Commission. Marketing exports, as part of an extended transfer system, involves the transfer of information into meaningful and productive strategies for reaching targeted market outlets and agency clientele of individual businesses and agencies in the Twin Cities area.

We noted earlier that Chicago was most competitive with the Minneapolis-St. Paul MSA in both manufacturing and services. Chicago has long filled the role of the country's transportation center, first with railroads then with highways and finally with air traffic. Chicago has remained the headquarters location for many transportation firms and a natural geographic point for them to consolidate freight. Thus, one of Chicago's advantages is that, as the market leader, it has the existing infrastructure to effectively handle large volumes of freight and passengers. This advantage acts as barrier to entry of other cities in challenging Chicago's dominance in airfreight. At the heart of the issue is the interchange of air cargo between carriers at O'Hare. Global shippers have the option of air freighting a shipment to Chicago to connect with another carrier at O'Hare or truck directly to the connecting carrier at the airport. The economics, as well as transit time objectives, favor overnight truck shipments to O'Hare. Updating the related tables and discussion in Chapters 1 and 2 will provide measures for tracking the changing competitive position of Chicago's infrastructure advantages in air cargo shipments.

MSP is in the middle of the pack with respect to common traffic measures like domestic origination-destination passengers (O-D), as noted in Chapter 2. It is substantially smaller than Chicago, Detroit, Atlanta, Denver, and slightly larger than St. Louis. It is also smaller than Dallas-Ft. Worth but approximately twice as large as Cincinnati, Pittsburgh and Charlotte. Although these data do not break out business travel and leisure travel, we would expect that these relative size rankings are likely to be robust. However, Table 2.1 also indicates that yields per passenger mile at MSP are greater than Chicago, Detroit, Atlanta, Denver and St. Louis. MSP is comparable with Dallas-Ft. Worth and below Cincinnati, Pittsburgh and Charlotte—possibly because of a greater level of business travel. This is an issue that can be addressed with primary data in future surveys of business travelers.

3.3.2 Identifying Service Gaps for Marketing Purposes

3.3.2.1 MSP as an important infrastructure facility

In order to understand the metrics needed for identifying service gaps, we must first identify the rationale for viewing MSP as an important infrastructure facility. Three elements define an important infrastructure facility:

1. It must be of *significant value* to an area's economy
2. Its users should be widely *diffused* across the different sectors of an area's economy
3. Its services are a *small fraction* of total expenditures, but critical to individual export-producing businesses that are part of the area's economic base

The last two elements differentiate infrastructure facilities from special purpose facilities. A special purpose facility's users are typically concentrated in certain sectors or industries, and its services tend to constitute a large fraction of all expenditures by these users.

An infrastructure facility must be responsive to the changes in demand generated by the overall economic change in the MSA, and deliver needed services to its diverse customers at satisfactory levels. Unlike in the case of special purpose facilities, we need to track relevant metrics proactively since a diffuse population of users cannot effectively speak up for themselves.

There are numerous data about the significance of MSP to the area's economy. Recall our basic premise that MSP facilitates exports from the MSA. Thus, we turn to export data as the metric to assess the importance of the facility to the area's economy. Chapter 1 documents the size of these exports. Exports from the MSA in 1997 totaled \$71 billion, including more than \$11 billion to foreign destinations. As such, this MSA is more export-intensive than the national average (7.3% of output is exported vs. national average of 6.8%). Furthermore, these exports are growing faster than the overall economy (4.4% export growth compared to 4.2% overall growth through 2010). Finally, exports are crucial to economic well being as they generate higher than average value-added jobs (46% higher value added per worker in export industries) that in turn generate higher than average earning (40% higher earnings per worker in export industries).

Chapter 1 shows data that corroborates the importance of MSP to the area's economy because of its role in facilitating the access of exports to distant markets. In our survey of business travelers presented in Chapter 2, 49% of the respondents checked the "top box" of 5-point scale assessing whether travel is "vital to their business." Furthermore, these same respondents disagreed with the idea that telecommunications is reducing travel needs.

Air transportation purchases on the input side (the output side relates to the purchases of air transportation services associated with exports of locally-produced goods and services to domestic and foreign markets) are diffused throughout the Minneapolis-St. Paul MSA economy. For example, the top 40 sectors (of 528 total sectors) that account for 80% of air transportation input purchases also account for 72% of overall MSA economic activity. Furthermore, the top sectors at any point in time show considerable change over time. For instance, Chapter 1 documents that six of the top ten industries in the MSA lost employment and exports over the 1991–1997 time period—a common attribute of a growing, dynamic economy. At this same time, the total MSA economy (as measured by value added) grew by 61% from 1991–1997, and air transportation grew by 92% in the same period. Together, these macro data show that air transportation demand, while correlated with overall economic activity in the MSA, is generated by the individual industries that make up the growing part of overall economic activity. The mix and level of individual business activities determines the demand for air transportation.

This diffuse nature of MSP users is corroborated by the data on MSP usage from our business travel survey. Questions three and four asked respondents for info on travel to and from their business location via MSP in the last 12 months. A very large fraction of the sampled establishments (80%) reported travel through MSP. Of these, 45% reported foreign travel. Further analysis of these data shows that the amount of travel reported by an establishment is highly correlated with the number of employees at the location (correlation of 0.78 between these variables). Thus, the usage of MSP appears widespread, and no special concentration of usage appears in our data.

Air transportation purchases—whether purchases associated with the transportation of production inputs that are imports to businesses and industries in the Minneapolis-St. Paul area or the transportation of local exports—are a small fraction of total industry expenditures. The

input purchases are less than one percent of total expenditures. Every major sector of the MSA economy (except for the transportation sector itself) spends less than 1% on air transportation services as a fraction of its overall input purchases. The air transportation export purchases, although larger than input purchases, also are a small part of total industry expenditures, as shown earlier in Chapter 1. However, it is not the dollar value of purchases that is important, but, rather, the dollar value of the air transportation-dependent exports that represent the economic base of the MSP area economy.

The higher level of purchases reported for shipment of air cargo—which is a very small part of the total purchases of air transportation services for export—represents the “inner ring” of participants that operate within that sector itself. Chapter 2 introduced the concept of concentric rings of usage with industry participants in the inner ring and “end-users” in the outer ring. For instance, an airfreight forwarder—this now refers to “exports” of locally-produced goods and services—is likely to purchase large amounts of services from other industry participants like air carriers and customs clearance agents. In contrast, an industrial firm that uses the same forwarder to arrange air shipments of its products will find that its expenditures on air freight are a comparatively smaller fraction of its total purchases, because it has to acquire raw materials, components, and other inputs.

This pattern of expenditures for air transportation services for exports is corroborated by our interview data reported in Chapter 2. In our interviews with air freight forwarders, the respondents reported that businesses that use their services possess low levels of knowledge about the internal workings of the air transportation system. They are insensitive to the trade-offs made across transportation modes, and connections as long as the shipment reaches its final destination in good order. It is a “black box” purchase by the freight shipper. In contrast, we found that air transportation industry participants themselves are highly sensitive to the prices and choices offered by competing facilities. For instance, freight forwarders reported that Chicago offered overwhelming advantages over MSP in scale, and choices of flights, so a large volume of freight is shipped by truck to Chicago and put on planes there. This dual pattern of usage highlights the two different types of users of MSP services. The findings presented here and earlier in Chapter 1, Table 1.12 highlight the difference between users purchasing

transportation services as inputs and users purchasing transportation services for the export of locally-produced goods and services.

3.3.2.2 Assessing service gaps & marketing opportunities

The knowledge derived from tracking the metrics as per our recommendations above should assist the identification and remediation of existing service gaps. These data should also enable policy makers to assess opportunities to “market” the Minneapolis-St. Paul International Airport. To illustrate the former, we consider some results from the business traveler survey. To illustrate the latter, we consider two possibilities. We reiterate that these are only illustrative and serve to remind us of the value of tracking these metrics systematically.

The data analysis in Chapter 2 suggests very strongly that the service level ratings of MSP by business travelers are low in relation to norms extrapolated from other surveys. Recall that only 10% of travelers rated their overall satisfaction in the “top box.” This appears to be a service gap that might get worse over time if exports, enplanements and traffic all grow as predicted in the forecasts reported in Chapter 1.

Can we specify a reasonable target for improvement on this metric? A comparison of the Xerox surveys and the ACSI surveys suggests that a reasonable target would be lower than the 90+ levels targeted by Xerox to account for the lower scores generally obtained by public services. An achievable level would be 50% in the top box by the end of 12 months. How might one achieve this? Unfortunately, the survey per se does not offer a specific solution. It only discloses a gap and improvement target levels. However, we can offer some speculative suggestions from programs at other airports. For instance, some airports in Scandinavia tie the rents of airport tenants to the satisfaction ratings received by their units within the airport. Thus, a restaurant would pay a lower rent if they hit a targeted satisfaction rating.

3.3.2.3 Ground Access Ratings

The better ratings given by flyers as compared to non-flyers on the “ground access” issue in our business traveler survey suggests that negative expectations surround the availability of parking and other factors related to ground access to MSP. Apparently, these perceptual concerns are alleviated to some degree when a person actually experiences service levels. Thus, a

communications campaign should be able to improve ratings. In particular, if construction were to create temporary problems, these data reinforce the need for such a communication program. Of course, the program would have to be fleshed out in much greater detail, but the impetus for such programs can come from collecting these data over time as changes are correlated to changes in the environment to spot these opportunities.

3.3.2.4 Marketing MSP to shippers as an alternative to Chicago O' Hare

Is it viable to market MSP as an alternative freight hub to Chicago? Presumably, we would identify our comparative strengths and market to those freight service users who value our strengths more highly. We can make a strong case against targeted strategies like this one because it does not “fit” the basic position of MSP as an important infrastructure facility to the area’s economy.

Recall that as an infrastructure facility, we expect that the data on usage patterns would depict a wide, but shallow usage pattern. Chapter 1 shows that a wide variety of businesses buy air transportation services, but these purchases are a relatively small fraction (less than 1%) of their overall purchases. Thus, even if MSP were to target market its superior attributes to particular shippers, these users are unlikely to switch their patterns of behavior because inertia is a strong determinant of small purchases. Furthermore, educating these users is a daunting task as they view the freight logistics process as a “black box” and are relatively insensitive to the internal workings of the system.

However, the usage data does reveal an exception. The participants in the air transportation industry do spend substantial amounts on purchasing these inputs, and they are sensitive to differences between air hubs. Might a targeted program work here? Unfortunately, the specifics of the matter work against us. Recall Chapter 2 showed that the scale and network advantages of O’Hare are overwhelming to the point that freight equal to four 747s are shipped to O’Hare every night to be placed on planes there.

3.4 Conclusions

The air transportation industry today operates in an environment of intense competitive awareness. Rapid advances in information technology and evolving business practices are changing the way companies interact with the transportation infrastructure. At the same time, changes underway within the transportation sector (such as airline commission caps) are affecting the relationship between business travelers, travel agents and air carriers.

Businesses that use the air transportation system—whether for freight or passenger transportation—are keenly aware of the economic variables affecting the air transportation system. Further, these businesses are prepared to change the way they use the air transportation system in order to derive maximum benefit from their investment in air transportation.

Specific conclusions suggested by the applications of the knowledge base include:

One key question is whether or not the Twin Cities' air transportation infrastructure is adequate to keep up with increases in the demand for air transportation services. Recall that one of Chicago's advantages over Minneapolis-St. Paul is its capacity to handle high traffic volumes (both freight and passengers). Changes in industry location patterns and in air service consumers' usage patterns may make an area more or less competitive.

Research indicates that the Minneapolis-St. Paul International Airport constitutes an important infrastructure facility for the region it serves. Three elements that define an important infrastructure facility are:

- It must be of *significant value* to an area's economy
- Its users should be widely *diffused* across the different sectors of an area's economy
- Its services are a *small fraction* of total expenditures, but critical to individual export-producing businesses that are part of the area's economic base

MSP satisfies all three of these criteria, and so it should be considered as a part of the region's essential business infrastructure.

In light of this infrastructure status, the knowledge base is an ideal tool for assessing service gaps and marketing opportunities for the airport. Some illustrations of these potential uses are as follows:

- The data analysis in Chapter 2 suggests that service level ratings from business travelers are low in relation to norms extrapolated from other surveys. This may indicate a service gap which will only grow more severe as exports, emplanements and traffic all grow according to the predictions of Chapter 1.
- Other results from the business traveler survey suggest that parking and other ground access considerations are viewed negatively at MSP. A communications program could therefore be designed to address these perceptual issues.
- Analysis of the knowledge base argues against marketing MSP to shippers as an alternative to Chicago's O'Hare Airport. Because of the weight of O'Hare's existing advantages to shippers, and MSP's status as a regional infrastructure facility, make it unlikely that MSP could compete effectively against O'Hare—resources would be better spent elsewhere.
- One serious issue raised by the knowledge base is the possibility that the Twin Cities area's air transportation capacity will not keep up with increasing demands placed on its services by the export-producing industries that are such an important component of the region's economic base. Adequacy of air transportation infrastructure is a significant contributor to a region's ability to compete in a global marketplace; therefore, the airport should be considered as an important part of the region's overall economic infrastructure.

To maintain and increase the value of MSP to the region, it is necessary to track numerous economic variables and incorporate this information into a decision making tool. Such a knowledge base will be invaluable to planners and policy makers in addressing the challenges of airport operations in years to come.

The metrics and monitoring practices outlined in this report comprise a decision making framework. However, the real benefits of such a framework are only made available if the monitoring and analysis are continued over time. Through this continual updating and evaluation, decision makers can gain a clearer understanding of the challenges facing MSP and the region in the area of air transportation, and increase the value of MSP to the Minneapolis-St. Paul area and the State of Minnesota.

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4. Appendices

Appendix A: Glossary

Air cargo includes all goods carried commercially by air transportation.

Airfreight is air cargo, exclusive of Postal Service mail.

Barrier to entry is an act or instance of preventing somebody entering an activity, like “below-cost” pricing of air transportation from an air node by a dominant airline.

Base Employment represents the Economic Base of an area—the basic industries that produce the exports of an area calculated from the ratio of total commodity exports to total commodity supply, multiplied by total employment.

Capital Earnings are income payments to industry for its capital use calculated from Value Added less Labor Earnings.

Commodity Demand represents the purchases of Commodity Output. Gross Commodity Demand includes purchases of Imports as well as locally-produced Commodity Output.

Commodity Supply is the sum of locally produced Commodity Output plus Imports.

Commodity Supply Ratio is total area Commodity Supply divided by total regional Commodity Supply.

Consolidated Metropolitan Statistical Area (CMSA) is a metropolitan area of two or more contiguous MSAs.

Decision model is a simplified version of something complex used, for example, to analyze and solve problems or make predictions

Decision process is the process of choosing or making choices or reaching conclusions, especially on important business matters; the study of the best possible outcomes for decisions made under varying conditions.

Economic Base Employment is the employment in the exports producing sector of an area economy.

Economic Base is the exports producing sector of an area’s economy that supports the area economy.

Economic Base Multiplier is total area economic activity divided by its Economic Base—represented by an area’s Economic Base Employment—divided by total area employment.

Economic Indicators are measures of area economic activity.

Export Market Cycle is the process of local exports reaching distant markets to create local value, represented by a conceptual model in which local resources from all sources—locally produced and imported—provide inputs to the production system to produce goods and services for export.

Export Share Ratio is the total area industry exports divided by the corresponding total region exports.

Exports are the excess outputs of locally produced commodities shipped to markets outside the area or purchased by non-residents.

Final Demand Sector is the institutional market for industry output that includes households, local, state, and federal governments, and private capital formation.

Gross Area Product is the total Value Added created by remunerative economic activity in an area.

IMPLAN is an input-output based computer model for calculating the economic impact of outside events on a local area—an Impact Analysis for PLANning system..

Imports are commodities originating from outside an area for local industry and institutional use and consumption.

Industry Cluster is a group of industries utilizing each others outputs or a common output source as inputs in their individual industry production processes.

Infrastructure is the large-scale public systems, services, or facilities of an area, like airports and air traffic management systems, educational facilities and systems, and research centers, necessary for economic activity.

Infrastructure facility is something designed or created to provide a service or fulfill a need that is part of the infrastructure of an area.

Input-Output Model is an interrelated composite of an Inter-industry Transactions Matrix, a Value Added Sector, and a Final Demand Sector to represent the industry structure of an area and its input sources and final markets.

Inter-industry Transactions Matrix is a table of rows and columns representing the individual industry (column) purchases of production inputs (rows)

Labor Earnings are the wage and salary payments to employees and the income of business proprietors.

Local Economy refers to the commuting area of a central city commonly associated with a MSA (a single large commuting area) or CMSA (a collection of contiguous commuting areas).

Location Quotient is a measure of industry location and its importance to an area. It is a ratio of two ratios: its percent of total employment in a given area divided by the correspond percent of total employment for the region (or nation).

Metric ton is a unit of weight equal to 2204.6 pounds.

Metrics is measurement.

Metropolitan Statistical Area (MSA) is two or more contiguous urbanized counties with a central city population of 50,000 or more.

Per Capita Income is *Total Personal Income* divided by total population.

Total Personal Income is total labor earnings adjusted for place of residence and non-labor income. Total personal income was \$84.2 billion for the Minneapolis-St. Paul MSA in 1997 and per capita income was \$30,123. Labor earnings—consisting of wages and salaries, other labor income, and proprietor income—accounted for 79.5 percent of the total. Capital earnings—dividends, interest, and rent—are next highest. Transfer payments—mostly from

federal and state governments—account for the remaining 11.2 percent of the total. In addition, most MSAs have a negative adjustment for place of residence because of commuting to jobs from outside the MSA.

Income source	1997
	(pct.)
Earnings by place of work	79.5
plus: Adjustment for residence	-0.8
equals: Net earnings by place of residence	73.1
plus: Dividends, interest, and rent	15.7
plus: Transfer payments	11.2
Equal: Total personal income	100.0

Source: U.S. Dept. Commerce, BEA, REIS

Real Estate (SIC65) includes the financial accounts of real estate enterprises as well as certain property income, e.g., royalties, as show below:

Real Estate Sector Revenues, by Source, U.S., 1997

Source	Revenues (mil.\$)
Dealer's commissions	14,506
Property management	9,914
Title abstract and escrow fees	967
Management of cemetery plots	541
Condominium and co-op dues and fees	1,691
Royalties	12,973
Nonfarm business rents	39,081
Tenant-occupied residential rents (households)	47,243
Imputed rent by nonprofit institutions	6,348
Farm rent	8,029
Fed. Gov't enterprises rent	331
State and local gov't enterprises rent	169
Fed gov't purchases, rent	700
State and local gov't purchases, rent	3,302
Rent paid by foreigners	310
Rents paid by nonprofit orgs	1,070
Residential hotel receipts (households)	256
Total	147,431

Standard Industrial Classification (SIC) Code refers to the grouping of similar output-producing, income-earning activities by multi-digit code, for example, under the heading of Manufacturing are listed successively more detailed industry groups like (Food and Kindred Products (SIC 20), Meat Products (SIC 201), and Meat Packing Plants (SIC 2011).

Value Added is the total monetary value of the primary production inputs of labor and capital, including business taxes.

Appendix B: The Twin Cities and Competing Metropolitan Areas

Appendices containing additional information and tables relating to Chapter 1 are available directly from the Center for Transportation Studies at the University of Minnesota. These include 34 pages (single-spaced) of discussion summarized in Chapter 1 and an additional 60 pages of tables. Brief summaries of each of the appendix chapters, referred to as Chapters 2 and 3, are followed by a list of tables accompanying each chapter. The appendices will also be available for download from the CTS Web site.

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Twin Cities Metropolitan Area

This Chapter 1 Appendix focuses on the Twin Cities metropolitan area—its geography, economy, and people—and the role and importance of air transportation and related services to its future growth and prosperity. The demographic and economic models selected for this task help identify and define the critical relationships and variables that determine the area’s economic future. These models also help identify the supporting data for this task.

Thus, the central focus of this chapter to provide measures of the value of the Minneapolis-St. Paul International Airport to the Minneapolis-St. Paul metropolitan area and to the economic well being of its people and economy. Included among these measures are changes in the area’s commodity exports and imports, its industry employment, labor earnings, and the contribution of each industry—especially those seeking export markets for their products—to the area’s gross product, GAP. We seek these measures of change, their sources, and their implications in evaluating the competitive position of the Twin Cities compared with other major air hub areas.

Twin Cities Metropolitan Area: 14 Additional Tables

Competing Metropolitan Areas

This Chapter 1 Appendix focuses on the key economic indicators for the six competing metropolitan areas selected for comparisons with the Minneapolis-St. Paul metropolitan area and its International Airport. These are viewed as the principal competing airports. Three of the airports (Chicago, Detroit, and Cincinnati) are in the North, two (Atlanta and Dallas) are in the South, and one (Denver) is in the West. The airport comparisons pertain to exports and related variables common to both the Twin Cities area and the competing areas, and their changing shares in each of their markets. Changes in an area's share of total U.S. industry sales, say of medical instruments, depends on the area's share of each of the export markets in which its medical instruments compete with the other areas, as well as the size of these markets and their growth rates.

Evaluating the competitive position of commodities produced by Twin Cities area businesses and industries requires the preparation of the same quantitative series for the competing airport areas as prepared earlier for the Twin Cities area. The Twin Cities area businesses and industries compete with businesses and industries of other areas in global markets. *Changes in the relative standing of the Twin Cities area businesses and industries in these markets provide measures of their economic viability and potential for contributing to the area's economic base in new jobs and higher labor earnings and value added per worker.*

Competing Metropolitan Areas: 32 Additional Tables

Projections, 1997–2010: 14 Additional Tables

Appendix C: Purchasing Processes Research Documents

Business Travel Survey Document

The Carlson School of Management is undertaking a research study on behalf of the Twin Cities Airport Task Force regarding various aspects of air transportation in the State of Minnesota. As part of this effort, we are conducting a survey to better understand needs and concerns about air travel in our region.

We would like to invite your participation in this effort by responding to this questionnaire. To ensure a representative sample, we chose names at random from Minnesota business listings. All of your responses will remain confidential, and only summary statistics will be included in any report.

In appreciation for your participation, we will send you an executive summary of the results. We are also happy to provide follow-up to any questions that you may have regarding the project.

General Instructions

In responding to this questionnaire, please consider the “business” or “company” to include only your specific location or site, even if your organization has multiple sites.

If you are unsure about a question, please provide us with your best estimate. It is very important that all of the questions are completed.

Please mail the completed survey back to us in the envelope provided.

We sincerely appreciate your participation. If you have any questions, please call:

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You can also e-mail us at fbeier@csom.umn.edu or gjohn@csom.umn.edu

Section I: General Background

In responding to these questions, "firm" or "company" refers to your *specific location* or *site*, and not to the entire corporation or agency.

1. How many employees work at this location? _____ people

2. What is your principal business activity at this location? (Check the most applicable category)

_____ Manufacturing

_____ Services

_____ Administrative

_____ Retail

_____ Other

3. In the last 12 months, has anyone **FROM** your location traveled through the Twin Cities Airport on a business-related trip?

_____ No (go to Question 4)

_____ Yes (go to Question 3a)

3a. If "Yes", what is your best estimate of the **total** number of business-related trips through the Twin Cities Airport made by **all** employees from your location?

_____ round trips in the past 12 months

4. In the last 12 months, has anyone traveled **TO** your location through the Twin Cities Airport on a business-related trip?

_____ No (go to Question 5)

_____ Yes (go to Question 4a)

4a. If "Yes", what is your best estimate of the **total** number of business-related trips made **TO** your location through the Twin Cities Airport?

_____ visits in the past 12 months

5. Some companies have negotiated travel contracts with airlines, agencies, etc. that may include volume discounts, specific billing practices, corporate travel cards, etc. Do you have such a contract for travel?

_____ Yes, we have a travel contract

_____ No, we do not have a travel contract

Section II: Business Related Trips and Visits

In responding to these questions, please consider all of the business-related trips made by employees **from** your location as well as the visits **to** your location through the Twin Cities Airport in the past 12 months.

1. What percentage of trips and visits included/were made to overseas destinations? _____ %
2. Please circle the most appropriate number below each statement.

	Strongly Disagree				Strongly Agree
a. These trips and visits are a vital aspect of our business.	1	2	3	4	5
b. We expect these trips and visits to increase in the future.	1	2	3	4	5
c. Telecommunications is reducing the need to travel in our business.	1	2	3	4	5
d. It is easy to travel to and from our location through the Twin Cities airport.	1	2	3	4	5
e. Most of our trips and visits use non-stop flights.	1	2	3	4	5

Section III: Evaluation of Twin Cities Airport

In responding to these questions, please consider all of the business-related trips made by employees from your location through the Twin Cities Airport in the past 12 months.

1. Please circle the most appropriate number below each statement.

	Strongly Disagree				Strongly Agree
a. Usually, we have access to reasonable fares.	1	2	3	4	5
b. Usually, we have access to convenient schedules.	1	2	3	4	5
c. Usually, we have access to convenient ground transportation to/from the airport.	1	2	3	4	5
d. Overall, we are satisfied with the Twin Cities Airport.	1	2	3	4	5
e. All things considered, the Twin Cities Airport meets our travel needs.	1	2	3	4	5

Section IV: Comments

If there is any comment you wish to add about these issues, please write them in below.

If you would like a copy of the executive summary of the report, please provide us with your contact address in the space below.

Name:

Address:

Integrated Cargo Carrier Interviews

Name: _____
Company: _____
Date: _____

- Briefly discuss the basics of your business.
- Do you have customers under contract for regular shipments and customers who contact you on an ad hoc basis?
- How do you get new customers?
- What types of products are shipped from/to the Twin Cities area by air?
- Discuss the differences in handling domestic freight and international freight.
- Is any of your air freight first trucked to Chicago instead of using the MSP airport? If so, why?
- Where do your airplanes fly from MSP? If to more than one airport, what determines the routing? Types of aircraft used and number per day out of MSP.
- Are you familiar with the freight facilities or infrastructure at MSP? If so, how do they compare with freight facilities and infrastructure at other airports?
- Have you ever discussed the freight facilities/infrastructure with the MSP authorities?
- If you can, discuss your expansion plans at MSP.
- Can you think of any consistent shortcomings of the MSP airport you would like to see addressed with regard to freight shipments – capacity, customs operations, etc.
- Are there any other thoughts you have regarding air freight that we haven't discussed that you feel are important?

** None of the information you have given me will be attributed to you or your company. Instead, the information will be used with other interview data to attempt to determine the key variables that affect the shipment of products by air.

Freight Forwarder Interviews

Name: _____

Company: _____

Date: _____

- Briefly discuss the basics of your business.
- Do you have customers under contract for regular shipments and customers who contact you on an ad hoc basis?
- What types of products are shipped from/to the Twin Cities area by air? By other means?
- What determines if a consolidated shipment goes by truck, rail, or air?
- What are the sizes of various consolidated shipments? Does size affect mode of shipment?
- When shipping by air, do you favor one carrier?
- Discuss the many differences in handling domestic freight and international freight.
- What are the reasons some air freight is first trucked to Chicago instead of using the MSP airport?
- Are you familiar with the freight facilities or infrastructure at MSP? If so, how do they compare with freight facilities and infrastructure at other hub airports?
- Have you ever discussed the freight facilities/infrastructure with the MSP authorities?
- Can you think of any consistent shortcomings of the MSP airport you would like to see addressed with regard to freight shipments – capacity, customs operations, non-stop service, frequency, etc.?
- Are there any other thoughts you have regarding air freight that we haven't discussed that you feel are important parts of the decision process when shipping product around the U.S. and the world?

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Travel Agent Interviews

Name:

Company:

Date:

Customers:

- What percentage of your business is corporate vs. individual/leisure?
- How do individual customers learn about you?
- Describe any contracts you have with corporate customers? What are some of the key provisions?
- Do you rebate commissions to corporate customers and get paid a fee instead?
- Do you get involved in negotiations when corporations sign incentive travel agreements with airlines?
- Do you charge fees to individual customers?
- Do you book predominately air trips, hotels, or car rentals? What % of your business are complete vacation packages?
- Where are all your offices located?
- Do you book airline round trips that originate in other parts of the country?
- Are domestic reservations handled differently than international ones?
- Do your corporate customers give you specific rules about how their employees can travel (which airline, non vs. one stop, Saturday stay, first class vs. coach, etc.)
- Do you audit average fares for your corporate customers by city of origin and by airline?

CRS Systems:

- Which CRS system are you aligned with and why that system? Describe any incentives that the CRS system gives you.
- Why is it important to be aligned with a specific system? Don't government rules prevent display bias?

Airlines:

- Do you have any override or other deals with airlines? Please describe how they work.
- Are there conflicts among your corporate deals, your CRS deals, and your airline deals?

Miscellaneous:

- Do you feel the air fares out of MSP are high relative to fares at other airports around the country? Do you feel the extra non-stop service available from MSP is a reasonable justification for these fares?
- Do you feel the passenger facilities at MSP compare favorably with other passenger terminals around the world? Are there any areas that seem especially good or bad relative to other airports?
- Are there any other thoughts you have regarding air travel that we haven't discussed that you feel are important parts of the decision process when people travel around the U.S. and the world?

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Travel Executive Interviews

Name:

Company:

Date:

- Please describe for me the typical travel patterns for people in your company including length of trip, destinations, number of people traveling together, etc.
- Is there a pattern to these trips (e.g. same O-D) or is it random?
- What are the purposes of these trips?
- Do your employees make round trips that originate in other parts of the country? Do these flights originate at cities that are not dominated by one or two airlines? Do most trips start or end at MSP?
- When making airline reservations do you go through travel agents or do you deal with the airlines directly? Do you deal with one preferred agent or airline?
- Are domestic reservations handled differently than international ones?
- Do you ever encourage employees to stay over Saturday night at a city to get a lower round trip fare? Do you provide an incentive for them to do this?
- Can employees keep their frequent flyer miles? Are there any rules about which airline they must book flights on?
- Do you have policies that require employees to travel with change-of-plane service instead of non-stop service if the price is much lower? Do you allow any employees to travel first or business class? What are your stated travel policies, if any, and are they strictly enforced?
- Has your company ever cancelled business trips because the available air fares were too high? Have you ever considered teleconferencing as a substitute for air travel?
- What percentage of your revenues are your company travel expenses? How is this total split among air fares, hotel expenses, and car rentals?
- Do you audit average fares for your employees by city of origin?
- Do you have volume incentive deals with any airlines? If so, please describe these in a general way.
- Do you feel the air fares out of MSP are high relative to fares at other airports around the country? Do you feel the extra non-stop service available from MSP is a reasonable justification for these fares?
- Do you feel the passenger facilities at MSP compare favorably with other passenger terminals around the world? Are there any areas that seem especially good or bad relative to other airports?

- Are there any other thoughts you have regarding air travel that we haven't discussed that you feel are important parts of the decision process when employees travel around the U.S. and the world?

** None of the information you have given me will be attributed to you or your company. Instead, the information will be used with other interview data to attempt to determine the key variables that affect air travel by company employees.