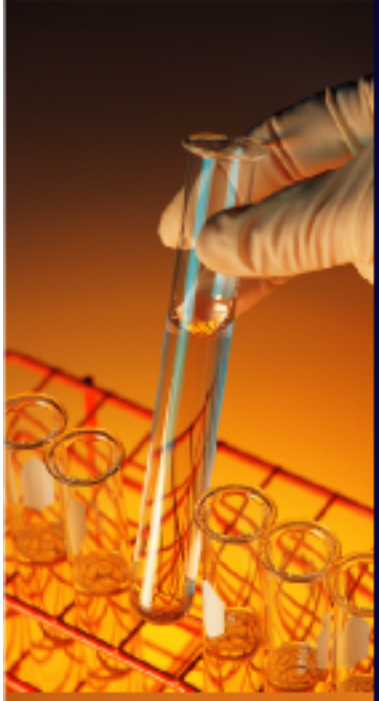
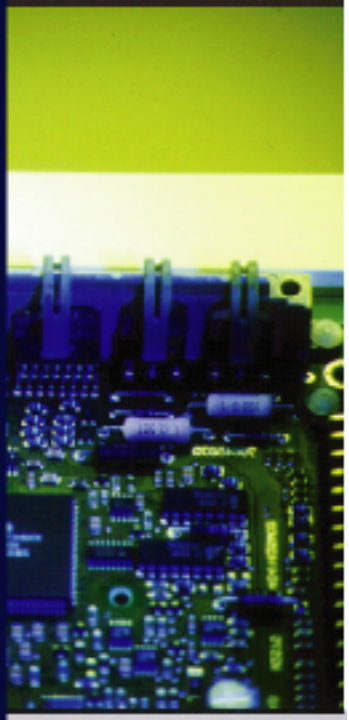
Arkansas Research and Technology Park: A Strategic Analysis





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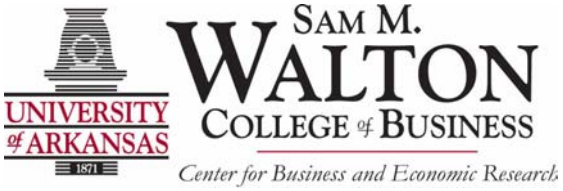
Center for Business and Economic Research

ARKANSAS RESEARCH AND TECHNOLOGY PARK: A STRATEGIC ANALYSIS



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EXECUTIVE SUMMARY

This study is a detailed strategic plan and economic impact analysis for development of a university related research and technology park to be located in Fayetteville, Arkansas. The Arkansas Research and Technology Park (ARTP) is an essential component of the state's overall strategy for equipping Arkansans to compete in the new economy.

It is critical to the economic vitality of the state that new and different types of employment be created. The ARTP is an effort to jumpstart formation of the knowledge-based economy in Arkansas by creating the clusters of expertise necessary to achieve critical mass in knowledge-based industry. This strategy has been used successfully throughout the nation and the world. In the southeast, examples are the Research Triangle in North Carolina and the Huntsville, Alabama region for air and space industries.

Development of the ARTP to date is a result of collaboration between varied stakeholder groups. The following list identifies the stakeholder groups and their contributions totaling $29.525 million:

- University of Arkansas—Land, financial commitment to planning process, construction of initial ARTP building and promotion of existing ERC building,
- City of Fayetteville—Land, financial commitment to planning process, and
- Northwest Arkansas Regional Council—Financial commitment to planning process.

The process has also been supported by:

- The State of Arkansas, Department of Economic Development,
- The Arkansas Science and Technology Authority,
- Local, regional and state business communities, and
- The Fayetteville Chamber of Commerce.

The benefits to the state, region, and city are both monetary and non-monetary. The monetary benefits from construction and operation of the ARTP from 2002-2031, in real dollars are:

- Over 30 years construction of the ARTP will create 1,582 temporary jobs,
- Construction of the ARTP will generate an expected present value of $27,127,423 over 30 years in employee compensation,
- The ARTP is expected to generate a present value of $2,176,617 in state and local tax revenues over its 30-year construction period,
- Operation of the ARTP will create 1,981 permanent jobs by 2031,
- The expected present value of the total impact of operating the ARTP on regional output will be $718,822,978, and

- The operation of the ARTP is expected to generate a present value of $17,726,627 in state and local tax revenue from 2002-2031.

Non-monetary benefits include the creation of an **entrepreneurial culture** capable of translating the intellectual property created by the university to commercialized, knowledge-based industry. Creation of the ARTP builds the **image** of the state of Arkansas as a destination for high wage-high skill employment. This new industry implies new and different sources of employment for Arkansans.

Federal funding is vital to realizing the full potential of local investment, and to the success of the ARTP as a driver for economic growth in the state of Arkansas. The role of federal funding in the continued development of the ARTP is to provide essential infrastructure and land acquisition. This study indicates substantial benefits will accrue from the public investment in the ARTP. Further, failure to invest in the future of knowledge-based industry in the state dooms Arkansans to a life sentence of diminished opportunity and declining standards of living relative to national averages.

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ARKANSAS RESEARCH AND TECHNOLOGY PARK: A STRATEGIC ANALYSIS

BACKGROUND INFORMATION

What is a Research Park?

A research park or science park, as defined by the Association of University Research Parks (AURP), is a property-based venture that has:

- Existing or prospective land and buildings intended primarily for private and public research and development facilities, high-technology and science-based companies, and support services;
- A contractual and/or formal ownership or operational relationship with one or more universities or other institutions of higher education, and science research;
- A role in promoting research and development by the university in partnership with industry, assisting in the growth of new ventures, and promoting economic development; and
- A role in aiding the transfer of technology and business skills between the university and industry tenants.

Worldwide, there are more than 250 examples of research and technology parks. Each of these parks exists as an engine for economic growth in its respective community, region, and state. Research parks are centers for innovation and places where new discoveries realize their potentials in the marketplace. Their host communities realize that by focusing scarce public and private resources in research parks, synergistic relationships can be fostered and economic value can be created.

Research and technology parks are best viewed as long term investments by the communities that they serve. The most successful research and technology parks, like those that made Silicon Valley and the Research Triangle famous, are the results of decades of investment and public-private partnership. To be a driver for economic growth, the formation of a research and technology park must be part of a deliberate economic development strategy that cultivates innovation and entrepreneurship.

A research and technology park is a physical space where links between high quality academic research and business ideas can be formed to the benefit of all. The resulting network acts as a foundation for economic growth.

Why Develop the Arkansas Research and Technology Park (ARTP)?

In terms of preparedness for an information-based economy, Arkansas lags behind the rest of the country. The Milken Institute produces a New Economy Index, which ranks states by combining factors that influence success in an information economy. The following chart details the position of Arkansas relative to the other 49 states in the year 2000.

Table 1: The Milken New Economy Index and Component Parts[1]

Year 2000 Measurement	Arkansas' Rank
Milken New Economy Index	50th
Percent of population with at least bachelor degrees	49th
Percent of population with advanced degrees	49th
Level of doctoral scientists and engineers	47th
Exports as a percentage of gross state product	40th
Per capita federal research and development dollars	49th
Per capita industry research and development dollars	45th
Per capita academic research and development dollars	47th
SBIR awards per 100,000	48th
Business starts	35th
Venture capital investment	44th
Initial public offering proceeds	41st

The abysmal position of Arkansas in most of these rankings is in great part a "chicken and egg" problem. The state has great difficulty in attracting high quality jobs because of the relatively poor educational status of its workforce. However, because of the lack of high quality jobs, the best and brightest citizens of Arkansas are often drawn out of the state to obtain the jobs that are most suitable for their skills.

Information technology, cluster development[2], and labor skills are considered the three most important elements for a region to stay competitive in the 21st century economy.[3] If Arkansas wants to engage fully in tomorrow's economic prosperity, it must build an economic development engine that has the power to attract and keep skilled labor, induce cluster presence, and create clean-industry employment. Because research parks provide the infrastructure and atmosphere to encourage research and development, creating the Arkansas Research and Technology Park (ARTP) is a crucial step in this direction.

The industries that have traditionally supported the Arkansas economy are faltering under the stresses of globalization. In order to assure that the infrastructure necessary for providing a good quality of life to the citizens of Arkansas exists in the future, the state

[1] Milkin Institute, http://www.milken-inst.org/poe.cfm?point=pub03.
[2] Cluster development can be defined as the focusing of development resources in specific industry areas in order to achieve the critical mass necessary to attract employers and retain employees.
[3] *Labor Skill Imperative: U.S. Competitiveness*; Council for U.S. Competitiveness, Washington D.C., 2001.

must invest now in a unified economic development plan. A research and technology park is a key part of that plan.

Why Plan an R&T Park in Fayetteville?

Having established the need for a research and technology park in the state of Arkansas, the question of where to locate the ARTP arises. The city of Fayetteville is uniquely suited to house a research and technology park. First and most importantly, because the flagship state research university is located in Fayetteville, the city is most likely to be the location in Arkansas where a research and technology park can be economically successful. According to a report by the National Governor's Association, "29 of the top 30 performing high tech metro areas are home to, or in close proximity to a major research university." The association of a research and technology park with a research university is so important that it cannot be overstated. In fact, most research universities have already associated themselves in some way with a research and technology park. The synergies that can be formed between the university and industry are potentially too profitable to ignore.

Fayetteville is the optimal choice for siting a research and technology park for other reasons besides proximity to the University of Arkansas. One key rationale for locating the ARTP in Fayetteville is that a consortium of various constituencies has come together to lend support to the formation of a research and technology park in the community. Decision makers from the University, the city, the region, and the state have committed resources with the purpose of facilitating the development of the ARTP. A strong sense of momentum exists within the community to see specific action come from the efforts of a core group of individuals and institutions interested in attracting knowledge-based industries to the state of Arkansas.

The Northwest Arkansas region offers particular promise as a home for burgeoning high-tech industry clusters. The Northwest Arkansas corridor, from Fayetteville in the south to Bentonville in the north, is growing and developing as a population center. During the 1990's, employment in the region increased at an annual growth rate of almost 4.5 percent. During the same time period, farm employment in the region declined outright, while manufacturing employment growth failed to keep up with overall employment growth. Therefore, manufacturing employment as a percentage of total employment in the Northwest Arkansas corridor fell from 23.05% to 18.57%. Concurrently, service and retail trade employment posted growth rates that were higher than average overall employment growth rates in Northwest Arkansas, leading to increases in their percentage of overall employment. Service employment increased from 19.31% to 22.41% of total employment in Arkansas from 1990 to 1999. During the same period, the percentage of retail trade employment grew from 19.35% to 22.19%. Table 2 provides a breakdown of changes in employment by sector during the 1990's.

Table 2: Employment by sector and industry from 1990-1999 for Fayetteville-Springdale-Rogers MSA[4]

	1990	1999	Annualized Growth 1990-1999	% of Total 1990	% of Total 1999	Difference
Total full-time and part-time employment	128,637	190,581	4.46%	100.00%	100.00%	
Wage and salary employment	106,546	156,748	4.38%	82.83%	82.25%	-0.58%
Proprietors' employment	22,091	33,833	4.85%	17.17%	17.75%	0.58%
Farm proprietors' employment	5,233	4,822	-0.90%	4.07%	2.53%	-1.54%
Nonfarm proprietors' employment	16,858	29,011	6.22%	13.11%	15.22%	2.12%
Farm employment	6,988	6,238	-1.25%	5.43%	3.27%	-2.16%
Nonfarm employment	121,649	184,343	4.73%	94.57%	96.73%	2.16%
Private employment	105,352	163,502	5.00%	81.90%	85.79%	3.89%
Ag. services, forestry, fishing, & other	1,447	N/A	N/A	1.12%	N/A	N/A
Mining	180	N/A	N/A	0.14%	N/A	N/A
Construction	5,843	11,417	7.73%	4.54%	5.99%	1.45%
Manufacturing	29,650	35,400	1.99%	23.05%	18.57%	-4.47%
Transportation and public utilities	8,930	11,963	3.30%	6.94%	6.28%	-0.66%
Wholesale trade	3,615	6,528	6.79%	2.81%	3.43%	0.62%
Retail trade	24,880	42,281	6.07%	19.34%	22.19%	2.84%
Finance, insurance, and real estate	5,971	11,057	7.09%	4.64%	5.80%	1.16%
Services	24,836	42,715	6.21%	19.31%	22.41%	3.11%
Government	16,297	20,841	2.77%	12.67%	10.94%	-1.73%
Federal, civilian	1,426	1,566	1.05%	1.11%	0.82%	-0.29%
Military	1,564	1,599	0.25%	1.22%	0.84%	-0.38%
State and local	13,307	17,676	3.20%	10.34%	9.27%	-1.07%
State	5,707	7,743	3.45%	4.44%	4.06%	-0.37%
Local	7,600	9,933	3.02%	5.91%	5.21%	-0.70%

[4] U.S. Department of Commerce, Bureau of Labor Statistics, http:\www.bls.gov.

The city of Fayetteville also offers a relatively attractive cost of living that is desirable by middle class working professionals. The following table presents a comparison of the cost of living index in Fayetteville-Springdale-Rogers Metropolitan Statistical Area (MSA) to other major metropolitan areas in the state and in the neighboring states. [5] The baseline is the average of all MSAs, so values that are lower than 100 indicate relatively inexpensive places to live and values higher than 100 indicate relatively expensive areas.

Table 3: Comparison of ACCRA Cost of Living in Selected MSAs

ACCRA Cost of Living Index[6]							
	Composite 100%	**Grocery 16%**	**Housing 28%**	**Utilities 8%**	**Trans 10%**	**Health Care 5%**	**Misc 33%**
Fourth Quarter 2000							
Fayetteville-Springdale-Rogers, AR. MSA	89.7	86.3	87.7	89.2	93.9	85.6	92.4
Little Rock-North Little Rock, AR. MSA	95.2	102.0	79.9	110.7	99.6	102.2	98.6
Hot Springs, AR	95.4	97.1	84.9	125.9	91.9	80.7	99.4
Memphis, TN-MS-AR. MSA	90.1	98.6	82.8	90.1	98.2	102.2	98.6
Atlanta, GA MSA	103.2	101.9	109.4	93.2	101.9	106.9	100.8
Dallas, TX PMSA	99.5	96.2	96.6	99.0	104.4	102.2	101.7
Houston, TX MSA	94.7	92.5	83.3	108.1	105.6	111.5	96.4
Oklahoma City, OK MSA	93.5	88.2	85.7	99.7	96.3	97.3	99.8
St. Louis, MO-IL MSA	96.7	93.8	88.6	97.0	104.2	104.8	101.5
New Orleans, LA MSA	99.3	105.9	86.9	135.9	108.5	103.3	94.5
Mobile, AL MSA	96.4	96.5	92.3	105.7	103.0	82.7	97.7

What Will the Proposed ARTP Accomplish?

There are three distinctive goals that ARTP seeks to accomplish. The immediate goal is to establish a high-tech infrastructure system that provides networks of research expertise, access to financial incentives in a location accessible to improved air and highway transportation for companies in the park. Thus, the first goal of the ARTP is to establish a physical presence where an entrepreneurial culture can be nurtured. The focusing of resources in a specific location will then lead to economic development, clustered around the particular strengths of the Northwest Arkansas region.

The midterm goal is to witness an increase in University of Arkansas' research funding, especially with increased funding from federal government sources. This is consistent with the strategy being pursued by the University in accordance with the findings of the 2010 Commission. As the state of Arkansas' premier research university, the University of Arkansas is striving to acquire research grants in amounts that are similar to funding at

[5] *2001 Arkansas Economic Report*. Arkansas Department of Economic Development, 2001.
[6] As measured by the American Chamber of Commerce Researchers Association (ACCRA) Cost of living index evaluates relative price levels for consumer goods and services in over 400 participating metropolitan areas throughout the United States and Canada for a typical mid-level manager, http:\www.coli.org.

peer institutions across the United States. Developing the ARTP is a necessary step in that process for the University of Arkansas.

The ultimate goal of creating the ARTP is to stimulate the economic growth of the entire state. The ARTP will improve the quality of life for all Arkansans by attracting high paying jobs, providing professional opportunities for high technology workers, and forming clusters of expertise that are important for attracting additional high technology firms. This economic growth will lead to increased high quality employment. Higher wages accompany high quality jobs and higher wages lead to increased tax revenues for the state and city. With increased tax revenues, governments at all levels can increase investment in public goods like primary and secondary education and physical infrastructure, thereby improving the quality of life of the next generation of citizens. The virtuous cycle continues, as the successes that come from economic development spurred by the ARTP breed future economic prosperity for the state and region.

PROJECT HISTORY: THE ARTP PLANNING GROUP

The ARTP Planning Group is a coalition of citizens and organizations that has been involved in the planning phase of developing ARTP since 2001. The group represents a broad range of interests from the state, the region, the city of Fayetteville, the University of Arkansas, local businesses, civic groups and other organizations. The ARTP Planning Group is comprised of five subcommittees:

- Site selection and development,
- Commercialization and development,
- Ownership/management/operations,
- Financing, and
- Research.

The ARTP Planning Group developed a general planning document, composed of reports from the subcommittees. These reports served as a starting point for this strategic planning document, providing a history of the thought process behind developing the park. Validation of the early work has been an important consideration throughout the formation of the planning document.

Mission Statement

The mission of the ARTP Planning Group is "to develop a research and technology park for Arkansas for the purpose of stimulating a knowledge-based economy."

Site Selection

It was the consensus of the ARTP Planning Group that the most appropriate location for the ARTP is adjacent to the Engineering Research Center (ERC) in south Fayetteville, where the highly interactive environment necessary for innovation exists. A second advantage of choosing ERC site is the 32-acre property owned by the city of Fayetteville is located just to the east of the School Street. This site seems ideal to support light industrial manufacturing, thus linking the ARTP to the existing heavy industrial park to the east.

Under the assumption that the ERC site provides the optimal location for the ARTP, this strategic plan defines a proposed park area that is bordered by Town Branch Creek on the north, by a mixture of residential and industrial development to the west, by School Street to the east, and by Cato Springs Road to the south. The ARTP proposal area is illustrated in Map 1. This section will discuss the ownership, the size, and floodplain and floodway concerns associated with the proposal area.

Map 1: The Proposed ARTP Site and the Surrounding Area

Available Land

Immediately available land is defined as parcels of land within the ARTP proposal area that are either owned by the University of Arkansas or by the city of Fayetteville. The two entities are primary stakeholders in the ARTP development process and have committed substantial resources to the creation of the park. Thus, the ARTP can begin the development process without substantial land acquisition in the initial phase.

Land Owned by the University of Arkansas

The University of Arkansas owns a total of 35.995[7] acres within the ARTP proposal area. About 28 acres are associated with the ERC. To date, one third of the 28 acres has been developed for incubator and laboratory space. The University plans to develop up to another three buildings on this parcel to fully utilize the site, which will further integrate intellectual infrastructure in the ARTP.

Land Owned by the City of Fayetteville

The city of Fayetteville owns the abandoned railroad easement that runs through the north end of the ERC site. This is a 100-feet-wide right-of-way that constitutes approximately 4.4 acres.

[7] Acreage information is obtained from Washington County Tax Assessor's Office. Ownership information is obtained from Washington County Tax Assessor's Office and the University of Arkansas.

Potential Land

Potential land refers to parcels of land within the ARTP proposal area that are owned by private owners. Thus, these parcels have to be acquired before any planned structures and amenities can be built. Private ownerships are shown in Map 1.

Other Privately-Owned Land

The remaining land consists of a total of 35.95 acres and is currently owned by a total of eleven property owners. One particular property constitutes 25.61 acres of land. However, the presence of the abandoned railroad separates the land into two parcels. The northern parcel constitutes 21 acres. The parcel directly to the east of the ERC consists of 4.61 acres. The rest of the private land consists of 10.34 acres and is owned by the other ten property owners.

Floodplain and Floodway

The total land of the ARTP proposal area constitutes approximately 76.3 acres. The configuration of floodplain and floodway will influence the layout of the park, as 36.5 acres of this land is situated within the 100/500-year flood plain. An additional 13.2 acres of this land is located within the floodway. The existence of the floodplain and floodway provides the ideal opportunity to incorporate water features, trails, and park amenities as site features. The water amenities will make the ARTP site an appealing place to work and will form an attraction for the entire Northwest Arkansas community's benefit.

Site Analysis

Accessibility

Transportation Accessibility

The newly opened Northwest Arkansas Regional Airport (XNA) is only about a 40-minute drive from the ARTP proposal area. XNA has direct connections with the hubs of major commercial airlines, so the ARTP will be accessible from both national and international markets. The site is directly accessible by two major highways that run in the north-south direction: Interstate 540 via Razorback Road (AR 112) and School Street (US 71). In the east-west direction, the site can be accessed from several local arterial roads, including 15th Street and Cato Springs Road. Currently, Research Center Boulevard, off of School Street, serves as the gateway to access the ERC site, but additional entrances should be considered as development warrants. Additionally, the Fayetteville Municipal Airport-Drake Field is a non-commercial airport located just minutes from the ERC that can serve private planes that would transport executives to the ARTP.

Picture 1: Northwest Arkansas Regional Airport (XNA)

Infrastructure Accessibility

Because of the existing ERC, most of the primary infrastructure including roads, water, sewer, gas and electricity are in place to serve initial development of the research park. Available access and utilities will reduce the initial costs for infrastructure and enhance the overall development process. A necessary addition for success of the park is dependable, low cost high-speed data access that is not dependent on University technical resources.

Research Accessibility

The primary advantage to choose the site adjacent to the ERC is its proximity to existing High Density Electronic Center and GENESIS Technology Incubator. Moreover, the university main campus is just a five-minute drive from the proposed ARTP site, making shared physical and intellectual resources convenient and realistic.

Picture 2: University of Arkansas Engineering Research Center (ERC)

Visibility

The existing facilities in the ARTP proposal area, including the High Density Electronic Center and GENESIS Technology Incubator help establish an immediate identity for the ARTP. Moreover, because of the site's proximity to Razorback Road, which is the southern gateway to the city of Fayetteville, an opportunity exists to turn the ARTP into a regional attraction. The ARTP will connect high tech, high wage jobs to the University of Arkansas' main campus and attract visitors from Interstate 540 into the city of Fayetteville.

Surrounding Neighborhood

The ARTP proposal area is located within a neighborhood that provides convenience and amenities. Firstly, West 6th Street and South School Street are home to many restaurants and businesses. A Wal-Mart Supercenter is on the 6th Street west of Interstate 540, and an IGA grocery store is at the intersection of 15th and School Streets. Secondly, several existing water features will serve as natural amenities for ARTP. The city of Fayetteville's Greathouse Park borders the northwest of the site and the Oxbow Lakes are just to the west of the site.

WHAT ELEMENTS MAKE A RESEARCH PARK SUCCESSFUL?

Essential Elements of Technology-Based Economies

The proposed ARTP will not exist in a vacuum. Rather, the development of the park is an important step in the larger process of converting the Arkansas economy from one based on agriculture and manufacturing to one that is fully able to participate in an information- and technology-based global environment. Both tangible and intangible factors have been identified as essential elements of technology-based economies.[8] These elements are therefore crucial to the success of any research and technology park. The necessary tangible factors are:

- Intellectual infrastructure,
- Spillovers of knowledge,
- Physical infrastructure,
- Technically skilled workforce, and
- Access to capital.

The intangible factors that must also be present are:

- Entrepreneurial culture and
- High quality of life.

Forming the ARTP is a critical step if Arkansas is to possess these important qualities that are essential to developing a technology-based economy, but the park must also be designed so as to maximize the likelihood of fiscal success if the strategy is to have reasonable long-term prospects.

Because research parks locate in different settings, exist in different social, political and economic environments, and vary in management structures, it is impossible to determine what factors would guarantee an economically successful research park. However, if a research park can successfully facilitate the creation, development, and success of growth companies, it will attract good quality potential tenants and reach expected growth rates. According to a study conducted by Xomix, Ltd. and Michael J. Keating & Associates, Inc.,[9] there are seven ways in which research parks facilitate park tenants' growth. In the following section, these elements are identified and related to the proposed ARTP.

[8] According to Dan Berglund of the State Science and Technology Institute. See his publication "Using Research and Development to Grow State Economies."

[9] *The Economic and Social Impact of University-Related Research Parks in the United States,* Xomix, Ltd, Michael J. Keating & Associates, 2001.

Features of Successful Research and Technology Parks

Feature One: Real Estate Amenities

Research parks must be able to provide competitive rents, and offer common amenities and other prestige facilities to their tenants. Restaurants, legal services, banks, fitness centers, tennis courts, childcare centers, shuttle services, etc. may be considered as attractions to potential tenants.

ARTP Comparison

The design guidelines for the proposed ARTP will emphasize the architectural quality of the park. The park will become another real estate gem added to the city of Fayetteville's landscape. Not only a set of supporting uses will be considered, but also the natural setting of the flood plain and abandoned rail will be turned into possible recreational bike/jog areas. The existing Razorback transit system provided by the University of Arkansas and the city of Fayetteville's trolley service should be extended to the ARTP to provide an alternative means of transportation. Additionally, tenants at the ARTP will have access to the amenities at the University of Arkansas, including libraries, theaters, and sporting events.

Picture 3: Aerial View of Downtown Fayetteville, Arkansas

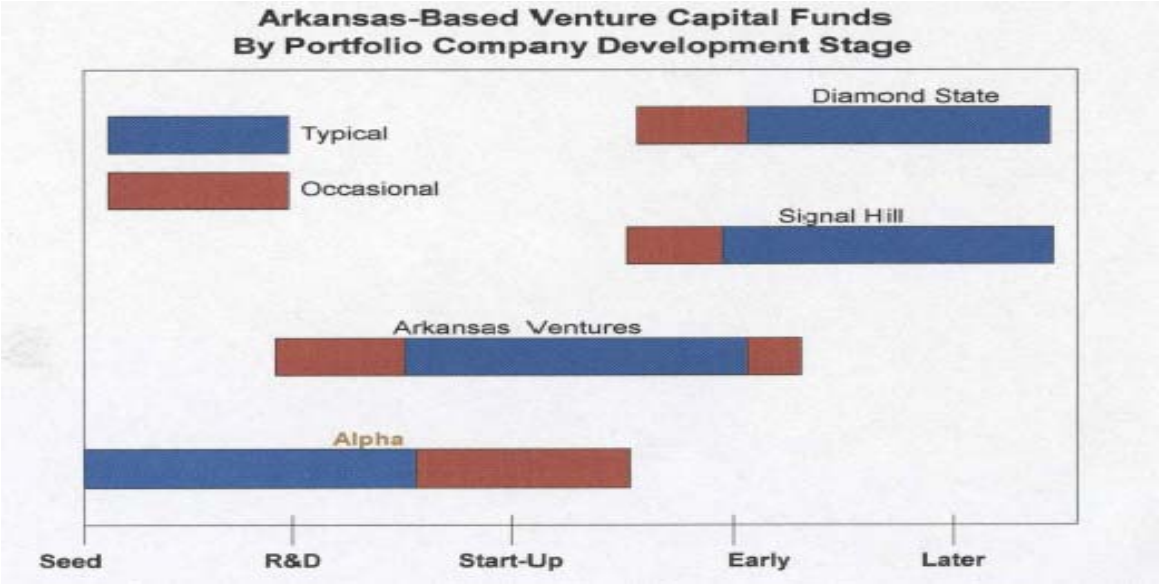
Feature Two: Access to Capital

Research parks must take proactive roles in forming partnerships with their local jurisdictions to acquire economic development funds. Research parks can also work with local financial institutions to establish seed money for start-up businesses.

ARTP Comparison

No matter what stage of growth, access to capital is essential to building a robust research and development base for the ARTP. Fortunately, a growing presence of venture capital is forming in Arkansas and particularly in Northwest Arkansas, to support the financial needs of emerging companies. As a consequence, a portfolio of capital sources now exists to meet financial requirements from early seed stage to late stage expansion. Moreover, Arkansas Ventures, a for-profit venture capital limited partnership, has strategically chosen to locate its offices in the GENESIS Technology Incubator, to leverage opportunities for investment in a market with high growth potential. Chart 1 details the availability of capital in Arkansas for all stages of the business development process.

Chart 1: Arkansas Based Venture Capital Funds By Portfolio Company Development Stage[10]



Feature Three: Proximity to a University

Proximity to a university not only gives research parks access to research equipment and facilities, but it also provides a pool of graduate students with diversified research expertise. Affiliation with a university also helps research parks get technical and

[10] This source of this chart is the Alpha Fund.

management support. Finally, university's social and cultural facilities and libraries create a friendly environment for the tenants, making them feel like members of the university family.

Picture 4: Old Main, University of Arkansas

ARTP Comparison

Proximity to the University of Arkansas will give the ARTP enhanced contact with the University's physical resources, including modern office facilities housed within the UA Engineering Research Center, 40 specialized research laboratories, University libraries, computers, and research experts. ARTP clients will also have the advantage of intellectual consultation from University of Arkansas personnel in a wide variety of specialized fields. A partial list is given below:

- Global Marketing Support Services (GMSS),[11]
- Arkansas Center for Technology Transfer (ACTT),[12]
- Service Corps of Retired Executives (SCORE),[13]

[11] Global Marketing Support Services is an outreach program of the University of Arkansas. It was created to assist small to midsize businesses compete effectively in international trade and explore global opportunities by providing training, consulting, and customized marketing research services.

[12] Arkansas Center for Technology Transfer is the industrial outreach arm of the College of Engineering of the University of Arkansas. Its mission is to improve and strengthen the economy of the state through technology-based resources.

[13] The Service Corps of Retired Executives (SCORE) is a resource partner with the U.S. Small Business Administration. SCORE is dedicated to aiding in the formation, growth and success of small business nationwide.

- Small Business Development Center (SBDC),[14] and
- Other relative colleges and departments of the University of Arkansas.

Feature Four: Access to Outside Resources

Research parks must play the role of liaison between tenant companies and outside social, political, and economic resources. The parks must be able to help their tenants obtain access to public financing incentives and investors, to recruit competent managerial personnel, to encourage ties with university faculty, and to provide University researchers with consulting opportunities.

ARTP Comparison
The ARTP will fully utilize the social, political, and economic support that has been demonstrated by all involved stakeholders from the beginning of the ARTP planning process. The ARTP will add value to these contributed resources and continue to explore other outside connections that will facilitate its growth. The following resources have been supportive to the success of the University's GENESIS Technology Incubator and they should be incorporated into the resource network of the ARTP:

- Arkansas Science and Technology Authority,
- Arkansas Department of Economic Development,
- The Arkansas Capital Corporation,
- The Small Business Administration,
- Small Business Innovative Research Program,
- Northwest Arkansas Economic Development District, and
- Fayetteville Chamber of Commerce.

Feature Five: Credibility and Image

Research parks must be an integral part of the surrounding communities, easily accessible, and highly visible. They must establish a positive image for providing high-quality and stable research, and play a critical role in local economic development.

ARTP Comparison
Since its inception in 1986, the GENESIS Technology Incubator has gained credibility in obtaining research funding, creating jobs, and generating tax revenues to the state and local communities. This established reputation will positively impact the research commitment provided by the proposed ARTP.

Feature Six: Assistance to Tenants

Because the success of a research park is so highly correlated with occupancy and growth rate, research parks must be responsive to the needs of their tenants and provide problem-solving resources.

[14] The Small Business Development Center is an outreach program in the Sam M. Walton College of Business at the University of Arkansas. It provides professional counseling, training, and resources to help start-up businesses.

ARTP Comparison.
The management structure of the ARTP will be designed to provide maximum responsiveness to tenant needs. The best practices of other research and technology park managers should be incorporated into ARTP management, such as having a tenant board. A particularly important member of the management will be the partnership developer. Not only will the partnership developer be responsible for bringing the tenants and university community together, but also this staff member will be the liaison between the ARTP tenants and the city administration, regional authorities, and state agencies and government.

Feature Seven: Incubation

Incubators should become a central component of a research park to nurture the development of start-up companies and the commercialization of technology. Once the companies graduate from the incubator, they can move into the research park as growth companies.

ARTP Comparison
The existing ERC can serve as the anchor tenant of the ARTP. It houses the GENESIS Technology Incubator and the research programs of the University of Arkansas College of Engineering. GENESIS is recognized as one of the most outstanding small business technology transfer programs in the country. GENESIS firms have generated hundreds of new jobs and millions of dollars in total revenues. It was awarded by the National Business Incubation Association "The Randall M. Whaley Incubator of the Year in 1991-92" for best overall program. GENESIS was also listed as one of four "Best Practice in U.S. Business Incubation Management" programs in a report commissioned by the Australian Commonwealth Government. With the success of GENESIS Technology Incubator, ARTP will provide the advantages of existing research and business incubation credibility required for future growth.

SPECIFIC STRATEGIC PROPOSALS FOR THE ARTP

Management Structure

Management Options

Table 4 presents the four types of management options that are generally adopted by university related research parks.[15]

Table 4: Management Options for University Related Research Parks

Management Structure	Percentage of Parks Adopted this Structure
Directly managed by the university	10%
Managed by a university-related foundation	55%
Managed with a developer as partner	10%
Managed by a community corporation	25%

It is also important to know the advantages and disadvantages associated with each type of structure. The following presents the pros and cons of each of these structures from the university point of view.

Table 5: Pros and Cons of Potential Management Structures

University Research Foundation	
Pros	***Cons***
• Clear chain of command	• Limited financial resources
• Maximum university attention and priority	• Limited ability to accept risk
• Strong image identification	• Involved decision structure
• University companies priorities	• Possible trustee meddling
• Strong faculty buy-in	• Limited development experience
University has a Seat on the Board of the Community Partnership	
Pros	***Cons***
• Builds strongest community support	• University only shares control
• Shared infrastructure and operating financing reduces risk	• University still looked to for financial commitments
• Generates strongest multi-agency marketing	• More aggressive community scrutiny of university technology commercialization process
• Projects strong university role in community	• Faculty has less commitment to park or to tenants

[15] Research Park Administrator Annual Meeting, 2000.

• Optimizes chances for federal and state support	
University Contracts of Joint Ventures with a Developer	
Pros	***Cons***
• Sets firm criteria and then avoids micromanagement by the university	• University gives up control over land
• May decrease university risk	• University has less control over tenant admission
University Cooperates with State or Local Government	
Pros	***Cons***
• University avoids primary financial and development responsibility	• Local government often is not experienced in this kind of development
• University can concentrate on technology commercialization, the park role that it does best	• Pressure to admit companies that can pay rent
• Visible way to work with city on economic development and to be a good citizen	• More difficult to maintain standards for park development

Proposed Management Structure for ARTP

The consensus of the ARTP Planning Group was that the most appropriate management structure for the park is to create a University Research Foundation. By adopting this management format, the ARTP preserves a strong identity of affiliation with the University of Arkansas. It also allows the ARTP to make independent decisions without waiting for approval by the City Council, the Mayor, the Faculty Senate, the University of Arkansas Board, or the Chancellor of the University. Such a foundation can function as the owner/leaser of the park and gives the ARTP the required legal status to receive funds from a wide variety of private and public sponsors.

Case Study: Washington State University Research Foundation, Inc.

The Washington State University Research Foundation (WSURF) is a charitable, scientific and educational [501(C)(3) not for profit][16] corporation that manages the Washington State University Research and Technology Park and manages the intellectual property portfolio of university technologies.

Board of Directors

According to the WSURF bylaws, the WSURF Board of Directors is comprised of the following members:

[16] A 501(c)(3) organization is organized and operated under Section 501 (a) of the Internal Revenue Code to seek recognition of exemption from federal income tax.

- Two “Presidential Directors” represent alumni or other friends of the University,
- Two “Regent Directors” represent the University’s Board of Regents,
- Two “Faculty Directors” represent the faculty members of the University, and
- Six “Community Directors” represent community, governmental, and commercial officials.

The Powers of the Board of Directors

According to the WSURF bylaws, the Board of Directors has the power to accept gifts, bequests or devises to the Foundation. It has the authority to enter into cooperative agreements with the University and other commercial entities to promote research and other educational projects. The Washington State University Research Foundation is created as a cooperative project under this authority.

The Officers of the Foundation

The Foundation’s officers should consist of a Chair, a Vice Chair, a Secretary and a Treasurer.

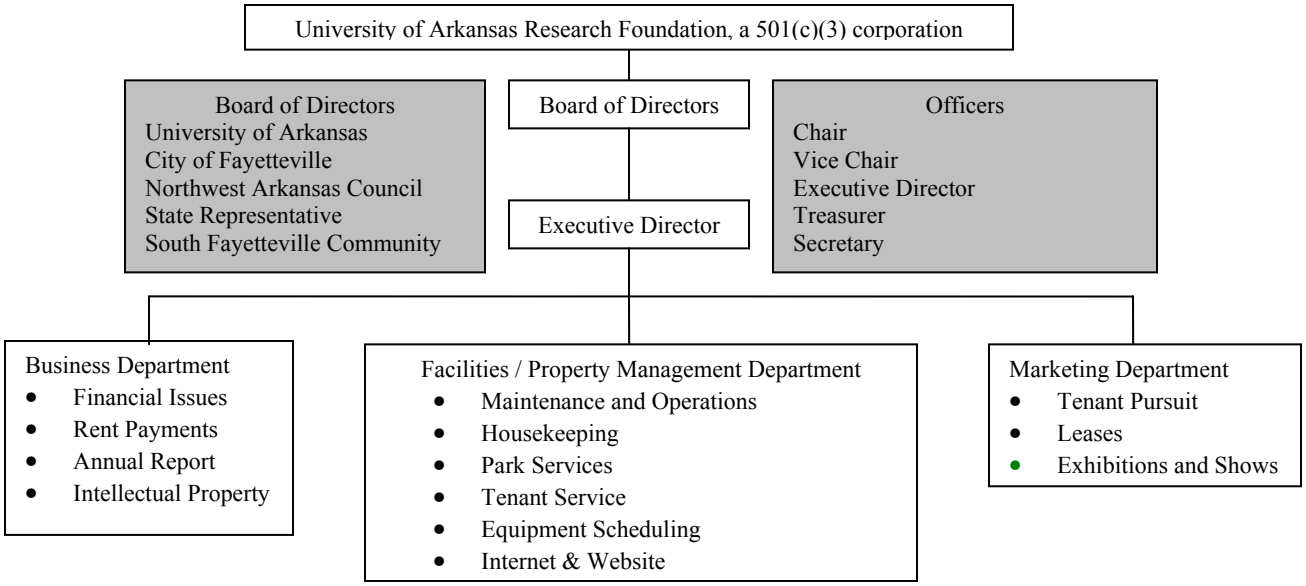
Executive Director

The Executive Director of the WSURF is jointly appointed by the University and the Foundation and is responsible for the day-to-day management of the Research and Technology Park. The Executive Director reports to the WSURF Board Chair and to the Washington State University Vice Provost for Research. The Executive Director has the authority to approve lease agreements, provide tenant improvements and renovations, approve routine expenditures, and sign checks on behalf of the Foundation. Besides the Executive Director, the WSURF also provide staff services including technology licensing personnel, and other support personnel, to perform the activities and responsibilities of the Foundation.

The Proposed UA Research Foundation

At least two components in the WSURF should be incorporated in a newly created University of Arkansas Research Foundation. The first is the way WSURF structures its board of directors. If the proposed ARTP is to represent local and regional constituencies, the city of Fayetteville, the Northwest Arkansas Council, state representatives, the south Fayetteville community, and local business groups all should have a seat/seats on the Board. The second component that should be incorporated is the authority of the Foundation to accept donations. Without this power, the Foundation will not be able to muster the necessary resources to manage effectively the operations and maintenance of the park. Chart 2 presents a proposed organizational structure for the UA Research Foundation.

Chart 2: Proposed Organizational Chart for the ARTP



Marketing Plan

Introduction

In the case of most consumer products, a marketing plan is a systematized outline of: 1) how an organization intends to develop a product or service offering, 2) how the organization intends to acquire and keep customers of its offering, and includes 3) a basic analysis of cost and/or profit outcomes with respect to marketing efforts. With respect to the marketing of the ARTP, the same methodology can be employed to identify specific actions that management should perform to increase the probability of success.

Situation Analysis

ARTP is envisioned as an important component of a comprehensive plan to improve the well being of the citizens of Arkansas through developing jobs in knowledge-based industry. Through the clustering of high technology industries around the strengths of the University's research program, the ARTP will stand apart as the focal point of knowledge-based economic development in the state of Arkansas. The board structure of the proposed University of Arkansas Research Foundation that will manage the ARTP will ensure cohesion of affected constituencies, including the state of Arkansas, the region of Northwest Arkansas, the city of Fayetteville, and the University of Arkansas. Each participant will reap specific benefits from the success of the ARTP including an improved taxation base, an image of the area as the home of information-based industry, and an increase in the amount of research dollars flowing into the University.

The ARTP is currently conceptual in its development. As a new offering, the goals of the park will be different than those of more established university-affiliated science parks; hence the strategies and decisions necessary to fulfill those objectives of ARTP will be unique. It should also be observed that the situations facing each university-affiliated research or science park are quite varied. The following plan is intended to provide a fundamental outline for the launch of the ARTP project. As the park matures, the objectives of marketing and strategies for achieving those objectives will change.

For the purposes of this early marketing planning effort, the following working mission will be used as the nucleus and basis for recommendations:

> **The mission of the Arkansas Research & Technology Park is to stimulate the development of a knowledge-based economy in the state of Arkansas through encouraging technological innovation and fostering technology transfer.**

Background: Factors That Attract Tenants and Identifying Likely Customers of the ARTP

Attractions for University-Based Research Park Participants

In order to develop a research park facility that is attractive to participants, it is necessary to understand what these participants are seeking. In a study on research park businesses, Goldstein and Luger[17] determined that those businesses in non-metropolitan areas considered the following to be the most frequently cited reasons for locating in a park:

- Presence of a research university in area,
- Buildings, facilities, sites in park,
- Amenities of park as workplace,
- Business climate of region, and
- Services provided by park management.

Those factors that were considered reasons for *not* locating in the park were:

- Too few professional workers in area,
- Local university not strong enough in key areas,
- Poor access to corporation's headquarters function, and
- High cost to buy/lease park site.

There are ten necessary conditions for a *successful* science park strategy, some of which are directly related to the marketing of ARTP.[18] These conditions include:

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[17] Goldstein, Harvey A. and Michael I. Luger, "University-Based Research Parks as a Rural Development Strategy," *Policy Studies Journal*, 20, 2, 1992, pp. 249-263.

[18] Cabral, Regis and S.S. Dahab, "Science Parks in Developing Countries: The Case of BIORIO in Brazil," *International Journal of Technology Management*, 15, 8, 1993, pp. 726-739 and Echols, Ann E. and Joe W. Meredith, "A Case Study of the Virginia Tech Corporate Research Center in the Context of the Cabral-

- Access to qualified research and development personnel in the areas of knowledge in which the park has its identity;
- Access to a market for its products and services;
- The capability to provide marketing expertise and managerial skills to firms, particularly startups lacking such a resource;
- The capability to protect product or process secrets via patents, security, or other means;
- The capability to select which firms will enter the park and which will be rejected (i.e., screening criteria);
- A clear identity, quite often expressed in a park's choice of name;
- A management with established or recognized expertise in financial matters and which has long-term economic plans in place;
- The backing of powerful and dynamic national and local economic actors (e.g., funding agencies or political institutions;
- An active leader with the power of decision and a visible profile to act as the interface between academia and industry; and
- A prominent percentage of consultancy firms, technical service firms, laboratories, and quality control firms.

These factors can be distilled into a single concept—for a research and technology park to be successful, it must focus its resources into clusters of expertise. At a minimum, the marketing of ARTP will involve the provision of such clustering, but will also depend upon the communication and promotion of these specific success conditions.

Potential Customers

A project of this nature serves multiple constituencies. The citizens of the state of Arkansas, the members of state government, and the faculty of the University need to be made aware of the importance of this venture, and informed as to how it can affect and improve their lives and their futures. Each of these groups can play an important role in the success of the park, and it is very important that they be informed, and perhaps intrigued, by the evolution of and the reason for the existence of the park.

Given what industrial participants of the research park seek, perhaps of utmost importance is creating awareness in and recruiting the appropriate research-involved faculty. This necessarily means targeting specific industries and rather communicating with the entire University community the existence and potential benefits of the park. Specific activities might include:

- Press releases and other information disseminated through University media,
- Open houses of the facility, and
- Other awareness-producing activities of the clusters of expertise represented at the ARTP.

Dahab Paradigm, with Comparison to Other US Research Parks," *International Journal of Technology Management*, 16, 8, 1998, pp. 761-777.

The ARTP will need to draw on existing funded research successes to attract a high quality client base. At the University of Arkansas, there were 103 industry-sponsored research projects during fiscal years 2000, 2001, and through December 2002, totaling $6.07 million dollars. Individual awards averaged almost $59,000 per award, and ranged from just over $1000 to about $1.4 million. There were seventy-seven organizations that sponsored these awards, 16 of which provided multiple research awards. There were approximately 70 individual recipient University researchers. These particular faculty members should be cultivated as indispensable assets to the ARTP.

The ARTP is intended to attract clusters of development that work on research in areas strategically aligned with those of the University. Companies with research interests and activities that complement those of the University comprise the primary market for the facility. The Planning Group identified primary areas of interest and research that are carried on within the University; these areas of interest are most likely to attract the tenant companies to the ARTP. These research areas are:

- Next generation electronics and photonics,
- Biotechnology and supporting biological, chemical, and food processes,
- Transportation, logistics and infrastructure issues,
- Materials and manufacturing,
- Database and telecommunications, and
- Environmental sciences and ecosystems analysis.

As targeted tenant firms, the following should be considered:

- Companies involved in the above referenced areas or specific departments or divisions of companies involved in these areas;
- Government research offices and labs (USDA, National Park Service, National Weather Service, others);
- International firms wishing to get a foothold in the United States or work with the University of Arkansas;
- GENESIS incubator graduate companies; and
- Graduates from non-University of Arkansas incubator facilities listed at the National Business Incubator Association at http://www.nbia.org/incs.html.

Market Segments

Approximately 35,000 firms in the United States perform research and development (R & D), of which 18,000 are manufacturers and 17,000 are in the non-manufacturing sector—nearly a 50-50 split. Yet manufacturers account for 77 percent of total industry performance (including federally funded industry performance). The main reason for this continued dominance of the manufacturing sector is simply that among manufacturing firms, the largest (in terms of number of employees) tend to perform a relatively large amount of R & D. Among small (fewer than 500 employees) R & D-performing firms in manufacturing and non-manufacturing sectors, those in the non-manufacturing sector tend to conduct twice as much R & D per firm as those in the manufacturing sector. In

2000, companies with 25,000 employees or more spent 39% of the total of about $200 billion R & D funds. Companies with fewer than 100 employees accounted for 9.5% of total R & D expenditures.

The purpose of these estimations is to provide a very rough idea of the numbers of firms that may be available as potential participants in the ARTP. Given the data available at this writing, it is not possible to determine *exactly* how many companies conduct research, how many would conduct research that would be synergistic with that of the University, or how many firms would be willing and able to locate in the ARTP. The numbers of firms in industries identified as those congruent with University research strengths were derived from the 1997 Census of Business, and are shown in Table 6. Ranges of potential for four geographic markets are calculated by estimating the total number of firms within each industry category, within each state. The geographic markets include the following:

- Arkansas only;
- Central-Southeastern (CSE) states including: Georgia, Alabama, Mississippi, Louisiana, and Arkansas;
- Contiguous states including: Texas, Oklahoma, Kansas, Missouri, Kentucky, Tennessee, Mississippi, Arkansas, and Louisiana; and
- Total United States.

Table 6: Number of Firms by Industry

Industry	Arkansas Only	CSE States	Contiguous States	U.S. Total
331 – Primary metal manufacture	49	324	788	5,095
333314 – Optical instruments & lenses	0	5	17	500
3344 – Semiconductors/electronic components manufacturing	27	164	608	5,458
4841 – General truck transport	841	4,654	10,645	44,781
4842 – Specialized truck transport	941	5,761	12,908	52,853
5416 – Management, scientific, technical consulting services 5417 – Scientific research & development services	374	5,142	12,076	96,106
Total for all industries	2,232	16,050	37,042	204,793

From each geographic area, a range of the numbers of firms participating in R&D is estimated at 1% and 10% of the total number of firms that may be potential technology park tenants. These ranges are presented in Table 7.

Table 7: Estimate, Numbers of Firms Involved in U of A – Congruous Research, by Industry

Industry	Arkansas Only		CSE States		Contiguous States		U.S. Total	
	1%	10%	1%	10%	1%	10%	1%	10%
331 – Primary metal manufacture	0	5	3	32	8	79	51	510
333314 – Optical instruments & lenses	0	0	0	0	0	2	5	50
3344 – Semiconductors/electronic components manufacturing	0	3	2	16	6	61	55	546
4841 – General truck transport	8	84	46	465	106	1,065	448	4,478
4842 – Specialized truck transport	9	94	58	576	129	129	529	5,285
5416 – Management, scientific, technical consulting services 5417 – Scientific research & development services	4	37	51	514	120	1,208	961	9,611
Total for all industries	21	223	160	1,603	369	2,544	2,049	20,480

Research and development spending varies widely by industry. Table 8 shows the most recent available R&D expenditures for four industries. Separate expenditures for the poultry industry are not available, so total expenditures for agriculture are provided. Spending totals for electronic components manufacturing and for research and development services are the largest; motor freight and warehousing comprises the industry that spends the least on R & D. To provide further perspective, a measure of R & D intensity is calculated. For the purposes of this strategic plan, because it is important to determine which industries provide the most likely candidates for research park participation, R & D intensity is calculated using the total R & D spending for the industry, divided by the total number of firms, to provide the simple average R & D expenditure per firm. These calculations are provided in Table 9. This provides some idea of the willingness and abilities of firms across these industries to participate in research and development.

Table 8: R & D Intensity, by Industry: Total R & D Expenditures for the U.S. By Industry (millions of dollars)

Industry	R & D Expenditures	Number of Firms in Industry	R & D Performing Companies	R & D $ Per Firm
Total agriculture (1998)	$7,900	228,159	6,800 (est. 3%)	$1,161,764
Primary metals (1998)	624	5,095	166	3,759,036
Machinery (1998)	5,610	30,665	1,963	2,857,870
Semiconductors/electronic components manufacturing (1997)	9,131	6,270	625	14,609,600
Motor freight and warehousing (1998)	253	103,798	101	2,504,950
Scientific research and development services (1998)	9,062	615,705	1,248	7,261,217

Table 9: Most Recent R & D Expenditures, By Industry

Industry	R & D Expenditures			
	1997	1998	1999	2000
Total agriculture	N/A	N/A	N/A	N/A
Primary metals	992	N/A	470	624
Machinery	5,610	N/A	6,057	6,580
Semiconductors/electronic components manufacturing	N/A	9,131	10,701	12,894
Motor freight and warehousing	N/A	253	460	N/A
Scientific research & development services	7,023	9,062	10,470	12,892

Competitive Analysis

Planners for ARTP should consider competition in the broadest sense possible at this point. Many of the fundamental needs to be fulfilled by the ARTP for potential clients and tenants could be fulfilled by other entities. The purpose of the ARTP is to attract technology-based firms to the state of Arkansas, and the park must therefore offer benefits that cannot be found somewhere else at a comparable price. The unique aspects of the ARTP will be its close relationship with the University of Arkansas and its ability to cluster related industries around the University's research strengths.

Assuming that the initial participants or tenants sought for ARTP are those within or relatively near to the state of Arkansas, they will be able to find physical facilities in many locations. On that basis, inexpensive office space or lab space may be considered as competing for ARTP participants in Northwest Arkansas. Nationally, commercial real

estate (office buildings) experienced the sharpest jump in vacancies ever in 2001; the largest of these jumps occurred in tech-heavy areas.[19]

At the same time, there are other research parks throughout the United States that will be marketing themselves to the potential tenants of the ARTP and stressing the comparative advantages of their own university affiliations. Further research on how to convey the uniqueness of the ARTP and Northwest Arkansas will. Certainly the University of Arkansas' intellectual property portfolio should be highly emphasized as a draw to national and international firms. Additionally, incubators from all over the globe should be considered as sources for potential ARTP participants.

Marketing Goals

With any marketing plan, the goals to be achieved through marketing efforts should expedite the achievement of the organization's overall goals, and ultimately the fulfillment of the organization's mission. At this early juncture, there is no formal mission for the ARTP; however, there are several goals that should be considered in these early stages of development.

- The primary goal for any new offering is to gain awareness and interest in what is being offered. In this case, the primary goal should be to create awareness of the clustering of industries around the University of Arkansas' strongest research programs. By focusing on the research induced clustered development at the ARTP, the park will be able to distinguish itself from other facilities with similar names or functions. For example, it is very important within the confines of Northwest Arkansas that people understand the differences between the Arkansas Research and Technology Park and the Fayetteville Business Technology Park. This leads back to the earlier suggestion that the identity of the research facility be actively fostered.
- A second goal is that identifying the specific faculty at the University of Arkansas who will be able to provide the basis for attracting industries and forming clusters of expertise. This step will create credibility and legitimacy for the ARTP, both within the region and throughout the country. Emphasis should be placed on the high quality of research carried on within the University that will be commercialized through the park.
- Internally, a goal might be considered that involves participation or occupancy by non-university entities. For example, a reasonable goal might be to attract one anchor industry within eighteen months to the facility. Further down the road, it will be important to maintain the satisfaction of the tenants, to acquire some percentage of non-university participants, or to broaden the scope of the research carried on within the park.

[19] "Office Buildings Had Sharpest Vacancy Rise in 2001," *Wall Street Journal,* January 31, 2002.

Strategy

In general, strategies for marketing the ARTP should be based on what goals we hope to achieve and what we are best at. More specifically, parks that have succeeded have been those with a very good interface between their host university and industry. Given the previous discussion on the mission and goals of the park, as well as those variables in the competitive and research environments, the following marketing recommendations are made.

Product & Service Strategy

It may be considered a disadvantage that the University of Arkansas has not pursued a high-technology research facility such as that being proposed. However, given that there have been literally hundreds of research and science park startups, dozens of failures therein, and several successes, there are several model parks that may be referenced, and the product and service offerings of those combined into a unique package. Table 10 below provides a description of tangible and intangible offerings made available at other research parks.

Table 10: Tangible and Intangible Offerings of Other Research Parks

Tangibles/Physical Offerings	Intangibles/Service Offerings

• An excellent interface between the University and participant organizations,
• Accessibility to discipline of engineering and life sciences, as well as other university expertise,
• Access to business contacts,
• Access to market(s) for products and services derived through research,
• Access to and from all major transportation venues,
• Excellent nearby housing,
• In-house internet server,
• Cutting-edge, yet relaxing atmosphere:
  o Architecture and landscaping,
  o Green space,
  o Picnic areas,
  o Jogging/walking trails,
• Physical facilities:
  o Shared space and state-of-the-art facilities,
  o Fiber-optic (or, better, next generation communications media),
  o Infrastructure for science in the 21st century,
  o Security,
  o Recreational facilities, and
  o Conference facilities
	• Quality of life,
	• Knowledge-based work force,
	• Access to capital,
	• Business services:
	  o Assistance with information on research grants, low-interest loans, financing programs, application development,
	  o Free review of business plans for entrepreneurial and growing businesses,
	  o Assistance to companies to locate in park by arranging real estate tax abatement programs for new buildings,
	  o One-to-one business services such as marketing, business-plan review, securing capital, investment funding,
	• Security:
	  o Long-term commitment by city and university,
	  o Physical safety, and
	  o Protection from industrial espionage.

Facility quality is a central issue with respect to the proposed park. It is well established that decisions regarding company premises directly influence the employees who use these facilities.[20] The attractive physical setting of the research park at Arizona State University is among the key factors that tenants began to locate there.[21]

Further, the appropriate aesthetic can lend credibility and identity to this new facility. Buildings are much more than concrete objects in the same way that a home is much more than a house. The physical facilities, grounds, and experience offered by ARTP will enable the entity to establish an identity, attract a wider market of participants, and be a good neighbor in south Fayetteville. It should convey a purpose, a history, and an organizational dynamic consistent with the vision of the park's research and science mission, and the ARTP could indeed be a focal point for business and pleasure visitors to Northwest Arkansas.

Potential Services the ARTP Should Offer

Along with what may appear to be a premium product/service package in Table 10, it is recommended that a vertical liaison between the university and those industry participants be included as a service offering. The relationship between academic and applied participants is the foundation of the existence of this facility, and participants need an individual or office to maintain communications. It is further recommended that marketing of this facility involve some type of horizontal liaison who would work across company participants, to facilitate and coordinate formal and informal collaborations in the form of joint ventures or research consortia. A service offering of this type would truly differentiate ARTP from other research parks.

To ensure participant satisfaction, it is recommended that we conduct systematic post occupancy evaluations (POEs) in order to measure satisfaction with the park environment, and enable park administration to anticipate what future tenants might desire to change later (four to six months after occupancy, should take into account seasonality). The rationale for this practice is that it would 1) maximize facility investment, 2) provide a baseline for comparison, 3) let participants know that host university cares, and 4) feed the experience of buildings and facilities in use into specifications of new, more efficient research and office accommodations.

Pricing Strategy

One suggested alternative to price setting is the premium pricing of space – that is, above local market. This would act as a signal regarding the high quality aesthetic and physical facilities provided by the park, but would also act as a screening criterion. It may be appropriate to offer anchor tenants a lower price-per-square-foot than smaller tenants. This approach should be considered, if ARTP intends to attempt to draw anchor industry participants.

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[20] See Lawrence, Peter, "Building Design: More than Meets the Eye," *Journal of Business Strategy,* 10, 4, July/August, 1989, pp. 15-19.

[21]) "Pioneering Tenants Like Park Atmosphere, Prestige," *Arizona Business Gazette,* December 14 1987, p. 8.

The Corporate Research Center at Virginia Tech University offers a unique pricing system, which they call commodity pricing. This involves a standard rental rate for all space and all tenants, indexed to the cost of living from the previous year. Rental rate is per square foot, and includes standard utilities and housekeeping. All leases are adjusted annually, are non-negotiable, and allow tenants to move to any location in the park during the term of their lease.

Promotional Strategy

Promotion as it is usually applied in a marketing context is not wholly appropriate in the case of ARTP. Best practices suggest that, rather than mass communication, focus should center on the establishment of "developing a network of relationships" [22]. These relationships would be fostered among the primary constituencies of the actual and potential tenants of the park, the people of Arkansas, and the faculty and staff of the University of Arkansas.

However, at this early stage of development, the most important goal for ARTP is to create awareness and interest in the ARTP, across all constituencies. *The park's identity must be clear and must be consistent and must be communicated through all information, documentation, or promotion disseminated about or by the park*. Further, this identity must be conveyable across *all* media. The park's identity, as with other types of marketed product or service offerings, may be distilled into a logo, a park name, or both. At the same time, the park entity itself must epitomize the theme itself. In other terms, the brand itself will not sell a product (for any length of time); the product must be of high quality and must offer consumers something satisfying.

Anecdotal evidence suggests that mass communication is not appropriate or helpful as a means of the promotion or marketing of a research park. In general, marketing for research parks is not print advertising or mass mailings. Rather, participating in research-related organizations and managing media coverage, particularly press media is the key to research park promotion. Publicity and public relations at this early stage are critical. The message must be consistent across media.

As the park develops and matures, the average research park spent 13.6% of its total operating budget on marketing and public relations. Most parks (83%) spend less than 25% of their budget on marketing-related activities. To these parks, the marketing budget expenditures consist of the costs associated with building relationships among research participants, including aerial photos, printing master plans, the old-fashioned brochure (or CD or DVD), airline tickets to visit prospects or to speak at various functions. Many AURP member parks have a presence on the World Wide Web; the Missouri Research Park provides a good model that goes beyond simple billboard. The University of Arizona Science and Technology Park also provides several types of information (specifically tax and business benefits) but also provides an interactive online application form.

[22]Michael J. Keating and Associates, Inc., *What it Takes to Effectively Market Research Parks*, 2001.

Outcomes

At this early stage, as stated earlier, the primary goal is to generate awareness and interest in the park. It could be envisioned that ARTP becomes a cutting edge facility, inside and out. ARTP could become something that is on the must-see list when people visit Fayetteville and Northwest Arkansas, such that the environment is stimulating and interesting not only to the research participants, but also to the local community, to the citizens of the state, and to the university community.

It is well accepted in the research park community that such an undertaking is very long-term. Some parks do not get their first commercial (as opposed to university) tenants for 1 to 2 years after completion of the first building. Maturity (and then, financial breakeven) of the parks does not occur for perhaps 15 to 20 years. The marketing of ARTP down the road will involve maintaining the positive relationships with research participants, and plans for the individual participants' successes may translate into larger laboratory needs. The success of the park will be measured by whether and how it fulfills its mission.

Recommendations

Based on the preceding discussion and analysis, and in addition to the above-suggested strategies, the following marketing recommendations are made with respect to the Arkansas Research & Technology Park.

1. At this early stage, a formal mission statement is compulsory. The mission needs to be concrete enough that it can be applied, and broad enough to be useful in describing what denotes success/failure of effort. Without this, it will be much more difficult for those participating in park development and management to develop the park's identity.

   Examples of other research park mission statements include:

   - Cornell Business and Technology Park: "to create a fertile working environment that maximizes the creativity and productivity of the executive and scientific labor force, while providing an interface between Cornell University and the business community;"
   - Appalachian Center for Economic Networks (ACEnet): "to build the capacity of local communities to network, innovate, and work together to create a strong, sustainable regional economy that has opportunities for all" (current focus is on food and technology sectors of the economy); and
   - Tri-Cities Enterprise Center (Washington State): "to provide business services, mentoring, and coaching to local entrepreneurs in order to create wealth, promote the growth and development of new businesses, gain jobs in the community, diversify the economy, broaden the tax base, and create new opportunities for local investment."

2. Objectives need to be established. These may include university-based objectives (e.g., numbers of faculty or departments involved in park-related research), industry participant-related objectives (tenant satisfaction, numbers of industry participants), or objectives related directly to research outputs (patents, published journal articles). Initially, the goals of the park, as stated earlier, should simply be to increase awareness and develop interest in the park, and to establish the park's identity as a premier research facility. As an ongoing organization, however, and as the research mission of the park matures, these initial goals will be modified to better fit the park's situation.

3. It will be necessary to further specify which firms in which industries would be appropriate to recruit as ARTP participants. For example, based on this somewhat limited analysis, it does not appear that motor freight and warehousing offers a viable target industry for ARTP participation. This industry is comprised of dozens of small-revenue firms. Although there has been some expressed interest in certain logistics research topics (e.g., driver retention) by local transportation firms through the U of A Department of Marketing & Transportation (e.g., enthusiasm but limited financial support for dissertation and other research), these firms operate on slim margins, and do not spend money on research even within their own firms. Compared to the other industry targets, the transportation and logistics area is the smallest in terms of the amount of R & D expenditure per firm. To truly develop synergies among park participants, it will be necessary to pick and choose among those collaborators and those industries that are consistent with the park's mission.

Potential Tenant Identification

The ARTP Focus

Initially, the focus of the ARTP, and the marketing effort that accompanies development of the park must incorporate forming clusters of development around the strengths of the University of Arkansas. The local business community will drive the types of clients likely to locate at the ARTP through potential synergistic relationships. For example, firms conducting research in agricultural biotechnology may locate for proximity to the region's large poultry industry.

As has been noted in the marketing plan, success of the ARTP will depend upon coherent integration of University of Arkansas research programs. It is these programs and the expertise they provide, both in terms of access and collaboration with faculty and recent graduates, which create value. While other areas of emphasis may be pursued in the end, it makes intuitive sense to leverage those programs and faculty that provide the greatest potential for success. Based on this assumption, the initial focus of ARTP will likely be on:

- Next-generation electronic and photonic devices,
- Biotechnology and supporting biological, chemical and food processes,
- Transportation, logistics and infrastructure issues,
- Materials and manufacturing,

- Database and telecommunications, and
- Environmental and ecosystems analysis.

What Makes a Company Come to the ARTP?

Although ARTP companies will range in size and operational scale and vary in different aspects of R&D, they choose to locate in the park for the following main reasons:

- Students are plentiful as a source for current part-time employees or future fulltime employees,
- Faculty with relevant research and consulting skills are readily accessible,
- University laboratories and associated equipment that might not otherwise be available at an affordable cost are located nearby,
- Research- and business-related collaborative opportunities exist among those firms affiliated with the ARTP, and
- Concentrations of entities are formed with similar business interests that result in synergistic activities associated with a critical mass of expertise.

Who Will be ARTP's Potential Tenants?

The future ARTP focus discussed above establishes the criteria for the characteristics of potential ARTP tenants. Based on these criteria, the research centers at the University of Arkansas are identified as the first category of potential tenants. Because they hold the strengths of existing university research programs, it is expected that these centers will initially support the ARTP by entering into partnerships with potential park firms or by leasing a space themselves. Table 11 details a list of these research centers.
The second category of potential ARTP tenants is current and former GENESIS companies. The ARTP will provide an additional location option to current GENESIS firms to accommodate their expanded operations. By settling at the adjacent ARTP, resources spent on searching for other locations by cultivating research partnerships with other potential host universities can be avoided. Former GENESIS tenants may return to Northwest Arkansas to seek the benefits derived from clustered infrastructure and information and human resources, which were not available to them prior to the development of the ARTP. Table 12 presents a list of current and former GENESIS firms.

Finally, after the University of Arkansas and GENESIS firms have established the core centers of excellence for the ARTP, national and international firms with potential synergistic relationships will be drawn to the park as tenants. As clusters form, there will be positive feedback loops that will encourage businesses to relocate and expand in the ARTP.

Table 11: Potential ARTP Tenants --- University of Arkansas Research Centers

Name of the Affiliated College	Name of the Research Centers
College of Engineering	The Logistics Institute
	Mack-Blackwell National Rural Transportation Study Center (MBTC)
	Membrane Separation Center
	Arkansas Center for Technology Transfer (ACTT)
	Chemical Hazards Research Center
	High Density Electronics Center (HiDEC)
	Arkansas Center for Electronics-Photonic Materials Innovation (ACEMI)
	Arkansas Advanced Photovoltaic Research Center
Bumpers College of Agricultural, Life and Food Sciences and the Division of Agriculture	Institute of Food Science and Engineering
	Center for Food Processing and Engineering
	Center for Food Safety
	Poultry Center of Excellence
	Genomics Core Laboratory
	Poultry Health Laboratory
	Central Analytical Laboratory
Fulbright College of Arts and Sciences	Arkansas Water Resources Center
	Center for Sensing Technologies and Research (CSTAR)
	Center for Advanced Spatial Technologies (CAST)
	Mass Spectrometry Laboratory
	Center for Protein Structure and Function
	Arkansas-Oklahoma Center for Space and Planetary Sciences
	Center for Semiconductor Physics in Nanostructures
	Research Laboratory of Quantum and Nonlinear Optics
	Semiconductor Fabrication and Nanoscale Characterization Facility
Walton College of Business	Center for Business and Economic Research
	Information and Technology Research Center
	Center for Management and Executive Development
	Supply Chain Management Research Center

Table 12: Potential ARTP Tenants --- GENESIS Firms

Current Status with GENESIS	Name of the Firm
Client Firms[23]	Advanced Diagnostics International, LLC (ADI, LLC)
	Arkansas Power Electronics International, Inc. (APEI)
	Challenge Environmental Laboratories
	Global Concepts
	Integral Wave Technologies
	John Gilmour, Inc
	NDSoft, LLC
	Process Dynamics
	PsyberSimula
	Space Photonics, Inc.
	Trestletree
	WayLink Systems Corporation
Member Firms[24]	Acxiom Corp.
	ITI Communications & Electronics Inc.
	Sam's West Inc.
Former Firms	Beta-Rubicon, LLC
	Bioengineering Resources, Inc.
	DayCo
	EarthCare Technologies, Inc.
	Electromap, Inc.
	Electronics & Space Corp.
	Vector, Inc
	Tangent Computer
	Ozark Aircraft Systems, Inc.
	Mercari Technologies, Inc.
	Invotek, Inc.
	Hamelly International, Inc.
	T.C.I.S.

[23] Client firms refer to small startup companies that typically have little or no affiliation outside of GENESIS.

[24] Member firms are usually departments or divisions of larger companies that need the facilities of a university environment to fulfill their goals.

Development Schedule

The development of ARTP can be divided into three phases: 1) a conservative, start-up development phase, 2) a market-induced development phase, and 3) an expanded development phase. Although the real estate products and timelines differ, the development processes of each phase have many similarities. Because a clearly defined and well-coordinated development process monitors development feasibility, checks developers' credibility, and explores financial availability, it is important to understand the procedures and issues involved during the planning process. This section presents the three phases of development for ARTP and their associated timelines.

Phasing and Schedule

Conservative, Start-up Development Phase

This phase refers to the development of up to three anchor buildings surrounding the GENESIS Technology Incubator. These will be two-story buildings each with a gross floor area between 45,000 and 56,000 square feet. Each building should be considered as an anchor for one of three research focus areas of the University such as Biotechnology, Next-Generation Electronics, and Logistics. The conservative phase will establish a nucleus for clustered development and an appropriate architectural design standard framework under which any subsequent development must follow. It is expected the planned $6.2-million University Innovation Center building will constitute at least one of these buildings. The projected timeline for the completion of this phase is 5 years.

Three alternative schemes A, B, and C, as shown in Maps 2-4, are developed to illustrate the concept of anchoring and the physical relationship between the existing ERC buildings and the new structures. Buildings A1, B1, and C1 in the maps refer to anchor buildings. The design attributes under the three schemes are shown in Table 13.

Map 2: Scheme A—The ARTP as an Urban Campus

Map 3: Scheme B: The ARTP with Plaza Aspects

Map 4: Scheme C—The ARTP Designed for Enhanced Views

Table 13: Design Attributes for ARTP's Three Anchor Buildings

Schemes	Buildings	Footprint (sf)	# Floors	Gross Area (sf)	Parking Req'd at 1 space/800 sf	Parking at rate of 425 sf/space[25]
A	A1	27,900	2	55,800	70	26,640
	B1	22,900	2	45,800	57	26,640
	C1	25,000	2	50,000	63	38,840
Total		**75,800 sf**		**151,600 sf**	**190**	**92,120 sf**
B	A1	25,000	2	50,000	63	106,450
	B1	24,300	2	48,600	61	23,160
	C1	24,750	2	49,500	62	41,325
Total		**74,050 sf**		**148,100 sf**	**186 spaces**	**170,935 sf**
C	A1	25,000	2	50,000	63	70,800
	B1	26,000	2	52,000	65	117,000
	C1	24,300	2	48,600	61	51,530
Total		**75,300 sf**		**150,600 sf**	**189 spaces**	**239,330 sf**

Market-Induced Development Phase

This phase is seen as the subsequent development clustered around the three anchor buildings built under Phase One. A synergistic relationship will have been formed between the park tenants and the university at this time. Thus, it is possible that private developers will be drawn to the site and driving the development. It is expected that the proposed site will be fully utilized by the end of this phase. The projected timeline for the realization of this phase is 25 years.

The concept of clustering is illustrated by two schemes as shown in Maps 1-3. Table 14 presents design attributes associated with each clustered building.

Table 14: Design Attributes for Three Physical Plans of ARTP

Schemes	Clusters	Buildings	Footprint (sf)	# Floors	Gross Area (sf)	Parking Req'd at 1 space/800 sf	Parking at rate of 425 sf/space[26]
A	A	A1	27,900	2	55,800	70	26,640
		A2	26,775	2	53,550	67	
		A3	26,775	2	53,550	67	18,050
	B	B1	22,900	2	45,800	57	26,640
		B2	28,300	2	56,600	71	
		B3	22,500	2	45,000	56	31,070
	C	C1	25,000	2	50,000	63	38,840
		C2	25,000	2	50,000	63	60,410
		C3	24,650	2	49,300	62	
		C4	24,650	2	49,300	62	
	D	D1	25,000	2	50,000	63	38,915

[25] Scheme A has parking at a rate of 350 square feet to a space, leaving room for less landscaping and shade trees than in Schemes B and C.

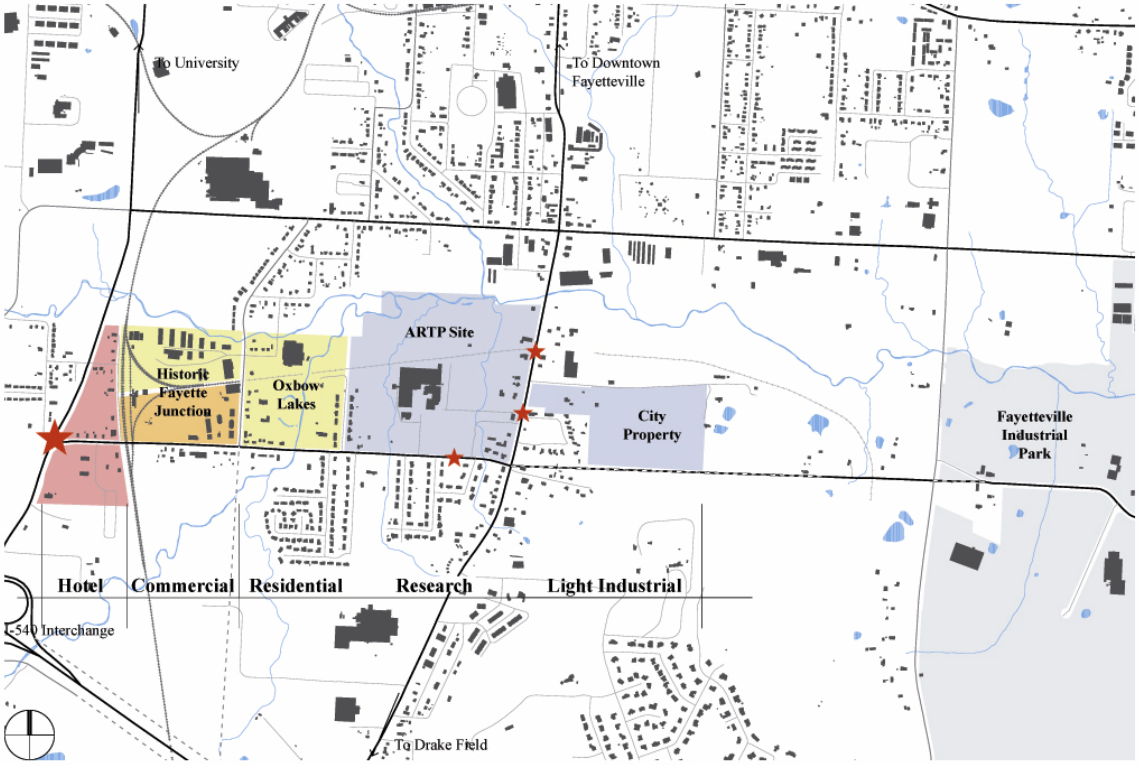
[26] Scheme A has parking at a rate of 350 square feet to a space, leaving room for less landscaping and shade trees than in Schemes B and C. Buildings with gross parking area left blank in the table indicate either shared parking with other clustered buildings.

		D2	25,000	2	50,000	63	37,220
		D3	25,000	2	50,000	63	13,975
		D4	25,000	2	50,000	63	
	E	E1	26,775	2	53,550	67	26,640
		E2	26,775	2	53,550	67	
	ERC Additions	1	12,690	1	12,690	16	
		2	8,310	1	8,310	10	
		3	6,490	1	6,490	8	
Total			**435,490 sf**		**843,490 sf**	**1,054 spaces**	**318,400 sf**
B	A	A1	25,000	2	50,000	63	106,450
		A2	34,700	2	69,540	87	15,935
		A3	40,500	2	81,000	101	
	B	B1	24,300	2	48,600	61	23,160
		B2	24,250	2	48,500	61	50,345
		B3	13,500	3	40,500	51	
	C	C1	24,750	2	49,500	62	41,325
		C2	24,750	2	49,500	62	41,325
	D	D1	15,000	3	45,000	56	143,360
		D2	15,000	3	45,000	56	
		D3	15,000	3	45,000	56	
		D4	15,000	3	45,000	56	
		E1	24,900	2	49,800	62	
		E2	33,840	2	67,680	85	40,130
		E3	24,900	2	49,800	62	127,170
Total			**355,390 sf**		**784,420 sf**	**981 spaces**	**589,200 sf**
C	A	A1	25,000	2	50,000	63	70,800
		A2	24,750	2	49,500	62	
		A3	24,750	2	49,500	62	
		R1 (retail)	4,500	1	4,500	6	
		R2 (retail)	4,500	1	4,500	6	
	B	B1	26,000	2	52,000	65	117,000
		B2	35,000	3	105,000	131	43,250
		B3	37,000	3	111,000	139	
	C	C1	24,300	2	48,600	61	51,530
		C2	24,300	2	48,600	61	51,530
	D	D1	25,00	2	50,000	63	
		D2	33,800	2	67,600	85	44,300
		D3	25,000	2	50,000	63	86,850
Total			**313,900 sf**		**690,800 sf**	**867 spaces**	**465,260 sf**

Expanded Development Phase

This phase refers to the induced effects of the development of ARTP on the surrounding communities. The ARTP will have some impact on the local real estate market (housing, retail, hotel, and recreational) toward the west up to Razorback Road. Already this area is the de facto gateway to the city, and careful zoning can ensure that an appropriate atmosphere, that embodies the spirit of high technology industry in harmony with the natural features of the Fayetteville landscape, can be provided and maintained. As shown in Map 5, it is projected that a community based on the burgeoning new industries will form in close proximity to the park. This community will likely include nice owner and renter occupied properties, hotel and conference services, and recreational facilities. The expanded development phase is market-induced and will occur as the demand associated with the ARTP warrants.

Map 5: Proposed Expanded Development of the ARTP



Risk Analysis

Although the ARTP will be the first research and technology park in Arkansas, it will be facing stiff competition from existing parks in neighboring states and across the country. Moreover, research parks are doomed to fail in the long term if the community that hosts the park cannot provide sufficient amounts of skilled labor. Finally, and perhaps most importantly, for ARTP to succeed the community, the region, and the state must continue to foster an entrepreneurial culture by maintaining and developing partnerships and by ensuring that the incentives facing potential tenants are such that the ARTP is a viable choice for hosting their industries.

Regional Competitors

Previously in this strategic plan, the case has been made that for Arkansas to improve its preparation for a world with an information-based economy, a research and technology park must be built. Further, for this park to have any chance of successfully developing, recruiting, and retaining high quality, high wage jobs, it must be located in close proximity to a premier research university. Thus, Fayetteville is the logical location choice for the ARTP. However, even after choosing Fayetteville as the location with the highest probability of park success, substantial risks still exist and must be taken into consideration.

Each of Arkansas' neighboring states will provide competition for research and technology park tenant companies. Missouri, Oklahoma, and Mississippi have already established university-owned or university–affiliated research parks. Kansas, Tennessee, and Louisiana have land-grant state university systems that are able to offer the strength and focus of research expertise needed for a research park. Texas has established its fame as a leader in high-technology employment at the national level. The proposed ARTP will exist in an environment where these established competitors exist and will need to differentiate itself from the other parks with specific centers of expertise and surrounding local and regional amenities

National Competitors

In the year 2001, there were approximately 150 research parks in the United States[27]. Many facilities are experiencing vacancies and lower-than-expected growth rate. Given the current economic recession, many industries have or will cut R&D spending. Such a soft market makes it difficult for the ARTP to draw high-tech firms and to compete with other more established parks. However, if the ARTP is not developed due to fear of market saturation, the state of Arkansas will have effectively chosen not to compete for the technology and information industry jobs that research and technology parks generate. As the industries that Arkansas has traditionally relied on as economic drivers continue to be subjected to globalization, the state will find itself in deeper and deeper economic distress. Despite the risks to the ARTP associated with competing with other

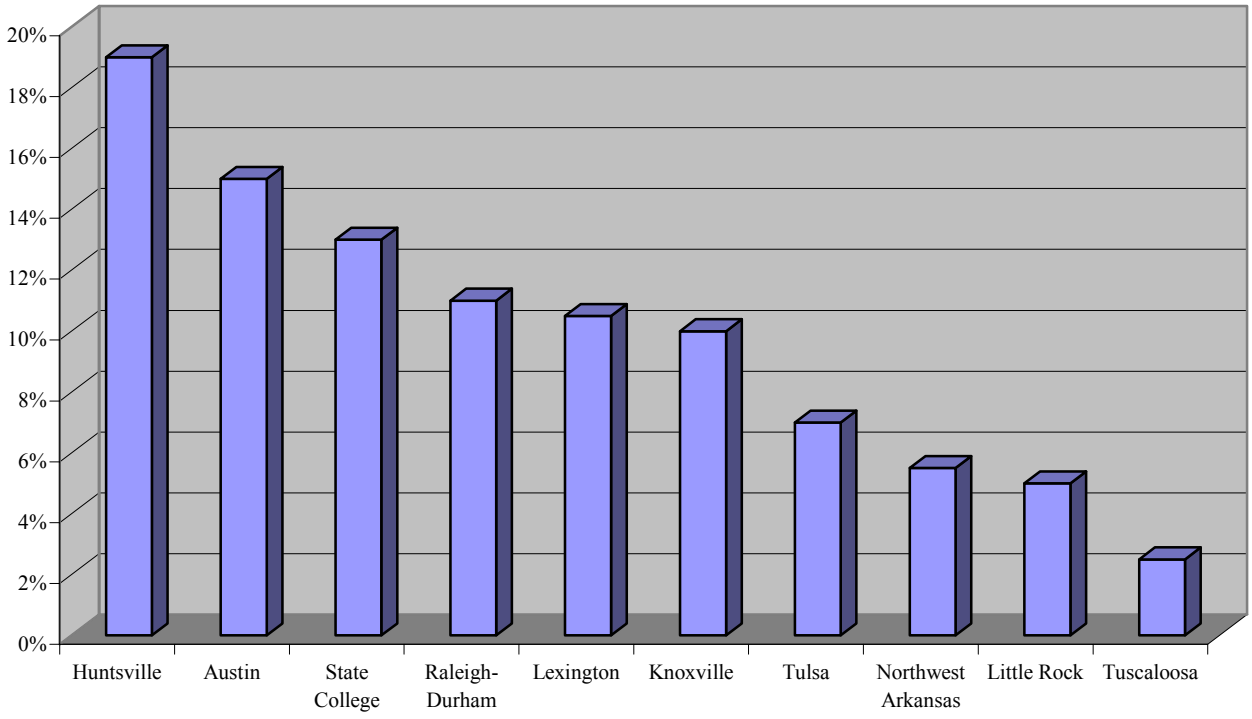
[27] *The Economic and Social Impact of University-Related Research Parks in the United States.* Xomix, Ltd. Michael J. Keating & Associates. 2001

research and technology parks, the state has no viable choice if Arkansas is to take its place in the new economy.

Available High-tech Labor Supply

Local skilled labor availability is typically evaluated by companies to determine if their operations will be able to recruit and maintain the work force they need. Labor supply is an especially crucial location decision factor to research firms because the jobs they create require workers with specialized skills, and any shortage of available workers may drive up employee costs significantly. Although the employment growth rate in Northwest Arkansas has been higher than the national average, 4.5% to 3.0% from 1990 to 1998, the region is in not in an advantageous position in terms of high-tech employment base. Chart 3 compares the percentage of high tech employment to overall employment of ten selected areas, including Northwest Arkansas. It shows that the region is at the bottom tier. Only 5.5% of employment in Northwest Arkansas is high-tech, lagging far behind Huntsville in Alabama (18.3%) and Austin in Texas (14.1%).

Chart 3: High Tech Employment as a Percentage of Total - 1998[28]



[28] *Competitive Assessment Report and SWOT Analysis of Northwest Arkansas.* Hillwood Strategic Services. 2000

Fostering A Culture of Entrepreneurship

Because the ARTP will be the first research and technology park in Arkansas, it is vital that all the constituencies involved in its development be committed to forming a community that values entrepreneurship and risk-taking as seeds of future prosperity. Perhaps the largest risk to the success of the park is that the physical structures will be in place, but the accompanying culture of entrepreneurship will not be as fully developed. Thus, it is imperative that the incentives for technology-based industry to settle in Northwest Arkansas be varied and robust at all levels. Partnership among decision makers at the University, the city, the region, and the state is the key to ensuring that the fundamental aspects of an innovative philosophy make their way into public policy. Only in this case will the ARTP be able to achieve its mission and perform as an engine of economic growth for Arkansas.

ECONOMIC IMPACT ANALYSIS

Introduction

The Center for Business and Economic Research (CBER) at the University of Arkansas was requested to evaluate the economic impacts of construction and operation of a proposed research and technology park in Fayetteville, Arkansas as part of a comprehensive strategic planning effort. The CBER employed an input-output model that describes the economic structure and the inter-industry relationships of Northwest Arkansas to evaluate the impact of the proposed facility on compensation and employment in the region, as well as tax revenue that would be generated from the new economic activity.

In many regions throughout the United States, research and technology parks are considered a means of facilitating economic development goals. While economic growth in Arkansas, especially in Northwest Arkansas, during the last decade outpaced the national average, sustained growth opportunities will only come to Arkansas if the state is able to transition to a knowledge-based economy. The construction of the proposed ARTP in Fayetteville will facilitate growth by fostering an environment where entrepreneurship is encouraged and by leveraging academic research to form clusters of technology expertise. Development of the ARTP will be a driver for long-term prosperity in Arkansas.

The purpose of this study is to evaluate the economic impacts of constructing the proposed ARTP. Research and technology parks not only generate direct benefits such as creating high-quality, high-wage jobs in the technology industry, but also like any other investment, generate indirect economic impacts that benefit the local economy as a whole. The indirect impact is referred to as the multiplier impact of constructing and operating the facility. This type of impact includes estimating the labor compensation, job creation, and tax revenues that are generated from constructing the facility and those directly involved in the operation of the facility. It also includes the impacts such as extra income and jobs that accrue to the entire affected region as a result of the extra spending by other related sectors in the region.

Benefits to the state, the region, and the local area are expected to originate from the resulting impacts from the construction and operation of the ARTP on income and employment in the area and the tax revenue generated from new economic activity that results. Based on data obtained during the strategic planning process and multipliers estimated from the IMPLAN input-output model, the following impacts from construction of the ARTP are projected:

- Over 30 years the ARTP will create 1,582 temporary jobs over 30 years,
- Construction of the ARTP will generate an expected present value of $27,127,423 over 30 years in employee compensation, and

- The ARTP is expected to generate a present value of $2,176,617 in state and local tax revenues over its 30-year construction period.

In addition to the one-time impacts of the construction of the ARTP, there will be ongoing economic impacts on Northwest Arkansas from the operation of the park. The following impacts are projected from the first 30 years of park operation:

- Operation of the ARTP will create 1,981 permanent jobs by 2031,
- The expected present value of the total impact of operating the ARTP on regional output will be $718,822,978, and
- The operation of the ARTP is expected to generate a present value of $17,762,627 in state and local tax revenue from 2002-2031.

Methodology

This study employs an input-output approach to evaluate the economic impact of spending on construction of the ARTP. The study relies on estimating multiplier impacts from the widely used input-output model, the IMPLAN model. IMPLAN is a regional impact model that enables the evaluation of the economic impact of specific activities such as construction or operation of public works projects, as well as retail, wholesale, manufacturing, and service sales within an economy. IMPLAN was originally developed by the U.S. Department of Agriculture, Forest Service in cooperation with the Federal Emergency Management Agency (FEMA), the U.S. Department of Interior Bureau of Land Management, and the University of Minnesota to assist the Forest Service in land and resource management planning.

The basic data sources for the current edition of the IMPLAN database and the model used in this study are the Input-Output Accounts of the United States, developed by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA), and county income and employment data published by BEA and the Bureau of Labor Statistics (BLS). The model reflects 1999 industrial structure and technology, and 1999 prices (trade flows in the model are expressed in 1999 dollars). However, results of this analysis were adjusted to 2002 prices.

IMPLAN uses a 525-sector input/output model to measure the effects of three types of impacts: direct, indirect, and induced. Direct impacts consist of employment and purchases of goods and services in the region resulting from the activity being evaluated, in this case, constructing the ARTP. Indirect (inter-industry) impacts consist of goods and services purchased by the firms, which supply inputs consumed in the direct activity. Induced impacts consist of increased household purchases of goods and services in the region by employees of direct and indirect employers. The model generates multipliers, which summarize the magnitude of the indirect and induced effects generated by a given direct change, to estimate changes in output, income, and employment. In other words, the multiplier is the ratio of total impact to direct impact.

To illustrate the concept of the multiplier, consider an increase in the production of an automobile assembly plant in a certain region. Assume the plant is increasing its production by a 1,000 automobiles per year, and hiring 50 new workers with a total payroll of $800,000 per year. These are the initial or direct impacts on the region. Now, the production of more automobiles requires more production on the part of the auto parts and steel industries to meet the additional demand by the automobile assembly plant. These two related industries would need to hire more workers, say 20 workers, with a total payroll of $300,000 per year. The workers in the three industries will spend the largest part of their payroll on purchases of goods and services, creating additional sales, revenues, and profit for sectors such as food, hospitals and doctors, etc. Those sectors would need to hire more workers (for example 20 with a total increase in payroll of $200,000) to meet the higher demand on their products. Assuming, for simplicity, those are the only rounds of spending in the region, the initial employment in the assembly plant, 50 workers, led to a total employment of 90 workers in the whole region. The employment multiplier in this case is 90/50 = 1.8. By the same token, a total income of $1.3 million resulted from the initial payroll of $800,000 by the assembly plant and the multiplier is 1.3/0.8 = 1.65.

In the IMPLAN model, inter-industry relationships (use and make coefficients) are quantified based on data on the production functions of the different industries in the region. The IMPLAN model can be used to estimate multipliers based on those coefficients in a specific region such as a county. In this study, the model is applied to Northwest Arkansas using data on Benton and Washington Counties. The results reflect the impact of the construction of the ARTP on industries and households in these two counties. Any leakage of spending to an out-of-the-local area is already considered by the IMPLAN model and is excluded from the total impact.

Economic Impacts

Economic impacts measure the importance of an industry in terms of the employment it provides and the goods and services it generates in a certain region. The regional economic impacts of constructing and operating the ARTP in Fayetteville are expected to come from two sources: (1) a one-time construction impact resulting from material purchases, hiring, and subsequent incomes that accrue during the construction phase of the facility; and (2) impacts of operating the facility.

One-Time Construction Impacts

One-time construction impacts consist of the increased economic activity expected to occur during the 30 years of constructing the facility and installing necessary equipment. These impacts are temporary and cease when the construction phase is complete. When attempting to determine a regional economic impact of an activity, we must take into account that some goods and services are purchased from outside the study region. The expenditures for these goods and services are not re-circulated through the regional economy and therefore lower the indirect and induced demands for local goods and services. This effect is a leakage, since successive rounds of spending result in decreased indirect and induced effects of a direct action.

To estimate the present value of the construction impacts of the proposed ARTP, several assumptions had to be made. The following assumptions acted as inputs for the IMPLAN model:

- The ARTP will contain 800,000 square feet of building space at build-out in the year 2031,
- Each building will take a year and a half to build and space will be constructed sequentially,
- The estimated costs of building the University of Arkansas' Innovation Center at the park site serve as a baseline for building all of the space at the park,
- Building costs are assumed to increase at 3% a year, per the standard assumption made by the University of Arkansas Physical Plant, and
- The discount rate is assumed to be 4.85%, which is approximately the rate on a 20+ year A-rated bond.

Table 15 details the cost projections for building the ARTP. The estimates do not include any land acquisition costs, but rather show the present value of building construction costs over the next 30 years.

Table 15: Construction and Installation Cost of the ARTP Facility

	Present Value of Construction Over 30 Years
Total Construction Cost	$77,501,298
Total Architect/Engineer Fees	$6,123,350
Total Other Project Costs	$3,963,933
Total Furniture and Equipment	$4,024,106
Total Contingencies	$8,076,828
Total Cost	**$99,689,515**

Using the values from Table 15 in conjunction with the assumptions listed above, a model was constructed to estimate the economic impacts of constructing the ARTP on the Northwest Arkansas economy. Table 16 presents the results of the IMPLAN model for output, employment, value-added and employment compensation. The results are broken down into direct, indirect, and induced components.

Table 16: Total Present Value of Economic Impacts of Constructing the ARTP

	Direct	Indirect	Induced	Total
Output	$79,426,114	$23,381,454	$13,459,818	$116,267,411
Employment (people)	938	394	250	1582
Total value added	$25,768,489	$12,445,413	$8,379,447	$46,593,350
Employment compensation	$15,637,908	$7,263,776	$4,225,739	$27,127,423

Table 17 further breaks down the economic impacts of the construction phase on output by industry. As expected, the largest impacts occur in the construction and service industries, with discounted totals of $79,380,336 and $12,506,264 respectively, but there are also multi-million dollar indirect or induced impacts on the manufacturing, transportation, trade, and finance, insurance, and real estate industries.

Table 17: Present Value of Impacts of Constructing the ARTP on Output of Industries in Northwest Arkansas

Sector	Direct	Indirect	Induced	Total
Agriculture	$439,739	$248,469	$115,104	$803,303
Mining		$2,267	$1,266	$3,533
Construction	$78,699,985	$294,560	$385,790	$79,380,336
Manufacturing		$4,102,317	$761,370	$4,863,687
Trans., Comm., & Utilities		$2,596,041	$963,263	$3,559,303
Trade		$6,024,996	$3,473,828	$9,498,824
Finance, Insurance, and Real Estate		$1,897,491	$3,182,832	$5,080,323
Services	$286,415	$7,957,510	$4,262,340	$12,506,264
Government		$257,803	$286,680	$544,483
Other			$27,345	$27,345
Total	**$79,426,139**	**$23,381,454**	**$13,459,818**	**$116,267,411**

Operation Economic Impacts

Unlike the economic impacts of the construction phase, which are temporary, the impacts resulting from operating the ARTP will be ongoing. However, for the sake of consistency, the operating impacts have only been estimated for the next 30 years, which is the proposed amount of time until build-out of the park site.

Again, assumptions were necessary to create forecasts of the impacts of operating the ARTP until 2031. These are detailed below:

- Each 40,000 square foot building will contain about 80 employees. The initial building will be more heavily administrative than the subsequent structures,
- The initial building, known as the Innovation Center will contain 16 administrators and 64 researchers,
- Subsequent buildings will house one administrator for every 9 researchers, or alternatively, about 10% of the employment per building will be support staff,
- Buildings will be constructed approximately every year and a half and filled within three years, and
- A discount rate of 4.85% (the rate on a 20+ year A rated municipal bond) is assumed.

Table 18 presents the results of the impact analysis of the Operating Phase of the ARTP. The results of the construction phase are presented again for comparison purposes. The employment created by the construction phase is temporary, while the employment created by the operation phase is ongoing. The output impact of operating the ARTP is about 3.8 times the output impact of construction and almost 4.5 times the present value of the cost of constructing the buildings.

Table 18: Total Present Value of the Economic Impacts of the ARTP

	ARTP Construction Impacts	ARTP Operation Impacts
Output (change in GSP)	$116,267,418	$718,822,978
Employment (total # of indirect & direct)	1,582	1,981
Total value added	$46,593,350	$345,075,587
Employment compensation	$27,127,423	$256,361,826

The results of the IMPLAN modeling process can be distilled into a set of multipliers of economic activity. Table 19 presents the resulting multipliers from the ARTP model. These numbers represent the ratio of the total economic impact to the direct economic impact of construction and operation of the ARTP.

Table 19: Multipliers of Economic Activity in Northwest Arkansas

	ARTP Construction Phase	ARPT Operation Phase
Output	1.46	1.48
Employment	1.70	1.36
Total Value Added	1.81	1.62
Labor Compensations	1.73	1.42

Table 20 presents estimates of the flows of construction and operating impacts on output and employment from 2002 to 2031. As the actual timing of the construction and occupancy of the buildings deviates from the assumptions mentioned earlier, the flows will change.

Table 20: Projected Output (in $millions) and Employment Impacts from 2002-2031 of Construction and Operation of ARTP

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Output															
Construction Impact	$7.4		$7.2	$7.0		$6.8	$6.7		$6.4	$6.3		$6.1	$6.0		$5.8
Operation Impact		$5.1	$9.9	$14.2	$13.5	$17.2	$20.6	$19.6	$22.5	$25.1	$23.9	$26.1	$28.0	$26.7	$28.3
Total Output Impact	$7.4	$5.1	$17.0	$21.2	$13.5	$24.0	$27.3	$19.6	$29.0	$31.4	$23.9	$32.2	$34.0	$26.7	$34.1
Employment															
Operation Employment	79.1		79.1	79.1		79.1	79.1		79.1	79.1		79.1	79.1		79.1
Construction Employment		98.1	197.2	296.3	296.3	395.4	494.5	494.5	593.6	692.7	692.7	791.8	890.9	890.9	990
Total Employment Impact	79.1	98.1	276.3	375.4	296.3	474.5	573.6	494.5	672.7	771.8	692.7	870.9	970	890.9	1069.1

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Output															
Construction Impact	$5.7		$5.5	$5.4		$5.2	$5.1		$4.9	$4.9		$4.7	$4.6		$4.4
Operation Impact	$29.7	$28.3	$29.5	$30.5	$29.0	$29.8	$30.5	$29.1	$29.6	$30.0	$28.6	$28.9	$29.1	$27.7	$27.9
Total Output Impact	$35.4	$28.3	$35.0	$35.9	$29.0	$35.1	$35.6	$29.1	$34.5	$34.8	$28.6	$33.6	$33.7	$27.7	$32.3
Employment															
Operation Employment	79.1		79.1	79.1		79.1	79.1		79.1	79.1		79.1	79.1		79.1
Construction Employment	1089.1	1089.1	1188.2	1287.3	1287.3	1386.4	1485.5	1485.5	1584.6	1683.7	1683.7	1782.8	1881.9	1881.9	1981
Total Employment Impact	1168.2	1089.1	1267.3	1366.4	1287.3	1465.5	1564.6	1485.5	1663.7	1762.8	1683.7	1861.9	1961	1881.9	2060.1

Tax Revenue Implications

As has been demonstrated, the construction and operation of the ARTP have implications for the economy of Northwest Arkansas. The same methodology used to estimate those benefits was also used to project the tax revenues generated from construction and operation of the facility. The facility generates income and sales that are subject to various taxes by the state and regional governments. The one-time construction impact will generate in local tax revenues, as indirect business tax revenues and state income tax revenues. The ongoing operating impact will have larger impacts on local sales tax revenues, indirect business tax revenues, and income tax revenues. Table 21 presents present valued projections for total local and state revenues over the next 30 years.

Table 21: Total Present Value of Local and State Tax Revenue

State and Local Tax Revenue	ARTP Construction Impacts	ARTP Operation Impacts
Indirect Business Tax	$1,561,553	$12,870,592
Household Expenditures Tax	$562,277	$4,356,928
Corporation Tax	$35,858	$213,233
Employee Compensation Tax	$16,928	$321,874
Total	**$2,176,617**	**$17,762,627**