

M E M P H I S



F O U N D A T I O N



MEMPHIS BIOLOGISTICS STUDY

EXECUTIVE REPORT

September 2005

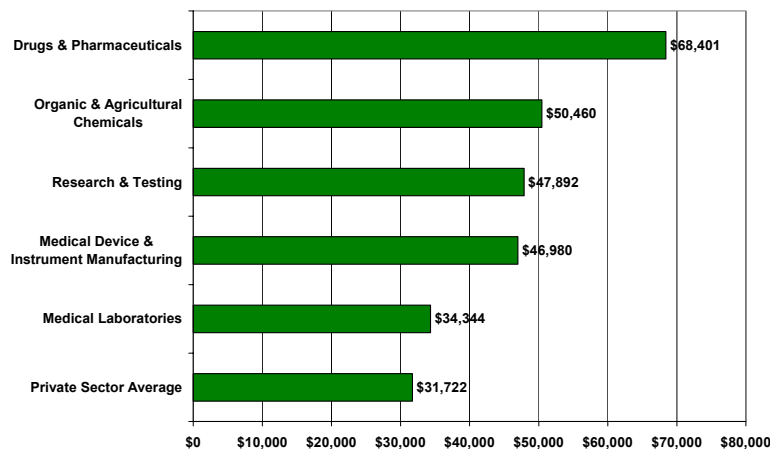
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FOREWARD AND ACKNOWLEDGEMENTS

There are favorable trends taking place nationally and globally in the biosciences industry that make it an attractive industry for which to seek economic growth. The bioscience industry provides white-collar jobs that pay up to 110% higher than the national average. Bioscience industry growth also improves community healthcare, education levels, and other aspects of quality of life. Many regions are actively pursuing strategies for growth in the biosciences. However, it is expected that not all regions will be successful in their efforts. We believe that the most successful regions in the future will clearly understand how to apply industry trends to their core competencies to wisely make use of public resources, attract investment capital, engage bioscience companies, and create higher paying jobs.

AVERAGE EARNINGS BY INDUSTRY IN THE U.S.¹



Bioscience industry consultants appear to focus typically on research as the catalyst for bioscience industry growth. The analysis tends to reflect the “research model” in which research institutions spin off new products that are commercialized and turn into emerging and growth companies. This type of analysis favors the historically large, long-established research centers and the bioscience clusters that have grown up around them. By comparison, this Biologistics study considers how to leverage existing infrastructure into the business of biosciences for economic growth opportunities.

¹ Source: IMPLAN data (Research and Testing category includes multiple industries).

Memphis has been recognized for decades as “America’s distribution center”. At the outset of this study, it appeared that enough evidence existed to create a hypothesis that the intersection point of the two different industries of “bioscience” and “logistics” could be substantial enough to justify efforts to study and determine whether “biologistics” could be an anchor that can serve as an economic driver within the Memphis MSA.

The Memphis Biologistics study is intended to (a) assist stakeholders in the Memphis MSA in understanding the biologistics market and its trends, (b) evaluate the region’s current position in biologistics and the related opportunities for economic development, and (c) provide a series of considerations and recommendations for implementation. Though numerous details must be worked out locally, this report intends to provide a roadmap to assist the Memphis MSA in developing a few targeted components of economic growth in the bioscience industry within the regional economy over the next 10 years.

Overarching the benefits for the region will be the support of the CMS mission by enhancing the nation’s delivery of biomedical products to consumers, pharmacies, retailers, and healthcare providers who serve Medicare and Medicaid beneficiaries, as well as the general public.

The core team represented a selection of specialists, advisors, and consultants assembled to perform the study under the direction of the Memphis Bioworks Foundation, a not-for-profit foundation dedicated to coordinated economic growth for the biosciences in the Memphis region. The study involved numerous stakeholders and industry participants as part of the interview phase. Thanks to the many individuals who were involved in this work, and to those who will carry this effort forward to fruition.

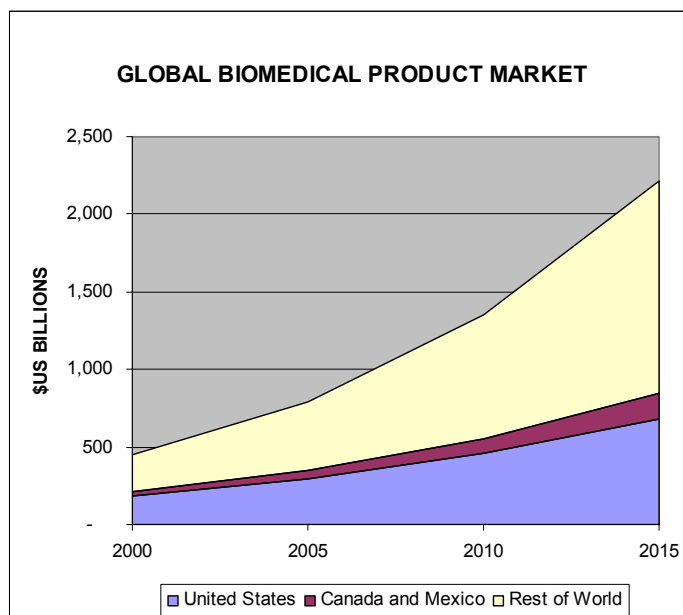
GLOBAL AND U.S. BIOMEDICAL PRODUCTS MARKET GROWTH

The worldwide sales for biomedical products are estimated at \$789.2 Billion in 2005. This market is expected to grow at the average rate of 11.4% annually between 2005 and 2010 and 10.3% annually between 2010 and 2015, reaching a global market of \$2.2 Trillion in 2015².

The United States has a dominant 37% share of the global market for biomedical products, or \$294.1 Billion in 2005. The biomedical products market in the United States should continue to grow at an average annual rate of 8.8% between 2005 and 2015, reaching \$681.8 Billion in 2015.³

² Source: Based on 2005 Pharmaceutical Forecast, Economic Trends, Industrial Information Resources, 2005.

³ Sources: Based on Office of the Actuary, CMS, January 2005 (extended one year for 2015) and 2004 HDMA Industry Profile and Factbook, Chart 284, Page 115.



The biomedical product market is large and growing at rates significantly above those of the general economy for both the United States and globally.

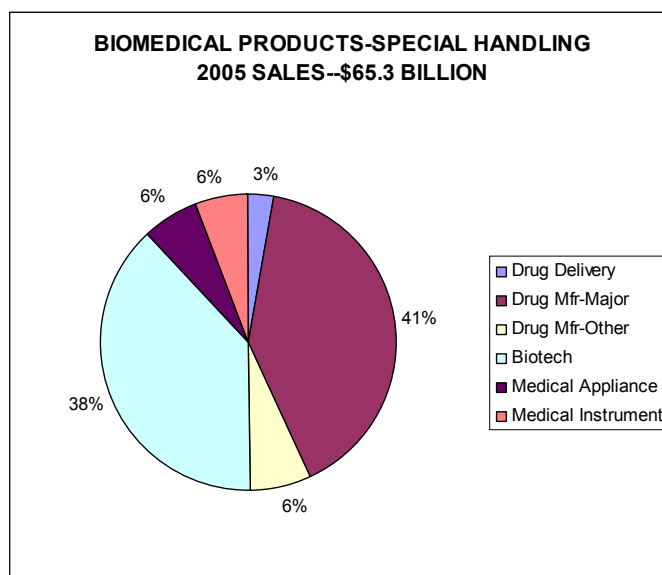
BIOLOGISTICS SEGMENTS STRUCTURE AND TRENDS

The U.S. biomedical product market of \$294.1 Billion in 2005 is comprised of six SIC (Standard Industry Classification) codes and, alternatively, six SEC Primary Industry Segments. It is comprised of 288 publicly traded companies with annual sales over a threshold of approximately \$20 Million (not including privately-held companies and divisions of conglomerates).⁴ The majority of product sales are from the 14 major drug manufacturers, while the other categories each have less than 10% of the total U.S. biomedical product market.

An attractive dimension of biologistics is in meeting special handling requirements. When we evaluate the portion of products that have special handling requirements, the sales of biomedical specialty products are estimated at \$65.3 Billion (22% of the total)⁵ primarily in biotech and specialty pharmaceuticals:

⁴ Source: Company filed information obtained through SmartMoney Stock Screener, June 2005.

⁵ Source: Analysis based on 2004 HDMA Industry Profile survey.



We project that those products which require special handling will increase at an annual average growth rate of 16% between 2005 and 2015, which is nearly twice the growth rate of all Biomedical Products. The market for products requiring special handling is projected to grow from \$65.3 Billion in 2005 to \$286.9 Billion in 2015.

| BIOMEDICAL PRODUCT SALES | | | |
|---------------------------------|--------------|--------------|-------------|
| (In \$U.S. Billions) | | | |
| | <u>2005</u> | <u>2015</u> | <u>CAGR</u> |
| General Logistics/Distribution | 228.8 | 394.9 | 5.6% |
| Requires Special Handling | 65.3 | 286.9 | 16.0% |
| Total | 294.1 | 681.8 | 8.8% |

Specialty product companies in biotechnology, specialty pharmaceuticals, and medical devices have special handling requirements, such as:

- Expedited delivery (overnight in many cases directly to a physician’s office).
- Refrigeration during storage and delivery
- Precautions for high unit costs (inventory cost issue) and high risk for counterfeit
- Special Dosing: perhaps patient specific and personalized in future
- Reimbursement needs under Medicare Part D
- Secure and careful handling due to fragility
- Management of short shelf life

The distribution channels used for biomedical products have consolidated in recent years. Between 1995 and 2005 the “Big 3” wholesalers in the United States have emerged, which together account for over 63% of all product distribution. This is a significant increase from 1995 where these three wholesalers represented only 21.8% of all product distribution. This market share increase resulted from aggressive acquisition strategies of regional competitors and national distribution agreements. However, industry trends indicate that direct-to-customer product distribution will capture significant growth in the future.

| U.S. PRODUCT SALES BY DISTRIBUTION CHANNEL | | | | | |
|---|---------------------------------|--------------|--------------|------------------|------------------|
| | SALES (in \$US Billions) | | | CAGR | |
| | <u>1995</u> | <u>2005</u> | <u>2015</u> | <u>'95 - '05</u> | <u>'05 - '15</u> |
| Amerisource Bergen | 5.0 | 48.2 | 96.5 | 25.5% | 7.2% |
| Cardinal | 8.0 | 65.1 | 142.1 | 23.3% | 8.1% |
| McKesson | 12.7 | 74.0 | 143.5 | 19.3% | 6.8% |
| Regionals | 35.8 | 15.3 | 24.9 | -8.2% | 5.0% |
| Direct to Chain Warehuses | 23.5 | 38.4 | 92.5 | 5.0% | 9.2% |
| Direct to Customers | 32.7 | 53.2 | 182.4 | 5.0% | 13.1% |
| Total | 117.7 | 294.1 | 681.8 | 9.6% | 8.8% |

This consolidation of the industry has severely limited the options that a manufacturer has today for product distribution. Moreover, the exercise of that consolidated distribution power may be resulting in higher prices for product distribution for many product manufacturers, especially those that are smaller. These factors appear to be creating unrest in the industry.

MEMPHIS MSA’S SHARE OF THE BIOMEDICAL PRODUCTS MARKET

The Memphis MSA is home to 1,255,000 people, which represents 0.42% of the population of the United States (296,412,000 people). It represents 0.44% of all employment in the United States. Not considering its current market position of strength in distribution and logistics, the Memphis MSA’s proportionate share of the national U.S. market would be 0.42% to 0.44%.

Biomedical product employment and sales are significantly higher in the Memphis MSA than the national average. The Memphis MSA has 0.59% of the national employment in Biomedical product establishments and 0.88% of the national product sales.

| MEMPHIS MARKET SHARE (2005) | | | |
|------------------------------------|------------------------------|--------------------------------|------------------|
| | <u>Memphis</u> <u>MSA</u> | <u>United</u> <u>States</u> | <u>% of U.S.</u> |
| Population (000's) | 1,255 | 296,412 | 0.42% |
| <u>BioMedical Product Market</u> | | | |
| Establishments | 53 | 11,832 | 0.45% |
| Employment | 3,147 | 531,932 | 0.59% |
| Sales (Millions) | \$ 2,588 | \$ 294,100 | 0.88% |
| Air Courier Services (Millions) | \$ 4,029 | \$ 47,717 | 8.44% |
| Air Courier Sales Reporting | \$ 42,120 | \$ 47,717 | 88.27% |

Although the Memphis MSA has a 40% - 100% higher than the national average level of participation in the biomedical product market, the level of employment appears under-represented given the much higher level of performance in distribution and logistics in general.

The substantial growth of the biomedical product market in the United States and globally should create an attractive opportunity for the Memphis MSA with its distribution and logistics strengths to develop a strategy to maintain and grow its share of the biologistics services market.

BUSINESS ECONOMICS OF BIOLOGISTICS SERVICES

In support of biomedical products, the biologistics services market represents a U.S. market of \$13.8 Billion in 2005. This market revenue and fees for logistics, warehousing, distribution, shipping, and related services is approximately 4.7% of total product sales.⁶

The U.S. market for biologistics services contains several segments, from which the Memphis MSA participates at rates higher than the national average at a rate of 3.8% of the U.S. Total, as shown in the following chart. The Memphis MSA's portion for shipping and delivery is much higher with 13.0% of the U.S. Total.

⁶ Source: Company filings and annual reports, and 2004 HDMA Industry Profile, Chart 8-9, Page 7.

| BIOLOGISTICS SERVICE REVENUE | | | |
|-------------------------------------|----------------|------------------|------------------|
| (In \$US Millions) | | | |
| | <u>Memphis</u> | <u>United</u> | |
| | <u>MSA</u> | <u>States</u> | <u>% of U.S.</u> |
| Warehousing and Logistics | \$ 249 | \$ 3,059 | 8.1% |
| Shipping/Delivery | \$ 160 | \$ 1,235 | 13.0% |
| Sales, Marketing, IT, Admin, Profit | \$ 122 | \$ 9,530 | 1.3% |
| Total | \$ 531 | \$ 13,824 | 3.8% |

It appears that the reasons the Memphis MSA does not enjoy a yet larger share of the biologistics market are twofold: (1) The evolution of the market has established a concentration of control in the supply chain whereby a handful of large manufacturers and the “Big 3” wholesale distributors have dominated, and (2) The methods of warehousing storage and delivery have been established in other regions where Memphis has not been engaged.

However, it also appears that the industry trends favor the Memphis MSA for realizing substantial growth in the biologistics services market and achieving market share gains.

A substantial opportunity is evident when considering the growth trends and the service revenue expected in the future. As shown in the chart below, the growth in air shipping and delivery is expected to grow at approximately twice the rate of the overall market. This higher rate of growth will be due to the growth of higher value biotech products along with growing trends in personalized medicine and products with special handling requirement which more frequently require expedited delivery.

| PROJECTED U.S. BIOLOGISTICS SERVICE REVENUE | | | |
|--|------------------|------------------|-------------|
| (In \$US Millions) | | | |
| | <u>2005</u> | <u>2015</u> | |
| Warehousing and Logistics | \$ 3,059 | \$ 7,091 | 8.8% |
| Air Shipping/Delivery | \$ 185 | \$ 817 | 16.0% |
| Ground Shipping/Delivery | \$ 1,050 | \$ 2,047 | 6.9% |
| Sales, Marketing, IT, Admin, Profit | \$ 9,530 | \$ 22,091 | 8.8% |
| Total | \$ 13,824 | \$ 32,046 | 8.8% |

And so, the first phase for a target for the Memphis MSA should be to capture as much as possible of the \$5.7 Billion in growth from 2005 to 2015 in Warehousing, Logistics, and Shipping (both Air and Ground), with an emphasis on Air Shipping.

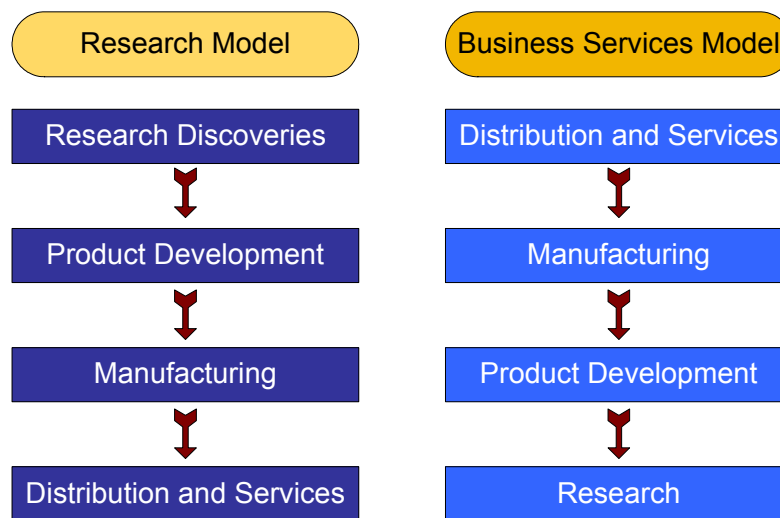
The second phase for the Memphis MSA should be to make inroads into the \$14.6 Billion in growth from 2005 to 2015 in related biologistics services including sales, marketing, information technology systems, and related overhead and profit.

The third phase for the Memphis MSA should be to leverage the growth in biologistics services into other bioscience businesses, such as manufacturing and product development.

THE CASE FOR A MEMPHIS BIOLOGISTICS SERVICES MODEL

It is envisioned that with the proper effort, many targeted companies will be attracted to centralize their warehousing and distribution in Memphis, followed by related business services such as logistics IT, sales, and marketing, and upstream activities of manufacturing. This, in turn, may lead to components of product development and research.

RESEARCH MODEL VS. BUSINESS SERVICES MODEL



The business services approach provides a more stable business environment and reduces the higher risks associated with unfounded markets. In support of this case for a business services model, the Boston Consulting Group (BCG) in its study for the state of Massachusetts argued:

“Although Massachusetts has always been an attractive environment for research, it is not well organized to support activities further down the value chain. Only about 10% of the state’s biotech companies are currently involved in manufacturing. Of those, more than half do their manufacturing outside the state. Given the richness of the current pipeline, more and more Massachusetts biotech companies will be moving down the value chain in the years to come. Early indications, however, are that they may choose to pursue these downstream activities elsewhere. Evidence suggests that the further a biotech company moves down the value chain, the less likely it is to locate activities in Massachusetts. For example, quite a few companies do initial development and pilot manufacturing in-state because of the value of co-location with research facilities. Remarkably few, however, conduct their clinical trials in-state. And very few do manufacturing in Massachusetts. The older a company gets, the smaller the share of its jobs that are located in Massachusetts. What’s more, downstream jobs, particularly in manufacturing, tend to be more stable geographically. The FDA’s lengthy and complex drug approval process includes approval of the manufacturing process and site. Thus, once a manufacturing site wins federal approval, it is not likely to be moved.”

We contrast this strong research environment in Massachusetts with the strengths of the Memphis region, as the nation’s distribution center. We emphasize the region’s abilities to leverage its existing investments for greater economic gain. The analysis indicates that the Memphis MSA is well positioned to take advantage of the industry trends and weaknesses of the large bioscience regions, as articulated by the Boston Consulting Group.

POSITIONING MEMPHIS AS THE BIOLOGISTICS HUB

There appear to be sufficient strengths in the Memphis MSA to allow its business and community leaders to begin marketing it as “America’s Biologistics Hub” to accompany the claim as “America’s Distribution Center”. However, the depth and permanence of this designation may require critical action steps to ensure that the region is recognized and rewarded as such.

The Biologistics Study included an interview process with over twenty (20) stakeholders and individuals within the following groups within the Memphis region and elsewhere:

- Logistics and Shipping
- Manufacturers and Service Organizations
- Community Leaders
- Universities and Hospitals

These interviews about the region’s strengths, weaknesses, opportunities, and threats reveal actions that should be taken by business and community leaders.

The recommended action items include both “build it and they will come” elements as well as business development and marketing that will encourage companies to expand to

the Memphis MSA and invest in the region. Business and community leaders will need to ensure that additional steps are taken to strengthen biologistics so that the process continues upstream, and doesn't just stop at the distribution of product. The team recognizes that much has already been done, and many initiatives are in process. The recommendations herein should be considered within the framework of the efforts in place now.

The specific recommendations are highlighted as follows and discussed in more detail in the full report:

- #1 Promote the Memphis MSA for biologistics expansion
- #2 Establish international partnerships
- #3 Encourage training for a skilled labor pool
- #4 Package incentives for targeted investment in the Memphis region
- #5 Enhance the technology base
- #6 Recruit new thought leaders into the region

#1 PROMOTE THE MEMPHIS MSA FOR BIOLOGISTICS EXPANSION

We realize that many promotional materials are currently available and efforts are being made daily to attract quality companies to the region. These recommendations are intended to provide additional focus and ideas. Some already may be in use or under consideration.

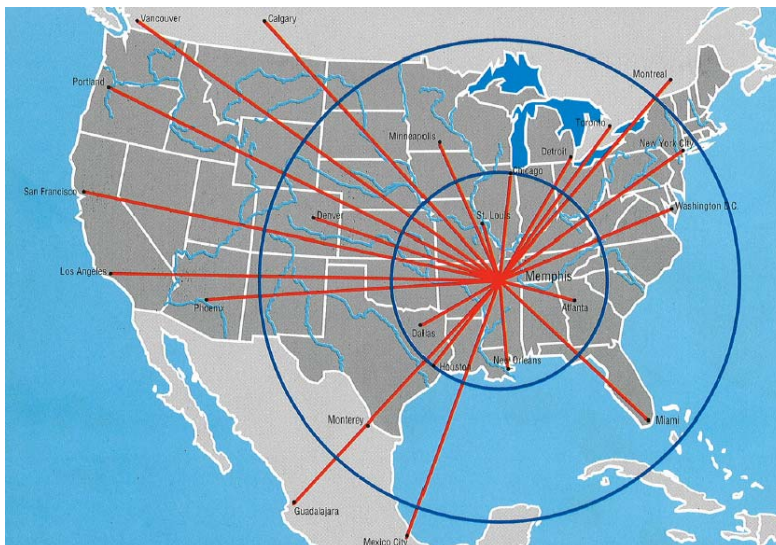
Rather than attempting to attract bioscience companies to relocate their headquarters to the Memphis MSA, it may be advantageous to seek for bioscience companies to locate or relocate their manufacturing and downstream operations to the Memphis MSA.

Promote: Accelerating Speed to Market

We recommend a theme for Memphis Biologistics related to “accelerating speed to market” for the products of its local, national, and international bioscience partners. The Memphis MSA accelerates speed to market by providing:

- Centralized U.S. geographic location with ground and air courier service to numerous locations as shown.

MEMPHIS AS A CENTRALIZED DISTRIBUTION HUB⁷



- Same day and overnight expedited delivery services in cost effective model which allows the business day to end much later than any other U.S. location, as late as 11pm-12mid-night in many cases. This allows companies to capture more business with expedited delivery in multiple time zones.

AIR PACKAGE CARRIER LATEST SHIPMENT CUT-OFF TIMES (PM)⁸

| CITY | CUT-OFF | CARRIER |
|------------------|---------|-------------------|
| Memphis, TN | 11:00 | FedEx |
| Indianapolis, IN | 8:00 | DHL Worldwide |
| Atlanta, GA | 11:00 | DHL Worldwide |
| Louisville, KY | 10:00 | UPS Air |
| Columbus, OH | 7:00 | FedEx and UPS Air |
| Dallas, TX | 8:00 | FedEx |
| Kansas City, MO | 7:30 | UPS Air |

It should be noted that although Memphis enjoys the latest air shipment cut-off time, the Memphis location currently does not produce a cost advantage for air shipping costs. The major air carriers generally charge the same price for

⁷ Used for this study with permission of Patterson Warehouses, Inc., Memphis, TN.

⁸ Source: CF Lynch & Associates, Memphis, TN, June 2005 reflects comparison of 5 major carriers for selected cities, subject to change and exceptions by city and carrier.

shipping from Memphis as they do for shipping from another location (such as New Jersey) with the shipment going through the Memphis hub.

- The advantage and protection of multiple transport companies. This point is strengthened by the fact that the multiple transport companies include all shipping methods of air, trucking, and rail. This diversity and redundancy provides efficiency, competitive costs, and backup services in the event that one of the transport companies is unable to perform. While the consultants expected that the major air courier in the MSA would be protective of its dominance in the region, the interviewee indicated that she proactively uses this selling point of multiple transport options when encouraging companies to expand to Memphis.
- Inbound transport cost advantages. While Memphis is recognized for its tremendous outbound distribution and logistics capabilities, at least one of the interviewees expert in this area emphasized that Memphis also has tremendous inbound logistics which serves to get raw materials in efficiently and more cheaply.

Interviewees commented that transport companies in Memphis are planning to place more emphasis in the future on International inbound and outbound operations.

- Reliable Operations. The region should also emphasize its location as one of the country's most reliable 24x7 365 days a year operation. The weather accommodates excellent 24x7 staff coverage and minimal closure situations at the airport. This point could be highlighted as one of the key attributes that attracted FedEx and their world-wide hub and headquarters to the MSA.
- International gateway for product export and import. Memphis will become an even better location with the international trends. The Memphis region has three Free Trade Zones (FTZ) which enable companies to import product and raw materials and store those items free of import duties until shipped out of the FTZ. The recent NAFTA agreements and breakdown of tariffs should also encourage international trade which Memphis is uniquely positioned to handle.

Moreover, the Memphis International Airport already has the longer runway to handle the planned larger Airbus 380 aircraft for international shipments (FedEx ordered six of these larger aircraft). Other competitive cities will be unable to accommodate these larger aircraft for international shipments, or will have to build the longer runway required.

The region could develop and promote other benefits to international partners, including U.S. FDA approval and quarantine services.

- Distribution, warehousing, and logistics facilities. Memphis has 160 million square feet of warehouse space with an average size for current construction of approximately 500,000 square feet (over 11 acres) per building. Approximately one-half of the warehouse space is Class A, much of which is suitable for biomedical products.

Memphis as both a manufacturing location and centralized distribution location may be promoted as a way to eliminate a significant amount of inventory by combining the inventories of manufacturing and centralized distribution in one location.

- Skilled labor required for special handling of biomedical products. After implementing programs such as those suggested in Recommendation #3, community leaders could publish the number of newly certified high school graduates qualified to perform special handling for biologistics.

Those interviewed generally agreed that the features Memphis has to offer in Biologistics should be promoted more succinctly. Some local interviewees indicated that the chambers of commerce lack promotional materials.

Most of those interviewed in industry from outside the region have not considered the Memphis MSA in their expansion plans. Many currently have no presence in Memphis and are not actively looking for new manufacturing and distribution centers. The status quo which excludes the consideration of Memphis may be acceptable to companies outside the region unless they become impelled to make a significant change by being convinced of the benefits and value.

Promote: Attractive Costs

Along with marketing of the “speed to market” attributes of the region, other features of the economic equation and willingness to relocate should be emphasized, including:

- Attractive cost of doing business
- Attractive cost of living

Both “attractive cost of doing business” and “attractive cost of living” are quantitatively understood and quickly accepted among prospects for expanding to the region or relocating. As shown in the following chart, Memphis offers both favorable Cost of Doing Business and favorable Cost of Living compared to the primary bioscience locations.

| <u>LOCATION COST COMPARISON</u> | | |
|--|--|------------------------------------|
| <u>REGION</u> | <u>COST OF DOING BUSINESS INDEX</u> | <u>COST OF LIVING INDEX</u> |
| Bay Area | 136.4 | 167.5 (SF) |
| Boston | 119.1 | 135.6 |
| Maryland | 104.6 (State) | 133.2 (DC) 93.2(BALT) |
| Research Triangle | 97 | 99.0 |
| San Diego | 105.1 | 137.8 |
| Memphis | 90.5 | 92.9 |

Promote: Fine Southern Living

Much of the current promotional material is focused strictly on business, with statistics on world-class logistics. We recommend more creativity in the promotional materials addressing the quality of life for bioscience executives and decision makers.

The interviewees generally understood that Memphis has been hampered in its attempts to attract companies because an “attractive quality of life” attribute is not easily recognized nor accepted. Bioscience companies tend to be more image conscious than traditional industrial companies and are more selective in the environment in which their decision makers want to live. Negative images of Memphis hamper the region’s ability to attract bioscience companies.

The region’s promotional literature should develop a theme that would capture the imagination and interest of bioscience executives. In addition to those items mentioned above, the promotional material should highlight those advantages which are insightful, but not generally known. An example is the benefit of having some of the most plentiful and clean water in the country, which may be vital for certain bioscience manufacturing applications that utilize significant amounts of clean water. The promotional literature could provide an interesting illustration depicting the rainfall some 300 miles away in the mountains, the dense rock layer protecting the underground water from pollution as it percolates through aquifers to the artesian well formations immediately under Memphis.

Increase Promotional Efforts

We expect that with the help of a reputable bioscience oriented marketing and public relations firm, the community leaders will be able to capture an outstanding list of attributes and features for promotional materials and brochures.

It is apparent that in some cases where Memphis was a runner-up for an expansion or relocation decision, the overall rating was very close. In one case, apparently Minneapolis was selected over Memphis due to the investment capital availability. Those interviewed generally felt that the community leaders need to be more proactive in seeking to attract companies to expand and relocate in the region. Recommendations were made to market to the relocation/expansion consultant market in order to leverage the sales effort towards multiple companies.

It was noted by at least two interviewees that many companies likely are present in the Memphis region through 3rd Party Logistics firms (e.g. GE), and therefore are not identified separately as having a presence in Memphis.

One of the aspects of promoting Memphis to companies that are hesitant to expanding directly or relocating to the region is encouraging the use of the region's expanding 3rd Party Logistics (3PL) firms. The use of 3PL enables companies to enjoy the benefits of logistics and distribution through Memphis more quickly and in many cases at a lower cost. Many local 3PL firms operate on large scale with multiple clients and thereby improve the productivity of labor, warehouse space, and equipment on a daily, weekly, and seasonal basis. It was estimated that only 15% of logistics and distribution is outsourced; indicating an opportunity to attract 85% of logistics and distribution to the 3PL model.

An effective way to communicate the advantages and benefits of expanding and relocating to the Memphis region is through case studies. In many ways the case study becomes an illustration or a testimonial to which prospective companies can relate.

#2 ESTABLISH INTERNATIONAL PARTNERSHIPS

A further extension of the Memphis *Accelerating Speed to Market* model is in the services provided to global institutions for access to the U.S. markets. We recommend that the Memphis MSA establish a few key global biologistics and business services partnerships.

In the near-term these partnerships will provide access to infrastructure and support systems at international centers of excellence that fill gaps in Memphis' current capabilities. In the longer term these partnerships will enable the Memphis region to participate in U.S. FDA approvals for foreign research and development efforts and intellectual property and project its business services (manufacturing and distribution) on

a global basis. These key global partnerships would also include research dimensions that provide access to non-core competencies in research from centers of excellence that fill in the current capabilities. These efforts would be complementary to the current efforts with TVA and Oakridge research center on engineering projects.

We recommend international partnership targets within the multiple countries, including four key target countries of: (1) Ireland, (2) Japan, and (3) Australia, and (4) India.

Target #1: Ireland

We recommend Ireland as the top global location for the Memphis region to target partnerships. Ireland has expansive pharmaceutical manufacturing infrastructure, model business services paradigm, and ties to U.S. programs.

Ireland is also an example of how healthcare service businesses do not have to be proximal to the area they serve. A rural area in Ireland now conducts Aetna managed care claims for all of Europe and some of North America. Based on this Irish model, the Memphis MSA should consider the opportunity to establish central call centers, service bureaus and other healthcare services businesses in the region for the United States and maybe international services.

Target #2: Japan

We recommend Japan due to anticipation of required logistics services. We believe that Japan still has the IP protection, infrastructure, universities network and best business practices in the region, and needs U.S. based logistical services. Japanese companies may be willing to establish manufacturing and business services in the Memphis MSA.

Target #3: Australia

We recommend Australia for its world class technology, infrastructure, and innovation. Despite having 0.3% of the world population, it is reported that Australia produces 2.7% of the world's medical research and generates sixty percent (60%) of Asian biotechnology revenue through publicly traded companies. In 2004, Ernest & Young rated Australia as the largest biotechnology market in Asia.

Australia has been a partner of what appears to be the fastest growing healthcare research region in the country, Arizona. There are many aspects of the Australian model that make sense for the Memphis MSA.

Target #4: India

We recommend India for its expansion as a manufacturer of biomedical products and needs a distribution partner for products in the U.S.

Since 1991, India has steadily moved up the world market in pharmaceutical sales. In 1991, India accounted for 0.25% of the world market. By 1998, India accounted for 1.5% of the world market. By 2006, India is anticipated to produce 8% of the world market needs. India has stated its objective is to produce 15-20% of the world market pharmaceutical products by 2010.

The Memphis MSA should determine how to partner with the Indian government and leading private sector companies for exclusive U.S. distribution for specialty products. The most apparent opportunity is the “individualized/customized” medicine product production. Bulk product can be manufactured in India and product finished in the Memphis region and shipped from the logistics centers of Memphis anywhere in the world.

#3 ENCOURAGE TRAINING FOR A SKILLED BIOLOGISTICS LABOR POOL

We recommend that steps be taken to encourage training for a skilled labor pool for biologistics. This training will support the special handling for the \$65 Billion (22%) of the biomedical product market. A natural upstream extension of training for biologistics will be training for product manufacturing.

We recommend training enhancements to include jobs training, curriculum, and cross training. Enabling the current talent pool to assimilate new job skills improves the talent pool to attract new companies and the quality of life for the workers. Encouragement of new skills or cross training can significantly shorten the development curve for the region’s talent pool.

Those interviewed generally agreed that there is a portion of the workforce which is unqualified for the workplace. Some of those interviewed felt that the chronically unemployed (or unemployable) significantly hampered the ability of firms to expand in the region. Most felt it was a major issue that prevents many prospective companies from seriously considering the Memphis region for expansion in manufacturing and services, or a corporate relocation. However, many executives were less concerned as they observed the highly qualified labor pool coming out of the high schools, community college, and Universities with training (and in many cases college degrees) in logistics and distribution. Some felt that by offering attractive pay and benefits, they could attract qualified candidates through employee referrals.

Those interviewed expressed a wide range of opinions regarding the level of training needed to support the special handling requirements associated with biologistics. Some indicated that the only practicable approach was OJT (On-the-job training), while many others felt high school courses in logistics and transportation could provide viable career options with higher pay to those students who do not intend to go to college. As mentioned previously, some also felt that college level courses in biologistics would fit well into the professional program.

The outline of career options for high school graduates who do not plan to attend college may be helpful for many high school students in the region. For many young adults, an understanding of this potential could change his/her life for good. As shown in the chart below, the higher wage and benefits differential of 28% - 55% and benefits for developing a few logistics and distribution skills should encourage some high school students to graduate and acquire skills they otherwise would not. Moreover, these positions are more likely to enable upward mobility to a supervisory position with over 100% higher wage.

**LOGISTICS AND DISTRIBUTION WAGES
ILLUSTRATIVE OF THE MEMPHIS LABOR MARKET⁹**

| NON-EXEMPT LABOR CATEGORY | WAGE | BENEFITS |
|--|-------------|-------------------|
| Warehouse Unskilled Assignments | \$9.00/hr. | Minimal |
| Warehouse Fork Lift Operator | \$11.50/hr. | Medical Insurance |
| Warehouse Special Handling Assignments | \$14.00/hr. | Medical Insurance |
| Warehouse Supervisor | \$20.00/hr. | Medical Insurance |

The wage differential of \$5.00 per hour results in higher earnings of \$10,000 per year. When multiplied by a 40 year work-life, the individual would earn \$400,000 more during his/her career in constant dollars, or approximately \$754,000 more with inflation of 3% annually.

#4 PACKAGE INCENTIVES FOR TARGETED CAPITAL INVESTMENT

Investment of capital in the region will help to establish the infrastructure for biologistics services and upstream bioscience regional growth.

Corporate investment in biologistics related expansion in the region should be encouraged through marketing the favorable economics and Return on Investment associated with expansion/relocation to the region. Economic incentives should also be offered which are typical of this type of corporate decision, including state jobs tax credits, income tax deferrals, and municipal bond programs.

Private investment funding in emerging and growing businesses should be encouraged through state sponsored matching programs, investment associations, and availability of lending through local banks.

We recommend that community leaders cooperate in their efforts, rather than compete, to attract biomedical companies to the region, even though the Memphis region is essentially divided between the two states of Tennessee and Mississippi. The region

⁹ Source: Based on interview of local 3PL provider near the Memphis International Airport, July 2005.

(whether in one or both states) contains key incentives that should be included as part of the region's promotional materials with details in the full report¹⁰.

Property Tax Incentives: Both Mississippi and Tennessee exempt goods in process/transport for property taxes. Mississippi has a Free Port Warehouse Law that exempts finished goods from property taxes, including school taxes. For new or expanding enterprises, certain properties may be exempted from property taxes, except school taxes, for up to ten years at the local option.

Income Tax Incentives: Mississippi and Tennessee offer an assortment of exemptions and credits against income tax.

Jobs Incentives: Both states provide for various Jobs Tax Credits and other jobs and hiring incentives.

Franchise Tax Incentives: Tennessee provides for exemptions.

#5 ENHANCE THE TECHNOLOGY BASE

Related technologies are a key accelerator for development of the biologistics market. We recommend that business and community leaders ensure that the region has a technology plan that ensures businesses operate in a world-class business environment.

This technology plan should include general infrastructure components comprised of such items as a leading physical and network security system, comprehensive Internet access, streamlined government services utilizing the Internet where possible, efficient transportation, and plans to accommodate growth.

Other key issues can be addressed through the appropriate technology, systems, and processes by businesses:

- Counterfeit drugs
- Secondary market purchases
- Processing of product returns
- Appropriate stocking levels
- Centralized distribution
- Integrity in the supply chain

¹⁰ Sources: American Chamber of Commerce Research Council; DeSoto County Economic Development Council, Memphis and Shelby County Office of Economic Development; Memphis Regional Chamber of Commerce; Mississippi Business Finance Corporation; Mississippi Department of Economic and Community Development; Mississippi State Tax Commission; Tennessee Department of Revenue. American Chamber of Commerce Research Council; DeSoto County Economic Development Council.

#6 PROMOTE BIOLOGISTICS THOUGHT LEADERS IN THE REGION

A celebrity spokesperson or organization for the market segment could lead to relocation of others to the region. History has shown that entire industries have been built around visionary leaders.

So is the case with biosciences. Large heart institutes or cancer centers have developed around specific individuals known for their work in the field. A similar effect could be achieved through highlighting individuals associated with revolutionizing biologistics related functions.

A biologistics thought leader could provide the reputation for expertise in the region. One of the pharmaceutical industry executives interviewed suggested that to penetrate the pharmaceutical industry required a “wedge play”, such as specialty products distribution, sample distribution, data management, or some other unique service ... something that would require pharmaceutical companies to come to Memphis to see.

A CALL FOR COORDINATED STAKEHOLDER ACTION

The U.S. market for Biologistics Services is \$13.8 Billion in 2005 and growing at 8.8% annually to \$32.0 Billion by 2015. The Memphis MSA has capabilities to help capture much of the growth. The opportunity expands further as the region captures a greater share of the biomedical products market growth as well. The action steps described in this report should help the region achieve economic growth through biologistics.

The timing of the Memphis region biologistics study is pivotal. The manufacturing and distribution portions of the industry are in flux. Biomedical product manufacturers are apparently open to change after the recent upheavals in the industry.

As shown previously, the biomedical product distribution market has consolidated to the “Big 3” wholesalers of (1) Amerisource-Bergen, (2) Cardinal, and (3) McKesson. These “Big 3” wholesalers have recently announced changes to the pricing structure for their services. The results of these changes may have minor impact on the large pharmaceutical companies which have significant negotiating leverage; however, may have large impact on the middle tier and smaller pharmaceutical and biotechnology drug manufacturers, resulting in much higher distribution and retail access costs. In addition to higher fees, questions linger regarding the integrity of the overwhelming majority of bioscience distribution, as highlighted in news reports.

Some of the interviewees located outside the region highlighted the desire for more biologistics options. As a result of structural changes in the pharmaceutical distribution industry, medical products manufacturers are anxious to have alternatives for distribution. It is likely that business entities will be formed to serve these needs.

ECONOMIC IMPACT TARGET

Coordinated actions that focus on biologistics should result in significant economic growth for the Memphis MSA. The growth can best be measured in terms of jobs, income, and GDP in the Memphis MSA, as analyzed by a credentialed economics professional at the University of Southern Mississippi and the Mississippi Technology Alliance for this study.

The impact is analyzed in terms of direct growth in biologistics and in terms of indirect growth from the “multiplier effect”, as firms and employees spend money in the local economy. Warehouses and shipping companies will purchase office supplies, fuel, professional services, and other goods during the course of business. Employees will spend their earnings on groceries, clothing, recreation, and other goods and services. This spending will create more jobs and income in the area. These indirect impacts are known as ‘ripple’, ‘spin-off’, or ‘multiplier’ effects.

Target: Grow Memphis’ Share from 3.8% to 5.6% by 2015

Biologistics revenue in the area would more than triple from \$531 Million in 2005 to \$1,784 Million in 2015, an annual growth rate of 12.9%. This would result in a 47% increase in market share from 3.8% in 2005 to 5.6% in 2015.

Growing the share of the Biologistics market by this amount could create over 16,000 new jobs in the Memphis area. This would mean \$570 Million in new wage and salary payments. The overall increase in ‘value added’ (or GDP) in the region would approach one billion dollars.

Should these targets be reached, the Memphis MSA would see a 2.1% increase in employment. Total personal income would be boosted by 1.7%.

These impact calculations are considered conservative by the economist. Since the *Biologistics* sub-sector of the logistics sector provides wages that are 30 to 50 percent higher than average logistics wages, we expect the indirect impacts to be even greater.

Clearly there are other benefits to higher wage jobs than just greater indirect economic impact effects. These jobs promote stability in the community as employees tend to stay longer in high quality jobs as opposed to lower paying, lower skilled jobs where turnover is high. Local governments benefit because higher income citizens provide more tax revenue while typically requiring fewer services.

In order to grow this market for the Memphis MSA, we recommend the action items described previously for use by the business and community leaders, under the coordination of the Memphis Bioworks Foundation.