Automation Alley's Fourth Annual Technology Industry Report

Report compiled by Anderson Economic Group, LLC

2008 Edition

Automation Alley®

Where Technology Builds Opportunity

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FOREWORD

The pulse of Automation Alley's technology industry continues to beat strongly, despite a wounded economy. Yes, high fuel costs, strong competition, and legacy costs have inflicted pain on the advanced automotive cluster of Automation Alley. However, the region's technology industry has proven it can stand on its own and advance despite the automotive industry's struggles, statewide economic malaise, and nationwide economic uncertainty.

This report, the fourth annual assessment of Automation Alley's technology industry, illustrates the impressive size and breadth of the industry, and offers evidence of future growth and advancements. The analysis also shows that the region's technology industry reaches beyond advanced automotive technologies. While employment in the advanced automotive cluster has declined, jobs have been added in clusters such as advanced manufacturing and the life sciences. The analysis further shows that even without the advanced automotive cluster, Automation Alley's technology industry is a much larger part of the economy than it is at the state and national levels. Indeed, with advanced automotive, the Automation Alley technology industry is 63 percent larger than the national industry in terms of share of total employment. It is still 13 percent larger if advanced automotive is excluded from the comparison.

Also included in this report are results from the first ever survey of Automation Alley technology companies. With assistance from Mitchell Interactive, we collected information from 200 technology businesses throughout Automation Alley. The findings help us pick up where employment and payroll data from past years leave off, providing an even clearer picture of the industry today. As would be expected, most respondents viewed the overall economy as weak. However, most also expected improvements in the coming months, and had positive views of the region as an environment in which to operate a technology business.

DEFINING TECHNOLOGY INDUSTRY CLUSTERS

A hallmark of this effort is a rigorous definition of the technology industry, which is based on recently published research by the U.S. Department of Commerce, Anderson Economic Group, and a handful of other experts. Our definition includes six specific technology clusters:

- Advanced Automotive
- Advanced Manufacturing
- Chemical and Material
- Information Technology
- Life Sciences
- Other Technologies

We have consistently used these definitions across our three annual reports, allowing for accurate comparisons. The methodology is documented in this report, its appendices, and in Automation Alley's 2005, 2006, and 2007 *Annual Technology Industry Reports* which are available online at www.automationalley.com.

KEY FINDINGS IN THIS REPORT

10 REASONS WHY AUTOMATION ALLEY IS POISED TO CONTINUE TECHNOLOGICAL LEADERSHIP

Automation Alley is a leader in advancing the reach of technology and, as the following 10 points show, remains well poised to continue in that role.

1. ***Despite overall economic declines and significant restructuring in the automotive industry, Automation Alley's technology industry has remained strong, with 2 percent employment growth outside of the advanced automotive cluster.*** From 2005 to 2006, Automation Alley's technology industry saw an overall small decline (just 0.3 percent) in employment. This decline, however, was confined primarily to the advanced automotive cluster. When advanced automotive is removed from the equation, Automation Alley's technology cluster shows a 2 percent employment gain from 2005 to 2006, with life sciences and advanced manufacturing leading the way.
2. ***Automation Alley has a significantly higher concentration of technology industry employment than is found across the national economy.*** In 2006, the industry employed 311,438 people in Automation Alley, representing 14.7 percent of employment in the region. Nationally, 9.1 percent of all employment was in the technology industry. This puts Automation Alley 63 percent above the national average for share of employment in the technology industry, and shows that the technology industry is clearly more concentrated in Automation Alley.
3. ***The advanced automotive cluster remains the cornerstone of Automation Alley's technology industry, but the other five clusters have proven capable of standing on their own.*** In 2006, the advanced automotive cluster was by far the largest employer among the technology industry clusters. However, the other clusters have proven their ability to stand on their own. Even if advanced automotive is not included in a comparison, Automation Alley has 9.4 percent of its total employment in the technology industry — more than 14 percent above the national average of 8.2 percent.
4. ***Automation Alley remains the center of the global automotive industry.*** While much has been made of the recent struggles of the "Detroit Three," Automation Alley remains the center of the global automotive industry. The region is home to research, development, design, and testing centers for domestic and foreign manufacturers alike, and 11.2 percent of all advanced automotive employment in the United States.
5. ***The life sciences cluster is rapidly growing as Automation Alley establishes itself as a leader, both in Michigan and across the country, in life sciences technologies.*** Employment in Automation Alley's life sciences cluster grew by 13.2 percent from 2005 to 2006, and the average wage for workers in the cluster grew by 4.4 percent to over $97,000 in 2006. The cluster also accounted for 1.7 percent of all employment in Automation Alley, well above the national level of 1 percent, clearly indicating the region's strong position in the life sciences cluster.
6. ***Small businesses in Automation Alley are attracting big funds for research and development.*** The U.S. Small Business Administration's Small Business Innovation Research (SBIR) program has funded millions of dollars of research and development activities at small businesses throughout Automation Alley. In 2006, small businesses in Automation Alley received 97 such awards. The value of these awards was $38.8 million, which surpassed the previous high from 2005.
7. ***Automation Alley universities' commitment to the research and development of technology has yielded billions of dollars in research grants, and their technology-oriented programs are growing to help meet the demand for high-skilled science and engineering workers.*** Research and development spending by Automation Alley universities topped $1 billion for the fourth year running, growing from $646 million in 1998 to over $1.04 billion in 2006. Automation Alley universities also enrolled a total of 12,194 science and engineering graduate students in 2006, 335 more than the prior year and 64 percent of the total science and engineering graduate student enrollment in the state.

8. ***Defense and homeland security continue to play a critical role in expanding the region's industries and universities.*** The Departments of Defense and Homeland Security continue to offer a catalyst for technology research and development among Automation Alley's universities and businesses. This can be expected to grow further as the military takes a lead role in alternative fuel research, and with the Army's recent relocation of its robotics development program to the Detroit Arsenal in Warren.
9. ***Technology businesses in Automation Alley are increasingly optimistic about Southeast Michigan's environment.*** Fifty-nine percent of respondents believe that Southeast Michigan's environment for a technology company improved or remained steady over the past 12 months, and 76 percent of respondents believe it will improve or remain steady over the next 12 months. This increase demonstrates optimism for Southeast Michigan as a growing technology hub.
10. ***Despite a stagnant economy, technology businesses in Automation Alley reported largely positive news about their employment levels and revenue trends.*** Over the past 12 months, 26 percent reported adding employment and 52 percent saw employment levels hold steady. Further, 65 percent of respondents said they experienced an increase in revenues; another 20 percent said revenues held steady over the past 12 months, and 75 percent responded that revenues were expected to grow over the next 12 months.

CONCLUSION

Without question, we are in challenging economic times at the global, national, and local levels. This reality stands in stark contrast to the years of economic expansion and stability that have prevailed in recent times. We cannot overlook this reality. However, we also cannot overlook the strength of Automation Alley's technology industry, the region's dominance in the global automotive industry, and the significant university investments and programs in Automation Alley. Concentrated efforts to promote the industry, support entrepreneurs, and encourage innovation will be crucial to the continued success of the region's technology industry in coming years. With leadership from groups like Automation Alley, there is no reason why the region cannot further enhance its role as a primary center of technology.

Patrick L. Anderson is the founder of Anderson Economic Group, LLC (AEG). He is the author of more than 100 published works, and the executive editor of *The State Economic Handbook*, recently published by Palgrave MacMillan. He was the winner of the 2004 Edmund A. Mennis prize for the best writing in business economics, given by the National Association for Business Economics. Mr. Anderson grew up in Oakland County.

AEG is a research and consulting firm that specializes in economics, public policy, finance, and market analysis. From offices in East Lansing, Michigan and Chicago, Illinois, the firm works with private firms, publically traded companies, municipalities, and non-profit organizations across North America.

This project was managed by Scott D. Watkins, a senior consultant with AEG and completed under the direction of Patrick L. Anderson, Principal and CEO. Other AEG staff contributing to the report were Cameron VanWyngarden and Lauren Hathaway. The survey was implemented and responses tabulated by Mitchell Interactive (www.MitchellInteractive.com), with analysis by AEG (www.AndersonEconomicGroup.com).

I. INTRODUCTION

OVERVIEW OF REPORT

This report opens with an overview of the Automation Alley region, followed by a discussion of how we define the technology industry as containing the following clusters:

- Advanced Automotive
- Advanced Manufacturing
- Chemical and Material
- Information Technology
- Life Sciences
- Other Technologies

We then quantify the technology industry in Automation Alley in terms of employment, number of private businesses, and payroll. Industry data are presented for 1998 and 2004 through 2006 to illustrate how the industry, along with each of its clusters, has evolved in recent years. Also, this year we have added an analysis of the share of total employment that is in the technology industry and its clusters. We present this for Automation Alley relative to the state and national shares. This provides a "location quotient," which measures the concentration of industry employment in one region relative to another.[1]

The report also assesses activities taking place today that signal future growth of the technology industry in Automation Alley. This includes quantitative measures such as patent awards and university research and development, plus qualitative assessments of items such as university programs and industry promotion activity.

Included in the report is a new section highlighting the findings of a survey of technology businesses in Automation Alley. The survey, conducted by Mitchell Interactive, polled 200 businesses to gauge their attitudes on the regional economy and their business's performance.

AUTOMATION ALLEY'S TECHNOLOGY INDUSTRY

Size of the Industry. Automation Alley's technology industry remains an integral part of the region's economy. In 2006, the industry employed 311,438 people, representing 14.7 percent of all employment in the region. At the state and national levels, the technology industry accounted for 12.8 percent and 9.1 percent of employment respectively (see Figure 1). This shows that the technology industry is clearly more concentrated in Automation Alley than in the overall state and national economies.

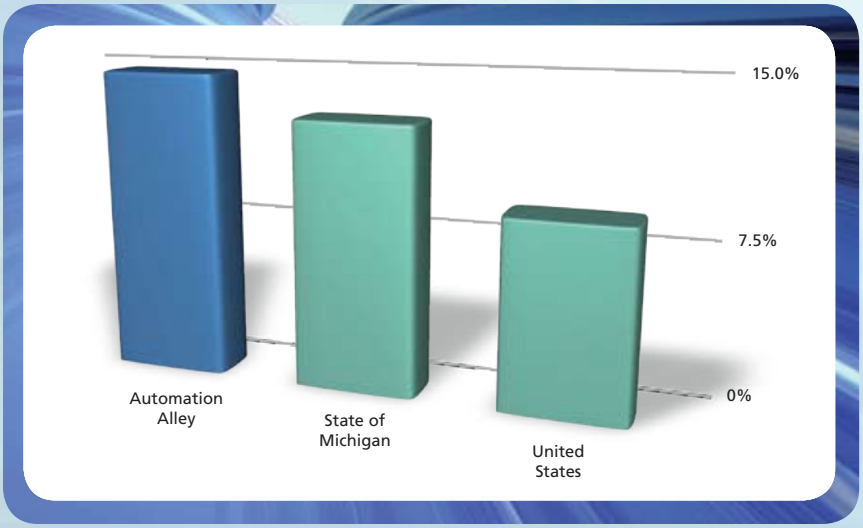
A closer look also shows that Automation Alley's technology industry reaches well beyond advanced automotive, which remains the largest cluster in terms of employment in the region. If you exclude advanced automotive from the definition of the technology industry, the region still has 9.4 percent of its total employment, and 15.4 percent of payroll, in technology clusters. This compares to 8.1 percent employment and 14 percent payroll for the state, and 8.3 percent employment and 14.1 percent employment for the nation.

Employment and Wage Trends. Total employment levels in Automation Alley's technology industry remained relatively steady from 2005 to 2006, with a 0.3 percent overall decline. The majority of this decline is attributable to losses in the advanced automotive cluster. When this cluster is excluded from the overall definition, we see that employment in the remaining clusters increased by 2 percent in Automation Alley (3,885 jobs), compared to 1.1 and 1.9 percent increases at the state and national levels.

The average wage in the technology industry increased in Automation Alley, the state, and the nation from 2005 to 2006, and wages in Automation Alley remain well above average levels. For 2006, the average technology industry wage in Automation Alley was $70,311 (a 1.8 percent increase over 2005). The state level was $65,370, and the national level was $65,892.

1. A location quotient over 1 indicates an industry is more concentrated in the regional economy being assessed than in the overall economy with which it is being compared. For example, a 1.5 location quotient for an industry in region X relative to the same industry in region Y indicates that the industry is 1.5 times more concentrated in region X than in region Y. From this you can conclude that the industry is a larger part of region X's economy than it is of region Y's. This does not necessarily offer a measure of strength, though a high concentration of workers in a given industry, or set of industries, may be attractive to businesses that benefit from "clustering," or locating near others with similar expertise.

FIGURE 1. Technology Industry's Share of Total Employment, 2006



TECHNOLOGY INDUSTRY CLUSTERS OVERVIEW

While overall technology industry employment declined from 2005 to 2006, it is notable that each of Automation Alley's technology clusters experienced somewhat unique changes in employment and wages, which are shown in Table 1.

TABLE 1. Automation Alley Employment and Payroll by Technology Cluster, 2005 v. 2006

	Employment: 2005	Employment: 2006	*Change in Employment*	2005 Average Wage	2006 Average Wage	*Change in Average Wage*
Advanced Automotive	117,401	112,542	*-4.1%*	$66,935	$66,935	*-1.0%*
Advanced Manufacturing	31,243	32,453	*3.9%*	$59,547	$58,456	*-1.8%*
Chemical and Material	9,044	8,584	*-5.1%*	$57,856	$61,892	*7.0%*
Information Technology	56,873	56,771	*-0.2%*	$65,076	$67,632	*3.9%*
Life Sciences	32,043	36,275	*13.2%*	$93,055	$97,141	*4.4%*
Other Technologies	65,808	64,813	*-1.5%*	$70,703	$71,770	*1.5%*
Total Technology Industry	**312,412**	**311,438**	***-0.3%***	**$69,068**	**$70,311**	***1.8%***

Source: Anderson Economic Group, LLC
Data: U.S. Census Bureau, County Business Patterns 2006

INDUSTRY SURVEY

In addition to the employment, payroll, establishment, and other technology industry indicators presented, we also surveyed 200 technology businesses in Automation Alley to measure their attitudes on the state and local economies, as well as their recent and expected business performance. Among the survey's findings were:

- A general level of optimism concerning the state and regional economy, with more respondents indicating they feel the economy will rate from 6 to 10 (with 10 indicating the most favorable performance) over the next 12 months when compared to the most recent 12 months.
- Sixty-one percent of respondents said Southeast Michigan was a favorable environment in which to grow a technology company, while only 11 percent said the region's overall economy was favorable.
- Sixty-five percent of respondents said that they experienced revenue increases in the past 12 months, and 75 percent expect revenue to grow over the next 12 months. An additional 20 percent reported steady revenues in the past 12 months, while only 5 percent anticipate revenue to decline in the next 12 months.
- In the past 12 months, 52 percent of respondents reported that they maintained their employment levels. Further, 26 percent reported that they added full-time employees, outweighing the 22 percent reporting a reduction in employment levels.

FIGURE 2: Percentage of Respondents with Favorable Opinions of Economies

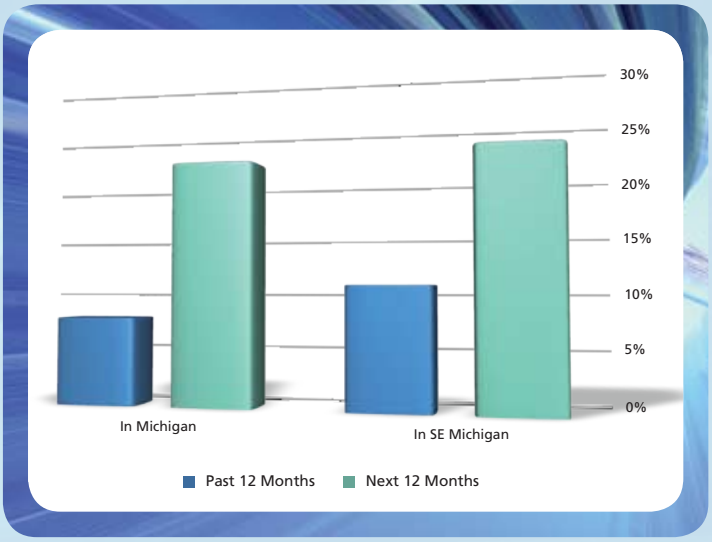
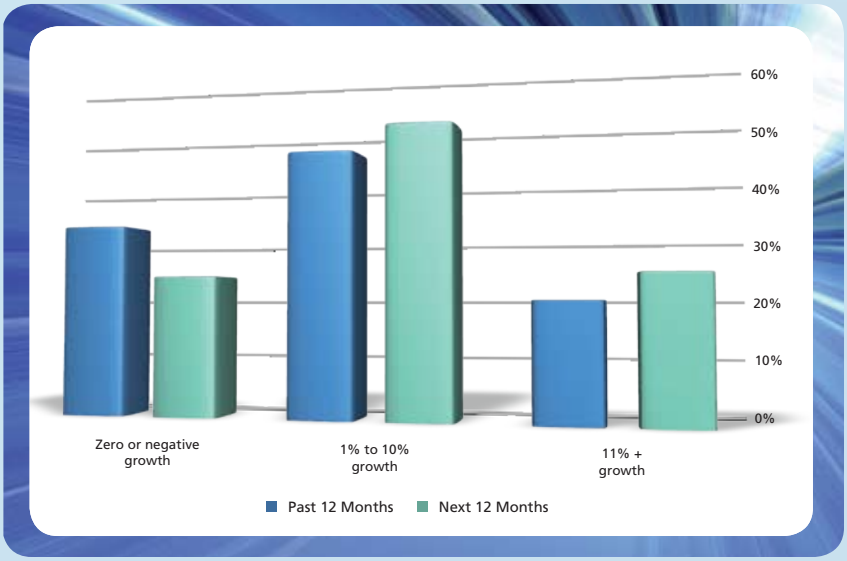


FIGURE 3: How Environment for Tech Businesses Has Changed in Southeast Michigan

FIGURE 4: Revenue Growth: Most Recent 12 Months and Next 12 Months



II. AUTOMATION ALLEY: REGIONAL OVERVIEW

INCOME DATA AND TRENDS

Throughout the 1990s, Automation Alley saw steady growth in per capita income. This growth has slowed, however, from 2000 to 2006. While the country as a whole experienced an annual average 2.7 percent increase in per capita income, Automation Alley and Michigan saw less than 1.4 percent average annual growth. The State of Michigan has fallen below the national average per capita income level, but Automation Alley has maintained a per capita income above the country average.

TABLE 2. Per Capita Income

	2000	2006	*Average Annual Change 2000-2006*
Automation Alley	**$24,405**	**$26,294**	***1.25%***
State of Michigan	$22,168	$24,097	*1.40%*
United States	$21,587	$25,267	*2.66%*

Source: Anderson Economic Group, LLC
Data: U.S. Census Bureau, County Business Patterns 2006

WORKFORCE DATA AND TRENDS

Labor Force. According to the U.S. Bureau of Labor Statistics, approximately 51 percent of Michigan's 2007 labor force was located in Automation Alley. Unfortunately, a larger share (54 percent) of the state's unemployed labor force was also in Automation Alley, as the region's unemployment rate for 2007 was 7.5 percent. Also notable is that the overall size of the labor force in both Automation Alley and in Michigan has continued to decrease in recent years. This may be due to people moving out of the state or voluntarily leaving the workforce because they are not able to find work.

Education. In 2006, approximately 87 percent of Automation Alley's adult population had graduated from high school or obtained an equivalent degree, and 17 percent of Automation Alley's population had graduated from college with at least a bachelor's degree. In addition, 11 percent of Automation Alley's population had obtained a graduate or professional degree. This is slightly higher than national and statewide statistics. Within Automation Alley, counties that stand out are Washtenaw, Livingston, and Oakland — all have adult populations where more than 21 percent hold at least a bachelor's degree, which exceeds the national average of 17.2 percent. These rates have also been increasing over the years.

III. THE TECHNOLOGY INDUSTRY IN AUTOMATION ALLEY

The technology industry is a central part of Automation Alley's economy. In 2006, the region's technology industry had 311,438 employees, representing nearly 15 percent of the region's private-sector employment. The industry's payroll totaled $21.9 billion, representing more than 23 percent of all private-sector payroll in the region.[2]

The average wage paid to an Automation Alley technology industry employee was $70,311 — a 1.8 percent increase over the 2005 average wage, and well above the industry's $52,904 average wage in 1998.

TABLE 3. Employment, Payroll, and Establishments — Automation Alley Technology Industry

	Employment	Total Payroll (1,000s)	Average Wage	Small Est.	Large Est.	Total Establishments
1998	361,900	$19,146,016	$52,904	7,550	591	8,142
–	–	–	–	–	–	–
–	–	–	–	–	–	–
–	–	–	–	–	–	–
2004	332,531	$21,849,549	$65,701	7,632	518	8,150
2005	312,412	$21,577,557	$69,068	7,529	508	8,037
2006	311,438	$21,897,585	$70,311	7,384	502	7,886
Change from 2005-2006	**-0.3%**	**1.5%**	**1.8%**	**-1.9%**	**-1.2%**	**-1.9%**

Source: Anderson Economic Group, LLC Data: U.S. Census Bureau, County Business Patterns 2006

2. According to the United States Census Bureau, County Business Patterns data do not include government employees, except those working in federally-chartered savings institutions, federally-chartered credit unions, and hospitals.

Relative Industry Size. The technology industry accounts for a much larger share of total employment and payroll in Automation Alley than in the State of Michigan, and in the country as a whole. As shown in Table 4 and Table 5, 14.7 percent of all private-sector employment in Automation Alley is in the technology industry, compared to only 12.8 percent for Michigan and 9.1 percent for the United States. Not surprisingly, this trend holds for payroll as well, with 23.4 percent of Automation Alley's private-sector payroll being generated by the technology industry, compared to 21 percent for the state, and 15.1 percent for the country.

These measures of employment and payroll concentration show that Automation Alley is a clear leader in the technology industry, not only at home in Michigan, but also on the national level. Further, this strength is not solely dependent on the automotive industry, which has fueled Automation Alley's economy for decades. Excluding advanced automotive, the region still has 9.4 percent of its total employment and 15.4 percent of payroll in the technology industry, compared to 8.1 percent employment and 14 percent payroll for the state, and 8.3 percent employment and 14.1 percent payroll for the nation.

TABLE 4. Share of Total Employment in Technology Industry by Cluster, 2006

	Automation Alley	State of Michigan	United States
Advanced Automotive	5.3%	4.7%	0.8%
Advanced Manufacturing	1.5%	1.9%	1.8%
Chemical and Material	0.4%	0.6%	0.5%
Information Technology	2.7%	2.0%	3.1%
Life Sciences	1.7%	1.4%	1.0%
Other Technologies	3.1%	2.2%	1.8%
Total Technology Industry	**14.7%**	**12.8%**	**9.1%**

Source: Anderson Economic Group, LLC

TABLE 5. Share of Total Payroll in Technology Industry by Cluster, 2006

	Automation Alley	State of Michigan	United States
Advanced Automotive	8.0%	7.0%	1.0%
Advanced Manufacturing	2.0%	2.6%	2.6%
Chemical and Material	0.6%	0.9%	0.8%
Information Technology	4.1%	3.2%	5.5%
Life Sciences	3.8%	3.5%	2.0%
Other Technologies	5.0%	3.8%	3.2%
Total Technology Industry	**23.4%**	**21.0%**	**15.1%**

Source: Anderson Economic Group, LLC

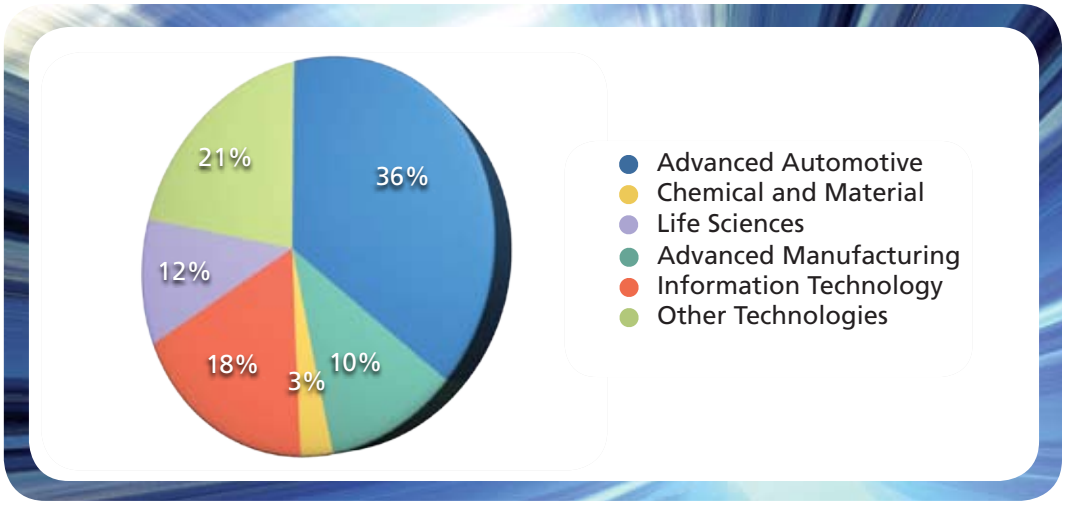
TECHNOLOGY INDUSTRY CLUSTERS

We have defined the technology industry by NAICS industry codes, which group businesses by their primary activity. In total, we identified 43 four-digit NAICS clusters that represent the technology industry. We then grouped these clusters by business activity and identified six main clusters:

- Advanced Automotive
- Advanced Manufacturing
- Chemical and Material
- Information Technology
- Life Sciences
- Other Technologies

Advanced automotive remains the largest component of the technology industry in Automation Alley, accounting for 36.1 percent of employment, but its role is less significant than it was in 1998, when it accounted for 45 percent of employment. The life sciences and other technologies clusters have grown to represent larger shares of the region's technology industry, providing a more diverse base in which workers can search for employment.

FIGURE 5. Employment by Technology Cluster in Automation Alley, 2006



ADVANCED AUTOMOTIVE CLUSTER

TABLE 6. Employment, Payroll, and Establishments — Advanced Automotive Cluster, 1998-2006

	Employment	Total Payroll (1,000s)	Average Wage	Small Est.	Large Est.	Total Establishments
1998	163,485	$8,743,020	$53,479	362	200	562
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
2004	127,832	$7,984,235	$62,459	375	180	555
2005	117,401	$7,858,227	$66,935	359	177	536
2006	112,542	$7,454,308	$66,236	352	171	523
Change from 2005-2006	**-4.1%**	**-5.1%**	**-1.0%**	**-2.0%**	**-3.4%**	**-2.4%**

Source: Anderson Economic Group, LLC
Data: U.S. Census Bureau, County Business Patterns

ADVANCED MANUFACTURING CLUSTER

TABLE 7. Employment, Payroll, and Establishments — Advanced Manufacturing Cluster, 1998-2006

	Employment	Total Payroll (1,000s)	Average Wage	Small Est.	Large Est.	Total Establishments
1998	46,886	$2,355,793	$50,245	970	93	1,063
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
2004	32,876	$1,842,821	$56,054	849	62	911
2005	31,243	$1,860,428	$59,547	810	67	877
2006	32,453	$1,897,062	$58,456	804	71	875
Change from 2005-2006	**3.9%**	**2.0%**	**-1.8%**	**-0.7%**	**6.0%**	**-0.2%**

Source: Anderson Economic Group, LLC
Data: U.S. Census Bureau, County Business Patterns

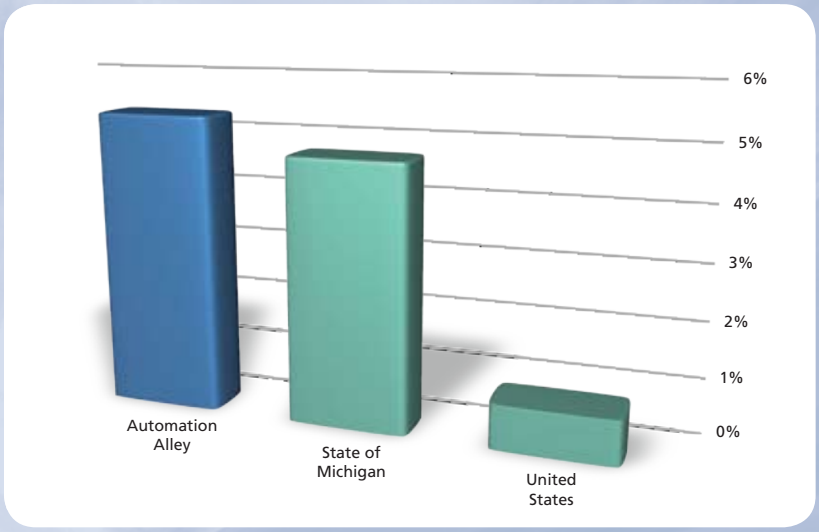
CHEMICAL AND MATERIAL CLUSTER

TABLE 8. Employment, Payroll, and Establishments — Chemical and Material Cluster, 1998-2006

	Employment	Total Payroll (1,000s)	Average Wage	Small Est.	Large Est.	Total Establishments
1998	9,644	$482,564	$50,038	227	22	249
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
2004	9,084	$500,278	$55,072	202	27	229
2005	9,044	$523,249	$57,856	197	25	222
2006	8,584	$531,280	$61,892	187	24	221
Change from 2005-2006	**-5.1%**	**1.5%**	**7.0%**	**-5.1%**	**-4.0%**	**-5.0%**

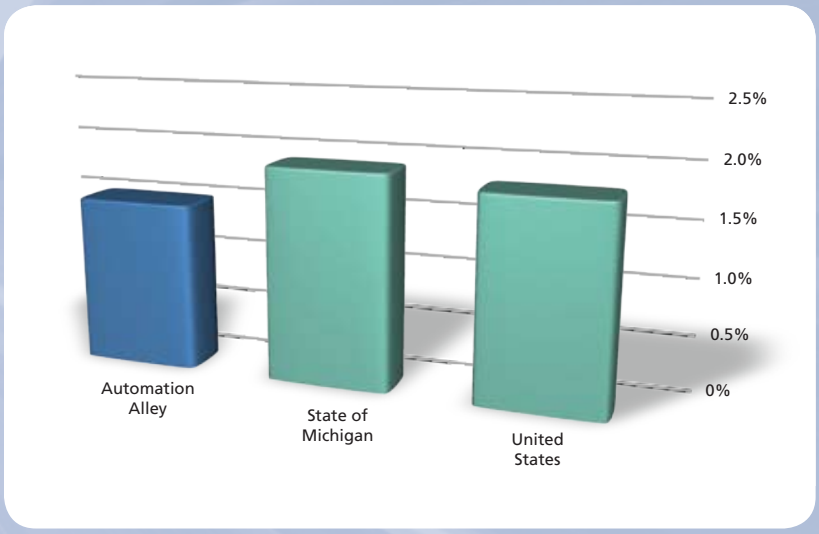
Source: Anderson Economic Group, LLC
Data: U.S. Census Bureau, County Business Patterns

FIGURE 6. Share of Employment in Advanced Automotive Cluster, 2006



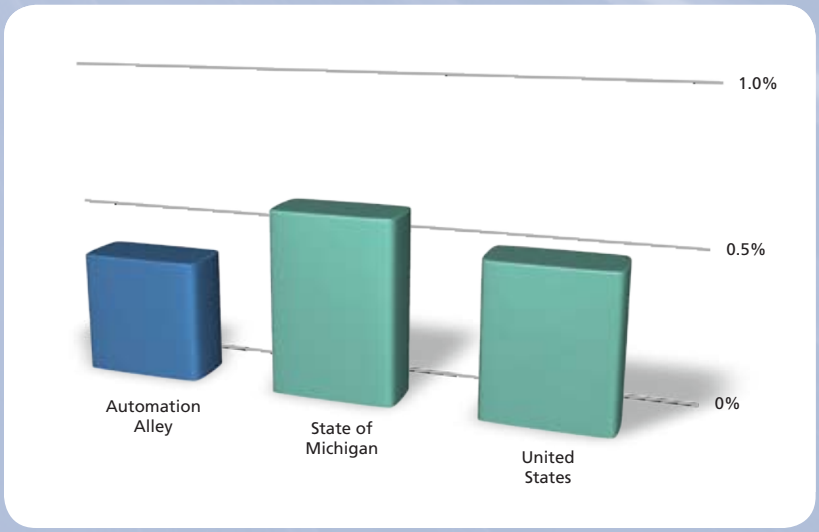
The advanced automotive cluster continues to be the largest technology industry employer in the region, accounting for 36.1 percent of all technology industry employment, and 5.3 percent of employment across all industries in the region in 2006. At the state and national levels, respectively, the advanced automotive technology cluster accounted for 4.7 and 0.8 percent of total employment. These measures show that advanced automotive in Automation Alley is 6.32 times more concentrated than at the national level, illustrating the region's continued role as an automotive leader.

FIGURE 7. Share of Employment in Advanced Manufacturing Cluster, 2006



The advanced manufacturing cluster proved resilient in light of pressures on manufacturers, with employment growing by 3.9 percent from 2005 to 2006. The average wage in the cluster was $58,456 for 2006, down just slightly from 2005, but still above the $56,054 level from 2004. Overall, the cluster accounts for 1.5 percent of employment in Automation Alley, which is a lower concentration than at the state and national levels. However, when combined with the relative size of the region's advanced automotive cluster, manufacturing in Automation Alley is clearly automotive centered.

FIGURE 8. Share of Employment in Chemical and Material Cluster, 2006



In 2006, Automation Alley's chemical and material technology cluster had employment of 8,584, down 5.1 percent from 2005. Despite this drop, total payroll in the region increased by 1.5 percent and the average wage rose 7 percent to $61,892. Overall, the cluster accounted for 0.4 percent of all private-sector employment, which, when compared to the state's and the nation's shares, yields a location quotient of 0.74. This shows that the cluster is less concentrated in Automation Alley than at the state and national levels.

INFORMATION TECHNOLOGY CLUSTER

TABLE 9. Employment, Payroll, and Establishments — Information Technology Cluster, 1998-2006

	Employment	Total Payroll (1,000s)	Average Wage	Small Est.	Large Est.	Total Establishments
1998	68,338	$3,363,941	$49,225	2,557	148	2,705
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
2004	62,877	$3,917,606	$62,306	3,095	121	3,216
2005	56,873	$3,701,046	$65,076	3,093	116	3,209
2006	56,771	$3,839,512	$67,632	3,044	114	3,158
Change from 2005-2006	**-0.2%**	**3.7%**	**3.9%**	**-1.6%**	**-1.7%**	**-1.6%**

Source: Anderson Economic Group, LLC
Data: U.S. Census Bureau, County Business Patterns

LIFE SCIENCES CLUSTER

TABLE 10. Employment, Payroll, and Establishments — Life Sciences Cluster, 1998-2006[a]

	Employment	Total Payroll (1,000s)	Average Wage	Small Est.	Large Est.	Total Establishments
1998	26,113	$1,737,532	$66,539	394	28	422
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
2004	34,510	$3,008,378	$87,174	424	32	456
2005	32,043	$2,981,756	$93,055	411	33	444
2006	36,275	$3,523,799	$97,141	403	35	438
Change from 2005-2006	**13.2%**	**18.2%**	**4.4%**	**-1.9%**	**6.1%**	**-1.4%**

Source: Anderson Economic Group, LLC Data: U.S. Census Bureau, County Business Patterns
a. NAICS code 5417 includes an estimated portion that accounts for employment in NAICS code 95 that would have been placed in 5417 for the years 1998-2002, based on the 2003 classifications.

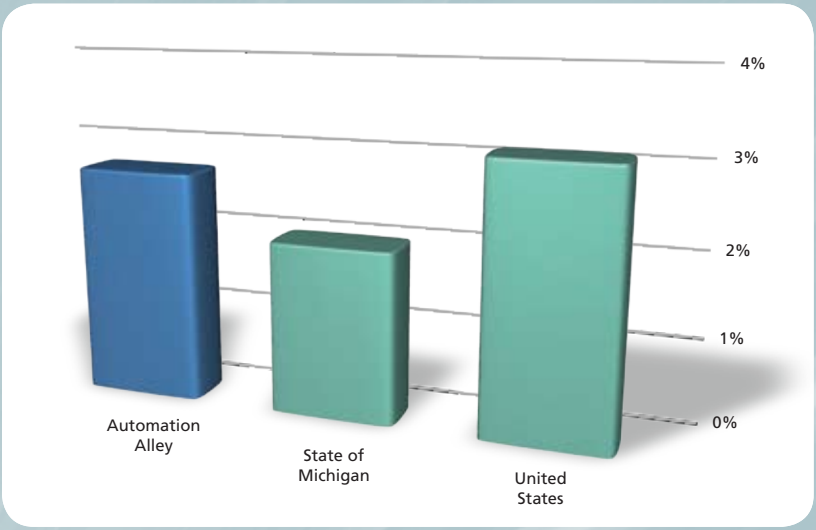
OTHER TECHNOLOGIES CLUSTER

TABLE 11. Employment, Payroll, and Establishments — Other Technologies Cluster, 1998-2006

	Employment	Total Payroll (1,000s)	Average Wage	Small Est.	Large Est.	Total Establishments
1998	47,434	$2,463,166	$51,928	3,040	98	3,138
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
2004	65,352	$4,594,231	$70,300	2,687	96	2,783
2005	65,808	$4,652,851	$70,703	2,659	90	2,749
2006	64,813	$4,651,624	$71,770	2,594	87	2,681
Change from 2005-2006	**-1.5%**	**0%**	**1.5%**	**-2.4%**	**-3.3%**	**-2.5%**

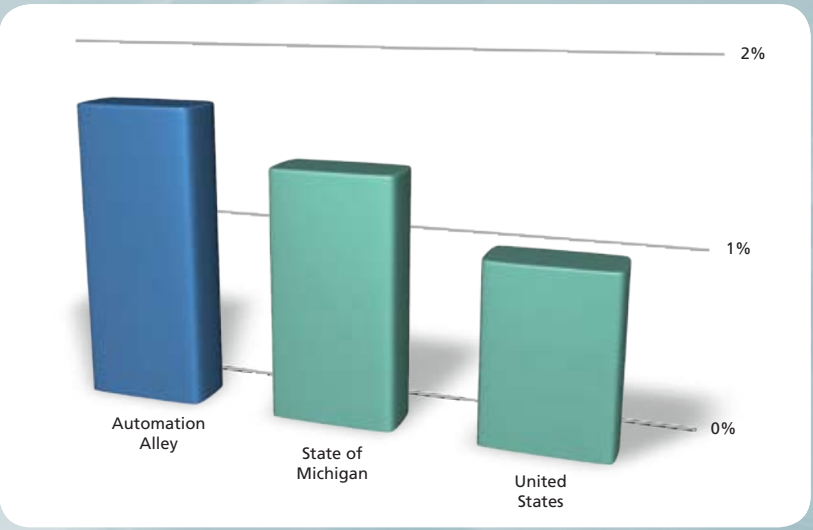
Source: Anderson Economic Group, LLC
Data: U.S. Census Bureau, County Business Patterns

FIGURE 9. Share of Employment in Information Technology Cluster, 2006



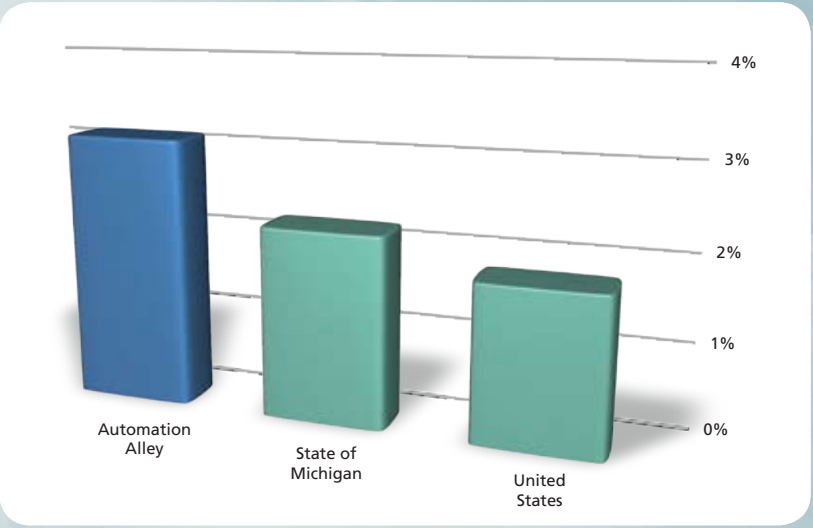
The information technology cluster of Automation Alley's technology industry had a 2006 employment level of 56,771, just 102 fewer than in 2005. Wages, however, grew by 3.9 percent over the period, resulting in a 2006 average wage of $67,632. Information technology employment accounted for 2.7 percent of all employment in Automation Alley. Compared to the state, this is a 1.34 location quotient, and compared to the nation the location quotient is 0.88. This suggests that Automation Alley's information technology industry is a larger part of the region's economy relative to the state, but a smaller part relative to the nation.

FIGURE 10. Share of Employment in Life Sciences Cluster, 2006



From 2005 to 2006, the life sciences cluster continued its trend of rapid growth and impressive wages, with a 13.2 percent employment increase and average wages jumping by 4.4 percent to $97,141. With 36,275 employees, this cluster accounted for 1.7 percent of all employment in Automation Alley, whereas the state level was 1.4 percent and the national level 1 percent. This higher concentration of employment in the life sciences industry gives Automation Alley a 1.21 location quotient relative to the state, and 1.66 relative to the nation, and indicates that the cluster plays a larger role in Automation Alley than in the other respective economies.

FIGURE 11. Share of Employment in Other Technologies Cluster, 2006



The other technologies cluster has also experienced significant growth in employment and wages in recent years, though from 2005 to 2006, employment saw a modest decline to 64,813 jobs. This, compared to the state, yields a location quotient of 1.46. Compared to the nation, the location quotient is 2.21, showing clearly that Automation Alley is a center for architectural and engineering work, which isn't surprising given the larger number of automotive research and design talent in the area.

TABLE 12. Other Technologies Cluster

NAICS	Industry Title
2111	Oil and Gas Extraction
4234	Professional & Commercial Equipment & Supplies Merchant Wholesalers
5413	Architectural, Engineering & Related Services

Note: To accommodate a change in the U.S. Census Bureau Industry classifications, we used 1997 NAICS 4214 (Professional and Commercial Equipment and Supplies Wholesalers) in place of 2002 NAICS 4234 for 1998-2002 data collection and analysis.

IV. INDICATORS OF TOMORROW'S TECHNOLOGY INDUSTRY

SCIENCE AND ENGINEERING GRADUATE STUDENTS

At the foundation of the technology industry is human capital, especially those trained in the science and engineering fields. As shown in Table 13, Automation Alley universities enrolled a total of 12,194 science and engineering graduate students in 2006, 335 more than the prior year, and 64 percent of the total science and engineering graduate student enrollment in the state. This concentration of students is attractive to employers seeking a labor market rich with talent, and demonstrates that Automation Alley's universities are helping to prepare students for the technology jobs that continue to shape the economy.

TABLE 13. Graduate Student Enrollment in Science and Engineering Fields

	1998	…	2004	2005	2006
Eastern Michigan University	670	…	970	1,021	1,112
Kettering University[a]	n/a	…	84	85	106
Lawrence Technological University[b]	n/a	…	306	342	416
Oakland University	1,070	…	1,138	1,149	1,181
University of Detroit Mercy	493	…	594	598	630
University of Michigan[c]	5,295	…	6,396	6,109	6,073
Wayne State University	2,800	…	2,536	2,640	2,676
Total	**10,328**	**…**	**11,940**	**11,859**	**12,194**

Source: National Science Foundation, Survey of Graduate Students and Post doctorates in Science and Engineering.
a. Note: The NSF does not report data for Kettering University. Kettering enrollment was provided by Kettering University Department of Institutional Effectiveness. Kettering University adopted electronic Graduate Student Enrollment data filing post 1998 complete academic year.
b. Note: 2003 was the first year that Lawrence Technological University had enrollment reported by the NSF.
c. Includes U-M Flint and U-M Dearborn.

UNIVERSITY RESEARCH AND DEVELOPMENT

Universities throughout Automation Alley also undertake important research that impacts the future of technology in the region. From 1998 to 2006, the universities significantly increased their R&D spending, growing from $646 million in 1998 to over $1.04 billion in 2006. Table 14 illustrates a 60 percent growth in R&D expenditures since 1998. Further, the universities in Automation Alley accounted for 71 percent of the $1.47 billion of total university R&D expenditures in Michigan for 2006.

TABLE 14. R&D Expenditures at Universities in Automation Alley (in thousands)

	1998	…	2004	2005	2006
Eastern Michigan University	$1,444	…	$3,266	$5,910	$3,580
Kettering University	$433	…	$661	$1,758	$3,473
Lawrence Technological University	$104	…	$655	$917	$2,137
Oakland University	$7,272	…	$6,616	$6,505	$9,169
University of Detroit Mercy	$1,853	…	$548	$586	$466
University of Michigan[a]	$496,761	…	$769,126	$808,887	$800,488
Wayne State University	$138,456	…	$225,475	$226,331	$220,731
Total	**$646,323**	**…**	**$1,006,347**	**$1,050,894**	**$1,040,044**

Source: National Science Foundation, Survey of Research and Development Expenditures at Universities and Colleges, FY 2005. Note: Data not available for Eastern Michigan in 1998 or for University of Detroit in 2004 or 2005 so the figures presented are NSF estimates.
a. Includes U-M Flint and U-M Dearborn.

Wayne State University, one of the leading research universities in Automation Alley, reflects Automation Alley's commitment to research and development of technology in the region. Wayne State University recently announced the awardees from Wayne State's President's Research Enhancement Program, a nearly $1.8 million investment designed to strengthen the university's position as a nationally recognized research institution and as a center of scholarship. It was also created to contribute toward developing research themes for the university that are consistent with an emphasis on its urban mission and global presence. This year's award recipients include a project aimed at generating a non-human primate embryonic stem cell (ESC) culture system, ultimately translating discoveries into clinical treatments for a variety of diseases; and a project aimed at developing a new auditory prosthesis system that will counter the existing clinical and engineering problems of current devices used to recover hearing. Technologies developed under this program will help treat other neurological disorders including tinnitus, Parkinson's disease, and epilepsy.[3]

University of Detroit Mercy (UDM) also stands out for its research and development. As part of Detroit's new "green" initiative, the city is looking for contemporary solutions to vacant land usage, including the potential of developing eco-villages of environmentally friendly, affordable housing. Recently, UDM's School of Architecture, along with other local support, sponsored a student design competition. The competition required students to design an eco-village on a five-acre site in Detroit's Woodbridge neighborhood and was intended to both promote green design technology in Detroit and make students more aware of green design principles and standards.[4]

The University of Michigan (U-M) recently announced that the engineering college will be expanding its reach into robotics. The newly formed master's program will let students specialize in developing unmanned ground vehicles and other automated technology that allows robots to work independently of human control. Falling in line with this recent expansion, the U.S. Army recently funded a $2 million research center designed to help U-M's engineering college invent battle-ready robotic technology. The new U-M programs help fill a growing need for robotics expertise.[5]

3. Information provided by Wayne State University's website: www.wayne.edu.

4. Information obtained from University of Detroit Mercy's website at www.udmercy.edu.

5. U-M to offer master's program in robotics, *Detroit News*, August 11, 2008

UTILITY PATENTS

Patents granted to businesses and universities are another useful indicator of technological innovation. Of the 491 patents granted to Michigan universities, 315 were awarded to universities in Automation Alley — the University of Michigan received 269, Wayne State University received 40, and Oakland University received six.[6] These patents range from a method for treating colon disorders (U.S. Patent Number 6,849,449) to sensors that can detect leaks in hydrogen fuel cells (U.S. Patent Number 6,935,158).[7]

PRIVATE-SECTOR PATENTS

Patents awarded to businesses and individuals are also a measure of technological development and innovation. During the five-year period from 2003 through 2007, companies in the region received 10,597 utility patents out of the state total of 15,485; or 68 percent. From 2006 to 2007, businesses in both the State of Michigan and Automation Alley were awarded 17 percent fewer patents than in the previous year. However, in 2007 alone, Automation Alley was granted over 70 percent of the state's private-sector patents.[8]

These patents ranged from technologies in the life sciences to the automotive industry. Unitech Pharmaceuticals, Inc. of Ann Arbor, for example, patented a method for treating multiple types of cancer (U.S. Patent Number 7,125,902) using chemical derivatives. Chrysler LLC, located in Auburn Hills, also received a patent (U.S. Patent Number 7,393,036) for its slide-out cargo door, which is designed to move along a path from a first position totally within the vehicle's cargo space to an extended position at least partially outside the vehicle.

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM AWARDS

The United States Small Business Administration (SBA) administers the Small Business Innovation Research (SBIR) program, which helps fund innovative research by small businesses throughout the country. The program recognizes that small businesses are entrepreneurial and innovative, but often lack sufficient funding to conduct research and development. To overcome this problem, SBIR awards are annually given to qualified small businesses that take part in a highly competitive selection process.

6. The schools included were: Michigan State University, Michigan Technological University, Oakland University, University of Michigan, Wayne State University, and Western Michigan University.
7. Information provided by University of Michigan's and Wayne State University's Tech Transfer offices, available at www.techtransfer.umich.edu and at www.techtransfer.wayne.edu, respectively.
8. Data collected from the United States Patent Office and analyzed by Anderson Economic Group, LLC.

SBIR awards and funding, though coordinated by the SBA, are actually granted by 11 federal agencies. Each agency gives public notice as to the type of research they would like to fund, and then receives proposals from small businesses interested in doing the research. If a small business receives an award, it will get either a Phase I award, which is for studying the feasibility of a research project, or a Phase II award, which is for the actual research and development process. Given the extent of Phase II, these awards are more difficult to receive and come with larger amounts of funding.

SBIR Awards in Automation Alley. Small businesses throughout Automation Alley have received SBIR project awards for research ranging from noise reduction, to web collaboration, to nanotechnology. During the period from 2000 to 2006, small businesses in Automation Alley received 618 SBIR awards worth nearly $189.5 million. This accounts for 76 percent of all SBIR awards, and 78 percent of all SBIR funding, received by small businesses in Michigan from 2000 to 2006.[9]

TABLE 15. SBIR Awards to Automation Alley Businesses

Year	Phase I Awards	Phase I Funds	Phase II Awards	Phase II Funds
2000	34	$3,116,815	19	$10,199,833
2001	46	$4,642,856	26	$14,116,394
2002	71	$7,384,592	15	$10,723,150
2003	65	$8,819,133	36	$26,541,293
2004	65	$6,191,054	24	$20,298,780
2005	82	$8,558,682	38	$30,103,471
2006	53	$6,337,025	44	$32,466,104
2000-2006 Total	**416**	**$45,050,157**	**202**	**$144,449,025**

Source: Anderson Economic Group, LLC
Data: U.S. Small Business Administration, http://tech-net.sba.gov/tech-net

The majority of SBIR awards granted in Automation Alley from 2000 to 2006 were given by the Department of Defense (53 percent) and Health and Human Services (29 percent). However, each of the 11 agencies participating in the SBIR program granted at least one award to an Automation Alley business during the period. The other agencies are the Department of Agriculture (four awards granted), Department of Commerce (one award granted), Department of Education (six awards granted), Department of Energy (13 awards granted), Environmental Protection Agency (six awards granted), NASA (44 awards granted), National Science Foundation (30 awards granted), Department of Transportation (one award granted), and Department of Homeland Security (six awards granted).

9. From 2000 to 2006 there were 802 SBIR awards granted to small businesses in Michigan. These awards were worth $236.4 million in funding. Data: U.S. Small Business Administration (http://tech-net.sba.gov/tech-net), accessed July 28, 2008. Analysis by Anderson Economic Group, LLC.

V. DEFENSE AND HOMELAND SECURITY

DEFENSE AND HOMELAND SECURITY

Automation Alley's relationship with the U.S. military and its partners plays a critical role in expanding the region's industries and universities. The Department of Defense (DOD) and Department of Homeland Security (DHS) contract with certain businesses in developing and commercializing technologies that protect our borders, allow for faster emergency response times, detect threats, and provide physical and virtual security. They also provide vital funding for universities' research and development of military technology.

Southeast Michigan is home to a wide range of companies that support the DOD and DHS. General Dynamics, with 2007 sales of $27.2 billion, has leading market positions in mission critical information systems and technologies, land and amphibious combat systems, shipbuilding and marine systems, and business aviation. Sterling Heights-based General Dynamics Land Systems, a business unit of General Dynamics, was awarded a contract worth $116 million for the purchase of long-lead materials for work associated with the Abrams main battle tank. The process will restore used equipment to combat-level capability. Upgrades include second-generation forward-looking infrared, far-target locate, a tank-infantry phone, and driver's vision enhancement. Improvements will increase the tank's fighting capability by providing soldiers with an electronic graphic of the battlefield with icons for friendly and enemy forces, and a tank commander's thermal sight for the .50 caliber machine gun.[10]

Southeast Michigan is also home to a unique hub of defense and DHS technology with the U.S. Army Tank Automotive Research, Development, and Engineering Center (TARDEC), the U.S. Army's TACOM Life Cycle Management Command, and Selfridge Air National Guard Base. Since World War II, TARDEC has maintained a presence in Detroit to tap into the area's automotive design and engineering talent. Currently, TARDEC employs over 1,200 Southeast Michigan residents and is expected to continue growing, as the DOD began moving the Robotic Systems Joint Program Office (RS-JPO) from Alabama to Warren, Mich. in August 2007.[11]

Automation Alley's universities play an important role in developing technology for the DOD and DHS. The 2008 expansion of the University of Michigan's robotics programs follows a move in 2005 by the Army to relocate its robotics development program from Alabama to the military's Detroit Arsenal in Warren. The office focuses on technology for the battlefield. The Army is spending $4 million for invention of battle-ready technology at U-M and seven other academic institutions, including Wayne State and Lawrence Technological universities.[12] Additionally, the DOD plans to award six grants to the University of Michigan and Oakland University totaling $3.9 million.[13] The funding will come as part of the Defense University Research Instrumentation Program (DURIP) and the Multi-disciplinary University Research Initiative (MURI). The DURIP program assists university researchers with defense-related research by providing funding for critical, state-of-the-art equipment, and the MURI program supports multi-disciplinary defense-related research that intersects more than one traditional science and engineering field.

10. Information obtained from General Dynamics Land Systems' website at www.gdls.com.
11. Automation Alley Releases Key Data on the State of Southeast Michigan's Technology Economy, Reuters. January 7, 2008.
12. Senators Levin, Stabenow Announce Nearly $4 Million to Support Defense Research at U-M, Oakland, U.S. Senator Carl Levin Press Release. March 9, 2007.
13. U-M to offer master's program in robotics, *Detroit News*, August 11, 2008.

VI. AUTOMATION ALLEY'S TECHNOLOGY SPOTLIGHT

Automation Alley is Michigan's largest technology business association, driving growth in Southeast Michigan's economy through a collaborative culture that focuses on workforce and business development initiatives. With nearly 1,000 members, Automation Alley is quickly on course to become the nation's largest technology organization.

Founded in 1999, the Automation Alley region encompasses the counties of Genesee, Livingston, Macomb, Monroe, Oakland, St. Clair, Wayne and Washtenaw, as well as the City of Detroit. Automation Alley's membership is comprised of a variety of industries, including those from business, government and education.

ENTREPRENEURIALISM AT ITS BEST

Automation Alley assists entrepreneurs in their efforts to accelerate the commercialization of new products, technologies and services. With the Alley's support and resources, ideas are cultivated into usable, marketable technology solutions.

Available to entrepreneurs are a vast array of services and programs, including Automation Alley's technology business accelerator program. To date, 22 companies from across Southeast Michigan have received seed funding totaling more than $3.6 million. Also, more than 450 technology start-up companies have received entrepreneurial support, ranging from business plan assistance to referrals and mentoring.

In addition, Automation Alley holds a Cooperative Research and Development Agreement (CRADA) with the National Automotive Center (NAC) — Michigan's only federal research lab. With an NAC office located within Automation Alley's headquarters, entrepreneurs have access to key government partners. Interested companies can also receive defense counseling from Brigadier General Donald Schenk (U.S. Army, Ret.) and Colonel Tom Lytle (USMC, Ret.).

GOING GLOBAL TO NEW MARKETS

Automation Alley provides small to mid-size companies with the necessary resources to support global expansion initiatives. Automation Alley also helps foreign companies, international business associations and educational institutions establish a presence in Southeast Michigan. Through these activities, Automation Alley enables area businesses to prosper in the international marketplace and bolsters business in Southeast Michigan.

Since 2001, Automation Alley has conducted trade missions to countries across the world. By visiting the markets of China, Brazil, India, Germany and Mexico, Automation Alley's trade missions have garnered more than $130 million in international business contracts for Southeast Michigan while creating more than 200 new jobs.

Upcoming 2009 trade missions include Russia in the spring and India in the fall.

LOOKING AHEAD

Collaboration is the cornerstone on which Automation Alley has been built.

By bringing together business, government and education, Automation Alley has successfully fostered technological innovation, economic growth and workforce development and will continue to do so as the organization evolves.

Automation Alley will also continue to be the voice of Southeast Michigan's technology economy, and promote member prosperity through technology acceleration, business assistance and international trade. Automation Alley will also brand Southeast Michigan as a center for technology and drive growth in the region's economy.

To view the entire report, visit www.automationalley.com.

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